United States Department of the Interior

FISH AND WILDLIFE SERVICE
Bishop Henry Whipple Federal Building
1 Federal Drive
Fort Snelling, MN 55111-4056

IN REPLY REFER TO:

FWS/NWRS-CP

June 29, 2010

Dear Reviewer:

We are pleased to provide you with this Draft Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) for Tamarac National Wildlife Refuge (Refuge) and Tamarac Wetland Management District (District).

The CCP will guide management of the Refuge and District for the next 15 years and will help meet their purposes and contribute to the mission of the National Wildlife Refuge System. The CCP will provide both broad and specific guidance on various issues; describe a vision, goals, and measurable objectives; and list strategies for reaching the objectives.

We invite you to review and comment on the Draft CCP and EA. By sharing your thoughts, you can help ensure that the final CCP is both visionary and practical. We will host an open house where you will be able to ask questions and voice concerns and suggestions. This event will take place at the Refuge Visitor Center, from 6 p.m. – 8 p.m. on Tuesday, July 20, 2010. The visitor center is located at 35704 County Highway 26, Rochert, Minnesota. The meeting date will be announced through the media and other means.

Written comments are also welcome during the 30-day comment period and should be addressed to: U.S. Fish and Wildlife Service, Tamarac National Wildlife Refuge, Attention: CCP Comment, 35704 County Highway 26, Rochert, Minnesota 56578. You may also send comments to us through the following web address: http://www.fws.gov/midwest/planning/Tamarac

To be considered in preparing the Final CCP, comments must be received by August 6, 2010.

We look forward to continuing the dialogue on the future of the Refuge and District, and thank you for your continued interest in keeping these lands a special place for wildlife and people.

Sincerely,

Dean Granholm

Dean Granholm
Acting Chief, Division of Conservation Planning

Tamarac

National Wildlife Refuge

Draft Comprehensive Conservation Plan

Table of Contents

Chapter 1: Introduction and Background 1

Tamarac National Wildlife Refuge 1
The U.S. Fish and Wildlife Service 3
The National Wildlife Refuge System 3
Refuge Purposes 3
Refuge Vision 4
Purpose and Need for Plan 4
Organization of the Plan 4
History of Refuge Establishment and Management 5
Legal Context 5

Chapter 2: The Planning Process 6

Internal Agency Scoping 6
Public Scoping 6
Refuge Program Reviews 7
Summary of Issues, Concerns and Opportunities 7
Tamarac NWR 7
Wildlife Management 7
Habitat Management 8
Visitor Services 9
Facilities/Roads 10
Tamarac WMD 10
Preparation, Publishing, Finalization and Implementation of the CCP 11

Chapter 3: Refuge Environment 12

Introduction 12
Other Units Administered 12
Wilderness Area 12
Wilderness Review 12
Areas of Special Designation 12
Ecological Context 13
Historic Land Cover 13
Minnesota Ecological Classification System 14
Migratory Bird Conservation Initiatives 17
Minnesota Comprehensive Wildlife Conservation Strategy 17
Midwest Region Fish and Wildlife Conservation Priorities 18
Landscape Connectivity and Corridors 18
Other Conservation Lands in the Area of Tamarac NWR 19
Social and Economic Context 19

Area Economy 19
Climate 19
Geology and Glaciation 19
Soils 21
Water and Hydrology 22
Refuge Habitats 24
Forest 24
Wetlands 26
Open Water 26
Grassland 26
Shrub 26
Developed Land 26
Refuge Wildlife 26
Birds 26
Mammals 29
Fish 30
Reptiles and Amphibians 30
Invertebrates 30
Threatened and Endangered Species 31
Refuge Resources of Concern 31
Threats to Resources 31
Invasive Species 31
Earthworms 33
White-tailed Deer 33
Zebra Mussel 33
Other Forest Pests and Pathogens 34
Contaminants 34
Climate Change and Tamarac NWR 34
Midwest Climate Change Impacts 35
Observed Climate Trends 36
Scenarios of Future Climate 36
Midwest Key Issues: 36
1. Reduction in Lake and River Levels 36
2. Agricultural Shifts 37
3. Changes in Semi-natural and Natural Ecosystems 37
Administrative Facilities 38
Visitor Services 38
Current Management 38
Habitat Management 38
Wetland Management 39
Open Landscape Management 40
The 1000-acre Tract 41
Forest Openings 42
Croplands 42
Forest Management 42
Habitat Restoration 43
Fish and Wildlife Management and Monitoring 44
Fish and Wildlife Management 44
Fishery Management 44
Wildlife Management 44

Predator and Exotic Wildlife Management 44
Fish and Wildlife Monitoring 44
Studies and Investigations 45
Water Quality 45
Climate Change 45
Pathways for Ecological Restoration of Native Plant Communities 46
Survivability of Spotted Knapweed Biological Agents to a Spring Prescribed Fire 46
Golden-winged Warbler Breeding Ecology 46
Post-fledging Ecology of Ring-necked Ducks in Minnesota 46
Disease Monitoring and Control 47
West Nile Virus 47
Avian Influenza (H5N1) 47
Visitor Facilities 47
Hunting 47
Fishing 47
Wildlife Observation 50
Wildlife Photography 50
Interpretation 50
Environmental Education 50
Outreach 51
Volunteer Contributions 51
Partnerships 51
Interagency Coordination 51
Tribal Activities 52
Cooperating Organizations 53
Archeology and Cultural Resources 54
Law Enforcment 55

Chapter 4: Future Management Direction: Tomorrow's Vision 56

Tamarac NWR Goals, Objectives and Strategies 56
Tamarac NWR Goals 57
Goal 1: Wildlife 57
Goal 2: Habitat 61
Goal 3: People 72

Chapter 5: Plan Implementation 81

New and Existing Projects 81
Tamarac NWR Operating Needs and Visitor Facility Enhancement Projects 81
Enhance Environmental Education and Interpretive Capacity and Capability 81
Provide Public Safety, Security and Resource Protection Through Increased Law Enforcement Capability 82
Develop Strategic Forest Management Program 82
Develop a New Audiovisual Program at Tamarac NWR Visitor Center 82
Update Visitor Center Exhibits 82
Hydrological Geomorphic (HGM) Assessment of Tamarac NWR Lakes and Rivers 82
Aquatic Resources and Water Quality Investigation 83
Climate Change Adaptations for Biodiversity Conservation at Tamarac NWR 83
Wetland Management District Operating Needs Projects 83
Enhance Wetland Management District 83
Survey FSA Easements 83

Future Staffing Requirements 83
Step-down Management Plans 84
Partnership Opportunities 84
Wilderness Review 84
Monitoring and Evaluation 84
Plan Review and Revision 85

Chapter 6: Tamarac Wetland Management District 86

Introduction and Background 86
District Purposes 86
District Vision 86
Planning Background 86
District Environment and Current Management 86
District Environment 86
Current Wetland Management District Programs: Where We Are Today 89
Habitat Restoration and Management 90
Wetlands 90
Grasslands 90
Forests 90
Wetland Management District Public Recreation, Environmental Education, and Interpretation 91
Wetland Management District Goals, Objectives and Strategies 91
Future Management Direction: Where We Want To Go Tomorrow 91
Goals, Objectives and Strategies 91
Goal 1: Wildlife 91
Goal 2: Habitat 92
Goal 3: People 95
Plan Implementation 96

Appendix A: Environmental Assessment 97

Appendix B: Glossary 145

Appendix C: Species Lists 147

Appendix D: Refuge Species of Concern 171

Appendix E: Bibliography and References Cited 179

Appendix F: Compliance Requirements 181

Appendix G: Draft Compatibility Determinations for Tamarac NWR and WMD 187

Appendix H: Collier Agreement 229

Appendix I: Appropriate Use 235

Appendix J: List of Preparers 251

List of Figures and Tables

Figure 1: Location of Tamarac NWR 2
Figure 2: Areas of Special Designation, Tamarac NWR 13
Figure 3: Ecoregion of Tamarac NWR 14
Figure 4: Vegetation of Tamarac NWR and Becker County Prior to European Settlement 15
Figure 5: Tamarac NWR in Relation to Major Provinces of Minnesota 16
Figure 6: Tamarac NWR in Relation to Sections and Subsections of the Ecological Classification System of Minnesota 17
Figure 7: Bird Conservation Regions Related to Tamarac NWR 18
Figure 8: Conservation Lands in the Vicinity of Tamarac NWR 20
Figure 9: Location of Tamarac NWR in Relation to Major Watersheds of North-central Minnesota 23
Figure 10: Current Land Cover, Tamarac NWR 25
Figure 11: Tamarac NWR Habitat 26
Figure 12: Current Visitor Services Facilities – Fall and Winter 48
Figure 13: Current Visitor Services Facilities – Spring and Summer 49
Figure 14: Future Land Cover Goals, Tamarac NWR 63
Figure 15: Hunting Areas on Tamarac NWR 73
Figure 16: Future Visitor Services Facilities –Spring and Summer, Tamarac NWR 77
Figure 17: Future Visitor Services Facilities – Fall and Winter, Tamarac NWR 78
Figure 18: Current Staffing Chart (2010), Tamarac NWR and WMD 84
Figure 19: Location of Tamarac WMD in Relation to Other FWS Lands 87
Figure 20: Overview of Wetland Management Districts in Minnesota 88

Table 1: Socioeconomic Characteristics of Becker County, Minnesota 21
Table 2: Summary of Area Economy, 2005, Tamarac NWR 22
Table 3: Distinct Classes of Soils Within Tamarac NWR Based Upon Moisture Capacity and Texture 22
Table 4: Vegetative Cover Types of Tamarac NWR Based on 2005 Aerial Photography Interpretation 27
Table 5: Proposed Changes in Vegetation Cover Types, Tamarac NWR 62
Table 6: New Staff Required to Fully Implement the CCP by 2025, Tamarac NWR and WMD 84
Table 7: Step-down Management Plan Schedule, Tamarac NWR 85

Chapter 1: Introduction and Background

Tamarac National Wildlife Refuge

Tamarac National Wildlife Refuge (Tamarac NWR), encompassing nearly 43,000 acres, is located in Becker County, 18 miles northeast of Detroit Lakes, Minnesota, (pop. 7,400) and 60 miles east of Fargo, North Dakota (Figure 1 on page 2). Tamarac NWR lies in the glacial lake country of northwestern Minnesota, in the heart of one of the most diverse transition zones in North America. Here eastern deciduous hardwoods, northern coniferous forests and western tall grass prairie converge, creating a rich assemblage of both plants and animals.

The landscape is characterized by rolling forested hills interspersed with shallow lakes, rivers, marshes and shrub swamps. Sixty percent of the refuge is forested with aspen, jack pine, red pine, balsam fir, paper birch, red and white oak, sugar maple and basswood tree types. Large and small wetland complexes comprise about 35 percent of the Refuge. Many refuge lakes and rivers contain large native wild rice beds that produce abundant food for waterfowl and other wetland dependent species. Twenty-eight lakes lie within the Refuge and three rivers flow through the Refuge, while marshes and wooded potholes number several thousand. The remaining 5 percent of Tamarac NWR is grassland, mostly remnants of early settler clearings or small farms.

Tamarac NWR wildlife is as varied as the habitat with more than 258 species of birds and 50 species of mammals. Bald Eagles are common with up to 23 territories producing as many as 33 young in recent years. Resident bear and gray wolves are seen periodically.

The Refuge was historically and remains a prized hunting, fishing, ricing and maple sugaring area for a succession of Native American people. The Dakota/Lakota inhabited the area until the 18th century when they were displaced by the Annishanabe or "Chippewa." These native people knew the value of the lush beds of *manoomin* (wild rice), stands of sugar maple and abundance of wild foods, fish and game the land provided for their people.

A bird's eye view of Tamarac NWR. Photo Credit: D. Brand

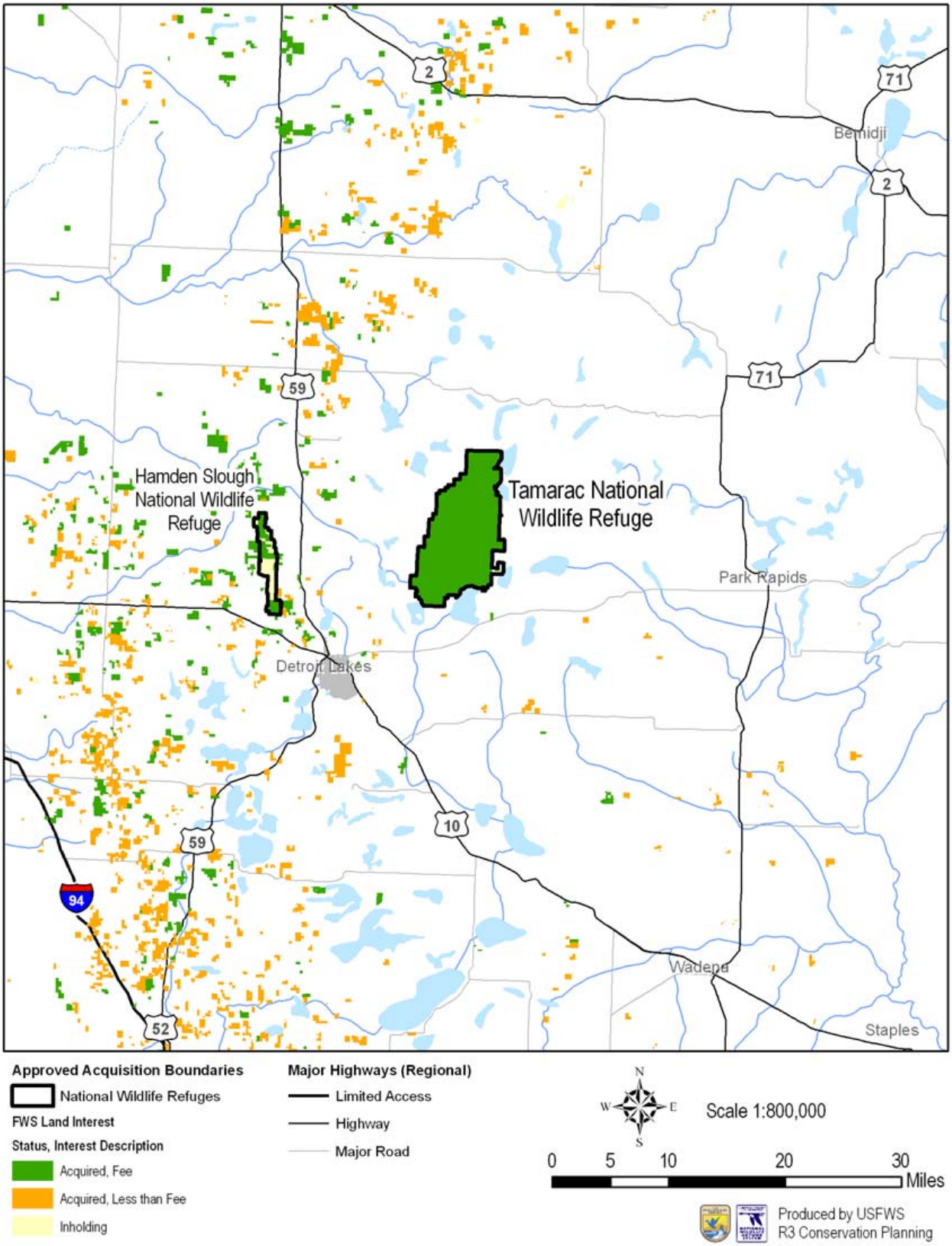
Today, the north half of Tamarac NWR lies within the original White Earth Indian Reservation established in 1867.

Between 1890 and 1930, the Refuge's original stands of red and white pine were logged. Catastrophic fires occurred during this time period due to extensive slash piles that were left behind after the logging. Several dams and ditches were also created by loggers, to transport logs down river to the mill. Settlers followed the loggers, but farming never achieved much prominence due to the dense forest, marginal soils and numerous wetlands.

Though the landscape has been altered by the influences of human history and past management, the Refuge remains largely intact with a functioning ecosystem and retains an untamed character for current visitors to enjoy, use and respect. With the encroachment of development surrounding the Refuge, the promotion of sound land stewardship practices will be key in remaining connected in the landscape.

The Refuge is also responsible for a five-county region known as the Tamarac Wetland Management District (Tamarac WMD). Established in 1987, Tamarac WMD stretches over 10,600 square miles in Beltrami, Cass, Clearwater, Hubbard and Kooch-

Figure 1: Location of Tamarac NWR



iching Counties, extending the Refuge's sphere of responsibility to the Canadian border. District activities, including an active Partners for Fish and Wildlife program, complement Refuge goals to ensure a landscape perspective for conservation delivery.

The U.S. Fish and Wildlife Service

Tamarac NWR and WMD are administered by the U.S. Fish and Wildlife Service (Service). The Service is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife populations and their habitats. It oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of nationally significant fisheries, administration of the Endangered Species Act, and the restoration of wildlife habitat. The Service also manages the National Wildlife Refuge System.

The National Wildlife Refuge System

Refuge lands are part of the National Wildlife Refuge System, which was founded in 1903 when President Theodore Roosevelt designated Pelican Island in Florida as a sanctuary for Brown Pelicans. Today, the system is a network of 547 refuges and wetland management districts covering nearly 95 million acres of public lands and waters. Most of these lands (82 percent) are in Alaska, with approximately 16 million acres located in the lower 48 states and several island territories.

The National Wildlife Refuge System is the world's largest collection of lands specifically managed for fish and wildlife. Overall, it provides habitat for more than 5,000 species of birds, mammals, fish, amphibians, reptiles, and insects. As a result of international treaties for migratory bird conservation and other legislation, such as the Migratory Bird Conservation Act of 1929, many refuges have been established to protect migratory waterfowl and their migratory flyways.

Refuges also play a crucial role in preserving endangered and threatened species. Among the most notable is Aransas National Wildlife Refuge in Texas, which provides winter habitat for the highly endangered Whooping Crane. Likewise, the Florida Panther Refuge protects one of the nation's most endangered predators. Refuges also provide unique recreational and educational opportunities for people. When human activities are compatible with wildlife and habitat conservation, they are places where people can enjoy wildlife-dependent recreation such as hunting, fishing, wildlife observation, photography, and environmental education and interpretation. Many refuges have visitor centers, wildlife trails, automobile tours, and environmental education programs. Nationwide, approximately 30 million people visited national wildlife refuges in 2004.

The National Wildlife Refuge System Improvement Act of 1997 established several important mandates aimed at making the management of national wildlife refuges more cohesive. The preparation of Comprehensive Conservation Plans (CCPs) is one of those mandates. The legislation directs the Secretary of the Interior to ensure that the mission of the National Wildlife Refuge System and purposes of the individual refuges are carried out. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the National Wildlife Refuge System.

The goals of the National Wildlife Refuge System are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Refuge Purposes

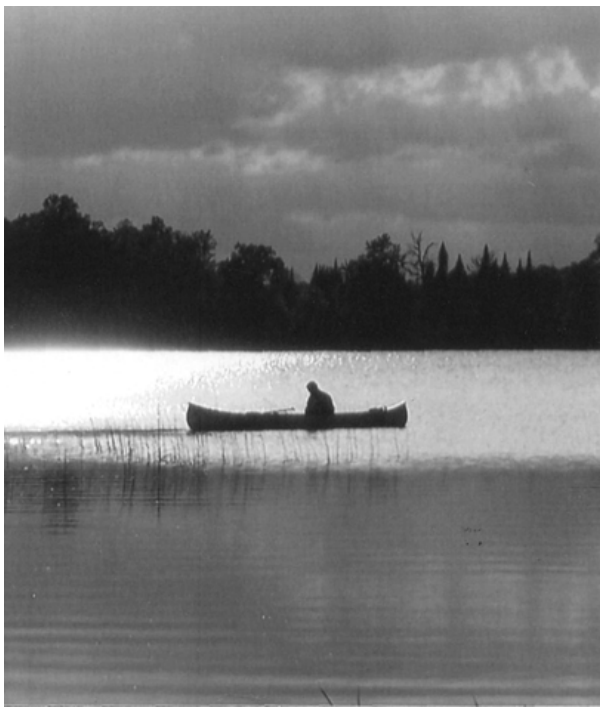
Tamarac National Wildlife Refuge was established in 1938…

- "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938.
- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

Refuge Vision

The planning team considered the past vision statements and emerging issues and drafted the following vision statement as the desired future state for the Refuge:

> **Tamarac National Wildlife Refuge** is treasured as an ecologically and culturally rich landscape of rolling forested hills interspersed with shallow lakes, rivers and marshes that nurtures a unique and diverse assemblage of plants and animals. Towering red and white pine intermingle with aspens, majestic old growth forests, jack pine barrens and tamarack-spruce bogs. In the land where food grows on water, bountiful wild rice provides for future generations of wildlife and native people. From the vibrant emergence of spring woodland wildflowers to the rich colors of autumn to the quiet hush of winter, people come to revitalize their spirit and connect with a rich wildlife heritage. Tamarac NWR will remain resilient to human influences and provide an unbroken landscape of native plant communities to support healthy and productive native fish and wildlife populations.



A lone canoe. Photo Credit: Heather Lehmann Callaway

Purpose and Need for Plan

This CCP articulates the management direction for Tamarac NWR and District for the next 15 years. Through the development of goals, objectives, and strategies, this CCP describes how the Refuge and district also contribute to the overall mission of the National Wildlife Refuge System. Several legislative mandates within the National Wildlife Refuge System Improvement Act of 1997 have guided the development of this plan. These mandates include:

- Wildlife has first priority in the management of refuges.
- Wildlife-dependent recreation activities, namely hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation are priority public uses of refuges. We will facilitate these activities when they do not interfere with our ability to fulfill the refuge's purpose or the mission of the refuge system.
- Other uses of refuges will only be allowed when determined appropriate and compatible with refuge purposes and mission of the refuge system.

This CCP will guide the management of Tamarac NWR by:

- Providing a clear statement of direction for the future management of the Refuge.
- Making a strong connection between Refuge activities and conservation activities that occur in the surrounding area.
- Providing Refuge neighbors, users, and the general public with an understanding of the Service's land acquisition and management actions on and around the refuge.
- Ensuring the Refuge actions and programs are consistent with the mandates of the National Wildlife Refuge System.
- Ensuring that Refuge management considers federal, state, county and tribal plans.
- Establishing long-term continuity in Refuge management.
- Providing a basis for the development of budget requests on the Refuge's operational, maintenance, and capital improvement needs.

Organization of the Plan

The purpose of the CCP is to specify management directions for Tamarac NWR and the Wetland Management District 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 the Refuge and District. The Tamarac WMD is managed by the staff of the Refuge. For that reason, some of the written material for the Refuge and District is integrated throughout the CCP. However, Chapter 6 was created to serve as a separate location for the goals, objectives and strategies for the Tamarac WMD.

History of Refuge Establishment and Management

The initial land acquisition for Tamarac NWR was the result of concern for limited waterfowl breeding grounds. During the 1930s, waterfowl populations plummeted due to drought, farming practices and wetland drainage, which reduced the amount of lands suitable for breeding, brood rearing and staging during migration. In response to these concerns, the Bureau of Biological Survey (now the U. S. Fish and Wildlife Service), began the National Waterfowl Restoration Program in June 1934 to search for lands suitable for restoration practices that would benefit waterfowl habitat needs.

The Refuge area was first recommended to President Roosevelt's Waterfowl Restoration Committee, of which publisher Thomas Beck was chairman and Jay N. Darling and Aldo Leopold, members. The committee, in turn, recommended investigation by the Bureau of Biological Survey, and studies during the summers of 1934 and 1935 indicated that Becker and Mahnomen Counties had the highest waterfowl nesting indices in the state of Minnesota. The Biological Survey viewed this area as a link in the series of migratory waterfowl refuges being established in the Mississippi Flyway. The Egg Lake region, as this area was known, provided adequate food and dependable water supply, which was rare during the Dust Bowl era. A suitable area for acquisition was laid out in consultation with wildlife officials of the Minnesota Conservation Department (now the Minnesota Department of Natural Resources) and local citizens. The proposed refuge boundary was readily approved by the Becker County Commissioners. Negotiations got under way to acquire these lands, which were owned by a variety of entities including private non-tribal individuals, county tax forfeited lands and Bureau of Indian Affairs. The Collier Agreement of 1935 (Appendix H) was an agreement between the Bureau of Biological Survey and the Bureau of Indian Affairs to establish Tamarac NWR while providing that Native Americans retained certain ricing and trapping privileges within the Refuge. Approximately, the northern half of the Refuge lies within the original boundary of the White Earth Reservation, which was established in 1867.

Tamarac NWR was established by Executive Order No. 7902 on May 31, 1938 by Franklin D. Roosevelt to serve as a "breeding ground and sanctuary for migratory birds and other wildlife". The Refuge was originally known as the Tamarac Migratory Waterfowl Refuge, thus emphasizing the importance of the area to waterfowl. The name was subsequently changed in July 1940 to Tamarac National Wildlife Refuge, as was the case with many other federal wildlife lands. The Migratory Bird Conservation Act of 1929, also known as the Duck Stamp, further solidified the Refuge's purpose. Although the Refuge's original focus was on waterfowl (ducks and geese), other migratory birds (forest passerines and raptors) and year-round resident wildlife (wolves and deer) have received an increasing emphasis in Refuge management over the years.

Following establishment in 1938, the north half of the Refuge was acquired almost instantly through purchases by the Migratory Bird Conservation Commission from willing sellers and of county tax forfeited lands. Much land in the south half was owned by influential hunting clubs. Their opposition to the Refuge delayed complete acquisition in the south half until the early 1960s. Land exchanges with the State completed acquisition of the present boundaries in 1968.

Early Refuge development was started by a Civilian Conservation Corp (CCC) camp in the 1930's and further enhanced in the 1960s by the Army Corp of Engineers Job Corps Conservation Center. These efforts included the construction of dikes, trails, water control structures and a number of refuge buildings. Many of these structures and buildings are still in use today and the trails are the foundation for refuge access.

Legal Context

In addition to the executive order establishing the Refuge, and the National Wildlife Refuge System Improvement Act of 1997, several federal laws, executive orders, and regulations govern administration of Tamarac NWR and WMD. Appendix F contains a partial list of the legal mandates that guided the preparation of this plan and those that pertain to Refuge management.

Chapter 2: The Planning Process

The Tamarac NWR and Tamarac WMD CCP has been written with input and assistance from citizens, universities and other non-governmental organizations (NGOs), and staff from other federal, state and local agencies. The participation of these stakeholders is important, and all of their ideas have been valuable in determining the future direction of the Refuge. Refuge and Service planning staff are grateful to all of those who have contributed time, expertise, and ideas throughout the CCP process. We appreciate the enthusiasm and commitment expressed by many for the lands and living resources administered by the Tamarac NWR.

Internal Agency Scoping

The CCP process began in late February 2007 with a kick-off meeting between Refuge staff and regional planners from the Service's office at Fort Snelling, 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 Scoping

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

Skiing at Tamarac NWR. Photo credit: D. Mudderman

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.

People 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 eight 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.

Refuge Program Reviews

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 the Minnesota DNR, the U.S. Geological Survey – Biological Resource Division, universities, NGOs, Refuge staff, volunteers and the Tamarac Interpretive Association attended these discussions. On July 17-18, 2006, a Visitor Services Review was conducted by the Regional Office. Regional Landscape Architect Richard Sorenson, Fergus Falls Prairie Wetlands Center Visitor Services Specialist Ken Garrahan, and Tamarac NWR staff participated in the reveiw. 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 conserva-

tion and demonstrate wildlife conservation techniques.

Preparation, Publishing, Finalization and Implementation of the CCP

The Tamarac NWR and Tamarac WMD CCP and Environmental Assessment (EA) were prepared by the staff of Tamarac NWR, the USFWS Regional Office and a representative of the Minnesota DNR. The CCP/EA will be published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Draft EA (Appendix A) presents a range of alternatives for future management and identifies the preferred alternative, which is also the Draft CCP. A public review period of at least 30 days, which will include a public meeting, will follow release of the draft plan.

Verbal and written comments received by the Service will be incorporated where appropriate and perhaps result in modifications to the preferred alternative or in the selection of one of the other alternatives. The alternative that is ultimately selected will become the basis of the ensuing Final CCP. This document then, becomes the basis for guiding management on the Refuge and its management district over the coming 15-year period. It will guide the development of more detailed step-down management plans for specific resource areas; it will underpin the annual budgeting process through Service-wide allocation databases. Most importantly, it lays out the general approach to managing habitat, wildlife, and people at the Tamarac NWR and Tamarac WMD that will direct day-to-day decision-making and actions.

Chapter 3: Refuge Environment

Introduction

Tamarac NWR encompasses 42,738 acres of land and waters 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 and is now Tamarac NWR. The primary ecological drivers influencing the plant and wildlife populations of the Refuge are the climate, hydrology, and natural disturbances such as fire, disease and wind events.

Frog. Photo Credit: Michele Gedgaud

Other Units Administered

Wilderness Area

The Tamarac Wilderness Area was established by law in 1976. The Wilderness Area is managed under the provisions of the 1964 Wilderness Act as a unit of the National Wilderness Preservation System. That is, it is "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain" (The Wilderness Act, September 3, 1964; (16 U.S.C. 1121 (note), 1131-1136)). Staff carries out no active management in the Tamarac Wilderness Area, but does conduct research in the unit. The management strategy for the wilderness area calls for passive management with natural succession allowed to take its course. In theory, examples of almost all forest types on the Refuge would be preserved in this one single complex of wilderness.

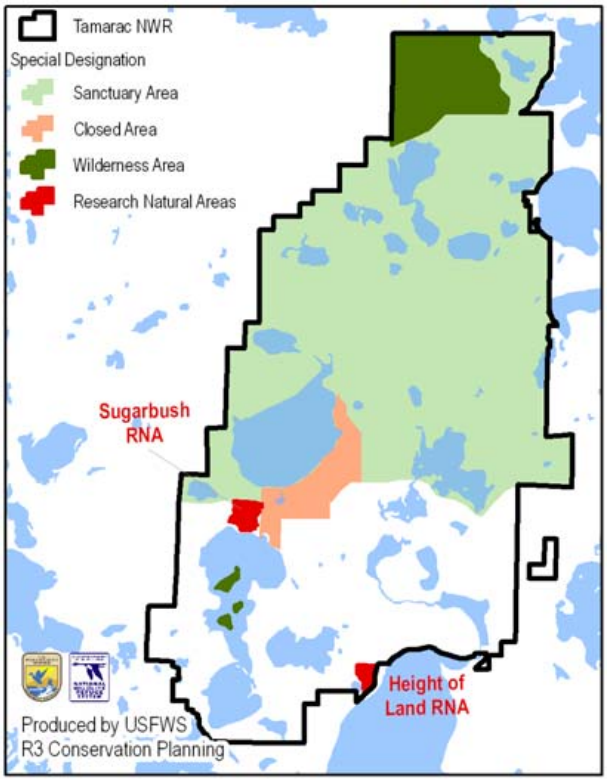
Wilderness Review

As part of the CCP process, we reviewed other lands within the legislative boundaries of Tamarac NWR for wilderness suitability. No additional lands were found suitable for designation as defined by the Wilderness Act of 1964. Many of the lands have been substantially altered by humans, both before and after the Refuge's establishment, particularly from agriculture, timber harvest, roads, and water control. Although Tamarac NWR cannot be described as pristine, it is largely an intact, health and functioning ecosystem that just does not meet the strict definition of suitable lands.

Areas of Special Designation

The Research Natural Areas were designated in 1972 with some general management and protection criteria. Research Natural Areas are managed to maintain the natural features for which they were established and to maintain natural processes; therefore, management of the Refuge RNAs is through protection against activities which directly or indirectly modify ecological processes or alter the type or feature which is being preserved. Manipulative practices such as grazing, prescribed burning, timber cutting, road construction and the use of chemical for plant, insect and disease control are not permitted unless such are necessary to maintain the type or process for which the RNA was established or to prevent the spread of insects and disease. There is not a lot of flexibility to manage the wilderness area or RNAs in regard to habitat management; however, there remains a tremendous amount of flexibility in the strategies and tactics that can be

Figure 2: Areas of Special Designation, Tamarac NWR



used to manage these areas (ie: fire suppression tactics, invasive species control, etc.).

The area bordered by the Blackbird Auto Tour and County Highways 29 and 26 was internally designated as an "Old Growth Area" in the early 1990s. The goal was to set aside a significant habitat block in addition to the Wilderness Area and RNAs that would be allowed to develop and be managed for characteristics of old growth forest. Prescribed fire was not excluded as a management tool, but large scale timber harvests would not be allowed. Silvicultural treatments would be used to create small canopy gaps of up to one acre in size to replicate wind throw events.

There is also a significant area designated as sanctuary for the benefit of breeding birds (Figure 2). The lower one-third of the Refuge supports visitor use activities and the sanctuary occupies the northern two-thirds of the Refuge. The sanctuary is closed to the general public from March 1 to September 1 each year. Approximately the northern half of the Refuge lies within the original boundary of the White Earth Reservation, which was established in 1867.

Ecological Context

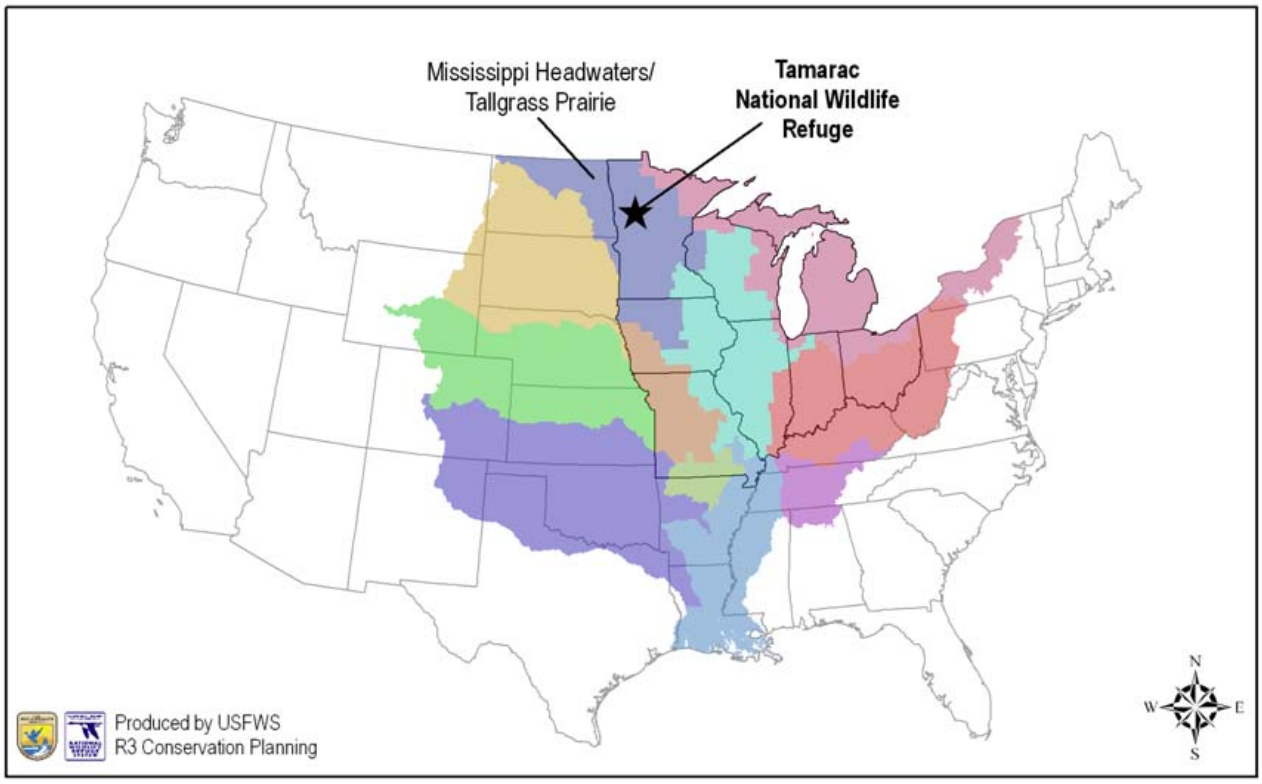
Situated along the backbone of Minnesota, the Refuge lies within a mile of the continental divide, which separates the Mississippi and Hudson Bay watersheds. Lake Itasca, the headwaters of the Mississippi River, lies approximately 25 miles northeast of the Refuge. Many Refuge lakes and rivers contain large wild rice or "manoomin" beds that 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 (Figure 3 on page 14). Hence, many species of plants and animals are at the extreme western edge of their range.

Historic Land Cover

Over thousands of years, the area's vegetative communities have undergone perpetual change, primarily due to climatic changes following glaciation. "Pollen core" records and pre-settlement conditions and are often the best or only sources of information on pristine, baseline conditions and natural environmental and biotic variability. This information is sometimes used as a reference of available vegetation at the various time periods. Pollen core records provide a long-term context of what the landscape was like since the time of the last glaciation, but are often limited in availability (Tester 1995). The pre-settlement vegetation represents a "snap-shot" in the time of the era immediately prior to European settlement within the area and by itself it does not adequately represent changes in vegetative communities and their associated processes over time.

Pollen records from Itasca State Park, which had the same glacial history and climate as the Refuge due to its proximity, indicate transition in dominant plant community types since the retreat of the Wisconsin glacier (Tester 1995). Immediately following this retreat, the land was likely barren and void of vegetation; however, within a few years coniferous trees such as spruce and pine began to dominate the landscape due to the cool and moist environment. These forests dominated the landscape until about 8,000 years ago, when more herbaceous species became prevalent. This indicates the presence of a savanna with scattered oak trees and large open areas of prairie due to warmer and drier conditions. Other studies indicate this warmer, drier period was characterized by extremely variable climatic conditions from drought to abundant precipitation (Almendinger 1988). Several thousand years later, the area became cooler and wetter again, giving rise to an expansion of the coniferous forest (primarily red and white pine) and other deciduous trees back into the area with a decrease of prairie. This condi-

Figure 3: Ecoregion of Tamarac NWR



tion has persisted until the present, with some increase in hardwoods in recent years. Peatlands formed approximately 3,000 years ago. These pollen core records provide a testament to the range of natural variability of vegetation within the larger landscape.

When Euro-American settlers first arrived in Minnesota in the mid-1800s, native plant communities occurred in complex patterns across the entire landscape. Francis Marschner (1882-1966) mapped the pre-European settlement vegetation of Minnesota based on Public Land Survey notes and landscape patterns. His maps provide a reference condition of the vegetation in the area of Tamarac NWR prior to European settlement. Caution should be used when interpreting these historic vegetation maps because of the scale and base data that Marschner used, but it does provide a good context of historic forest types. Based upon Marschner's interpretation for the area that is now Tamarac NWR, pre-European 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 (Figure 4 on page 15). After more than a century of extensive settlement and development, the vast majority of native plant communities within the state have been destroyed or substantially altered. Although forested communities have changed in composition across much of northern Minnesota following nearly 150 years of logging, opportunities exist for sustainable management and conservation of forested communities in large areas.

Minnesota Ecological Classification System

Recently, the Minnesota DNR established an Ecological Classification System (ECS) for land classification and ecological mapping for Minnesota based upon the national hierarchy of nested units (ie: Provinces, Sections, Subsections, Land Type Associations, etc.). The vegetation classification is hierarchical with units describing broad landscapes to local native plant communities (NPC). The Minnesota ECS enables land managers to consider ecological patterns for broad landscapes or for a single small local unit, (ie: forest stand or native plant community) which is valuable at multiple planning levels and crucial to the long-term ecological integrity and stability of these ecosystems. One of the most important considerations in the ECS classification is the inclusion of ecological processes as an organizing principle (e.g., fire regime, successional or seral stage, hydrology, etc.). In order to facilitate habitat management and restoration, an assessment of cur-

Figure 4: Vegetation of Tamarac NWR and Becker County Prior to European Settlement

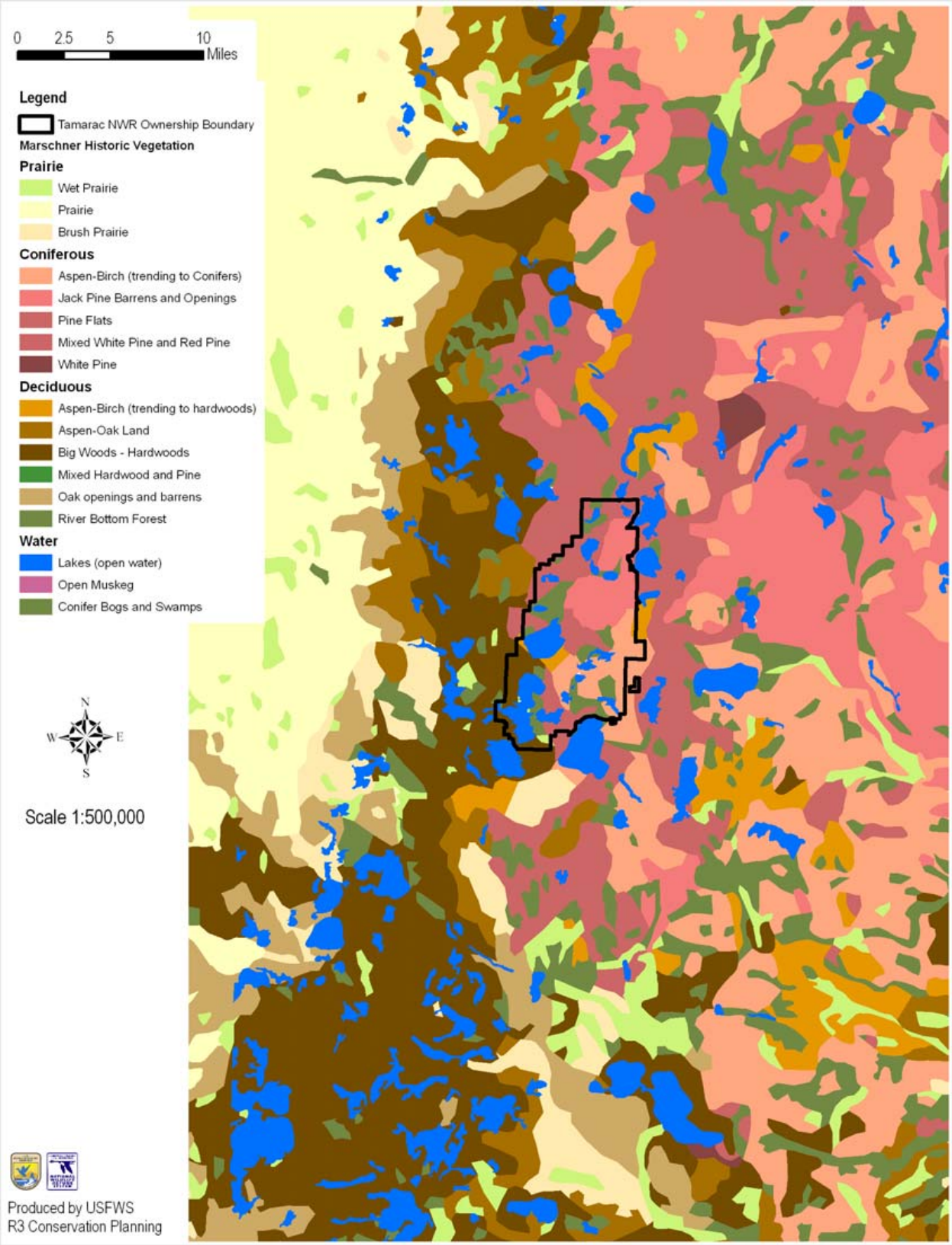
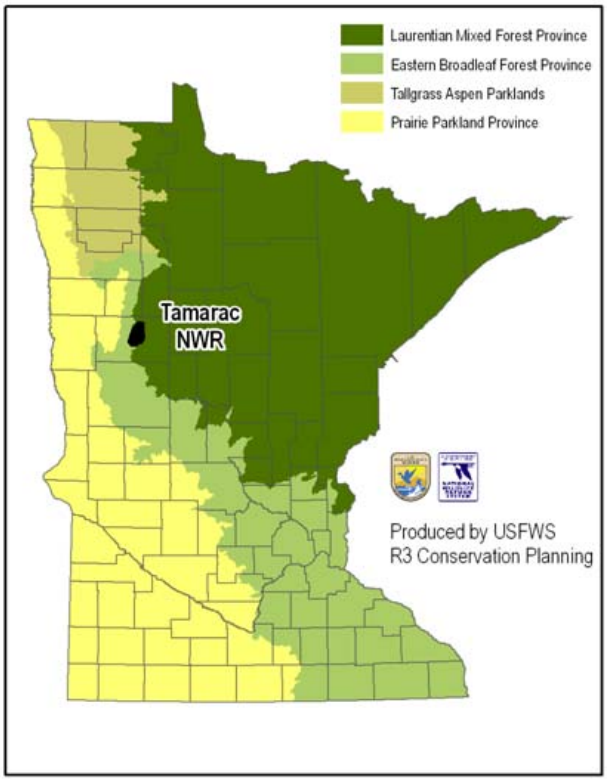


Figure 5: Tamarac NWR in Relation to Major Provinces of Minnesota



rent conditions including disturbance regimes, successional pathways, rare communities, common plant/animals and habitats, invasive species, water resources, and soils is imperative. The comparison of current conditions to historical and desired future conditions is crucial in the development and refinement of management goals, objectives and strategies.

Provinces are the highest level of classification under the Minnesota ECS. These provinces were defined using major climate zones, native vegetation and biomes such as prairies, deciduous forests and boreal forests. The four major provinces of Minnesota include the Laurentian Mixed Forest, Eastern Broadleaf Forest, Prairie Parkland and the Tallgrass Aspen Parklands. Tamarac NWR falls primarily in the Laurentian Mixed Forest with the exception of a small sliver along the southwestern edge of the Refuge, which falls in the Eastern Broadleaf Forest (Figure 5). Tamarac NWR lies near the tallgrass prairie province but is clearly within a forest landscape.

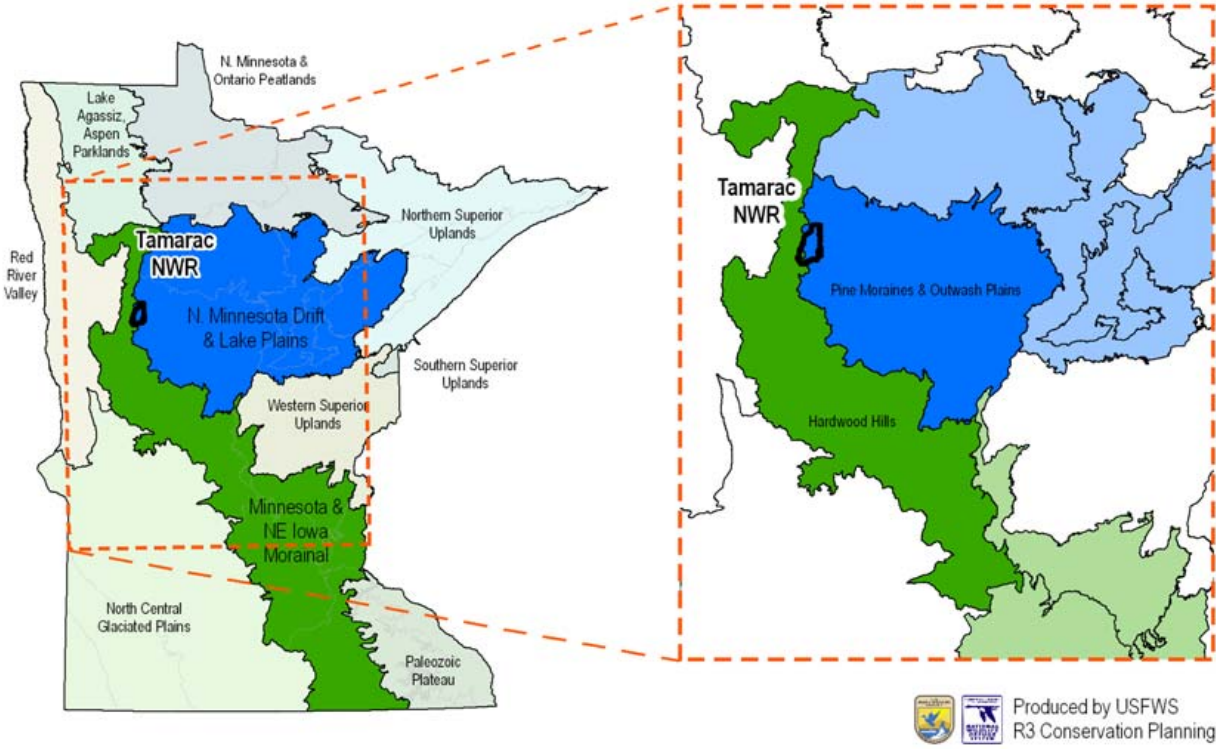
Sections are units within provinces that are defined by origin of glacial deposits, regional elevation, distribution of plants and regional climate. Tamarac NWR falls primarily within the Northern Drift and Lake Plains section, with a small sliver falling in the Minnesota and Northeast Iowa Morainal (Figure 6).

Subsections are units within sections that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief and the distribution of plants, especially trees. Tamarac NWR falls primarily with the Pine Moraines and Outwash Plains subsection, and a small portion in the Hardwood Hills subsection. The subsection level will be the primary reference for landscape level planning. The Pine Moraines and Outwash Plains subsection should be the primary reference for planning as greater than 97 percent of the Refuge falls within this subsection. Considerations for the Hardwood Hills subsection should be restricted to the extreme southwestern corner of the Refuge, along the west side of Tamarac Lake.

The Pine Moraines and Outwash Plains Subsection is characterized by the mix of end moraines, outwash and till plains, abundant lakes and wetlands, and large, heavily forested tracts. Kettle lakes and wetlands are common on the outwash plains (Minnesota DNR 2006). Before this area was settled by people of European descent, forests of jack pine mixed with northern pin oak were most common on excessively drained portions of broad outwash plains, and aspen-birch and pine (mixed red and white) forests were the most common on the irregularly sloped end moraines (Figure 6 on page 17). Mixed hardwood and pine forests, dominated by a diverse mix of northern hardwoods and white pine, were found in the most fire-protected areas at the northern and eastern edges of the subsection. Fire occurred on a 10- to 40-year interval within much of the subsection, accounting for the dominance by upland conifers and quaking aspen-birch forests (Frissel 1973); however, natural fire protection was provided by irregular topography, broad wetlands, and relatively large lakes. Forest management and tourism are the predominant land uses within this area today; however, agriculture is becoming more common. Near-shore habitat is being lost at a rapid pace due to increased development along lakes, thus negatively affecting fish and wildlife.

The Hardwood Hills Subsection is characterized by many wetlands, prairie potholes, and kettle lakes exist throughout the area. Before settlement by people of European descent, vegetation included maple-basswood forests interspersed with oak savanna, tallgrass prairie, and oak forest, but the topography and distribution of lakes and wetlands provided a partial barrier to fire that resulted in woodlands rather than prairie vegetation. Fire was important in oak savanna development, whereas, windthrow was common in the sugar maple-bass-

Figure 6: Tamarac NWR in Relation to Sections and Subsections of the Ecological Classification System of Minnesota



wood forests. Currently much of this subsection is farmed and many wetlands have been drained. Important areas of forest and prairie exist throughout the subsection, but they are small and fragmented. Development, tourism, and outdoor recreation, especially around lakes, are other significant land uses that are impacting wildlife within this subsection.

Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions for refuges. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, landscape-oriented perspective (Figure 7 on page 18).

Several trans-national migratory bird conservation initiatives have emerged to help guide the planning and implementation process. The regional plans relevant to Tamarac NWR are:

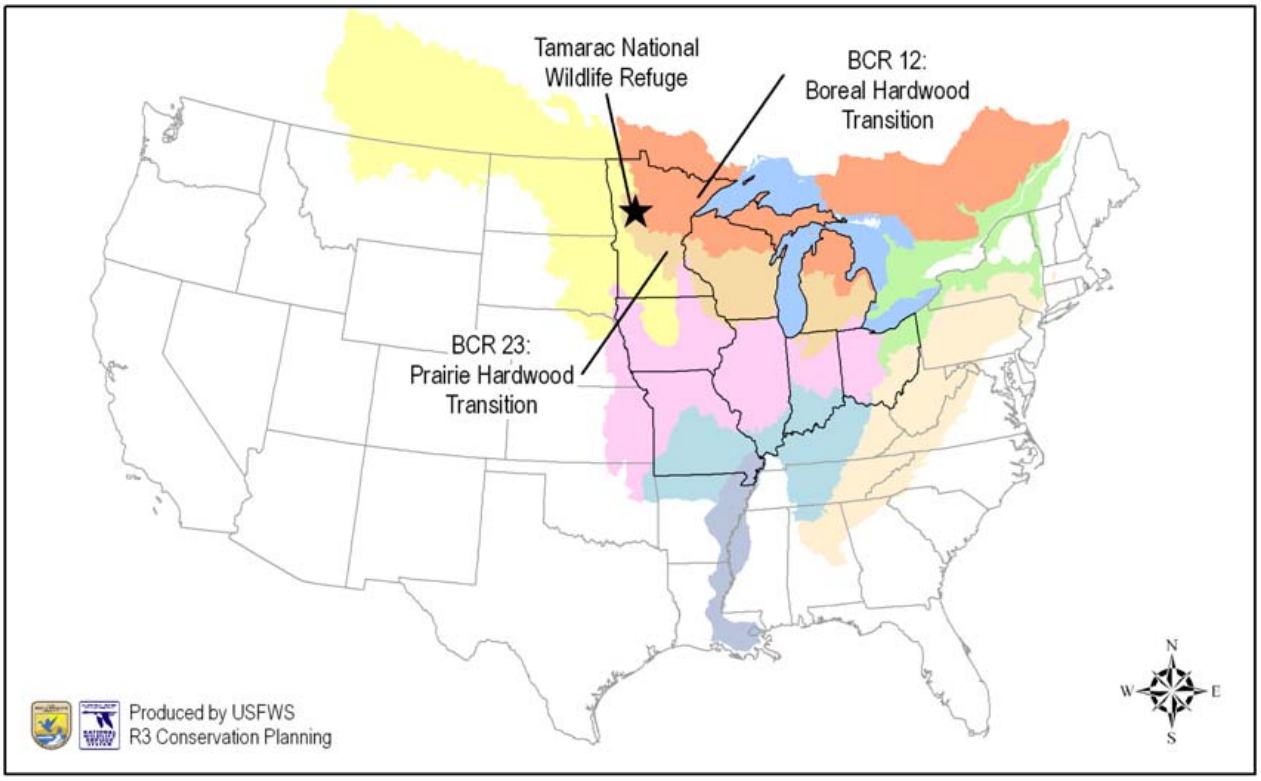
- The Upper Mississippi River/Great Lakes Joint Venture Implementation Plan of the North American Waterfowl Management Plan;
- The Partners in Flight Boreal Hardwood Transition [land] Bird Conservation Plan;
- The Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan; and
- The Upper Mississippi Valley/Great Lakes Regional Waterbird Conservation Plan.

All four conservation plans will be integrated under the umbrella of the North American Bird Conservation Initiative. Each of the bird conservation initiatives has a process for designating priority species, modeled to a large extent on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance, and population trend. These scores are often used by agencies in developing lists of priority bird species. The Service based its 2001 list of Non-game Birds of Conservation Concern primarily on the Partners in Flight, shorebird, and waterbird status assessment scores.

Minnesota Comprehensive Wildlife Conservation Strategy

In 2005, Minnesota completed the Comprehensive Wildlife Conservation Strategy (CWCS), a stra-

Figure 7: Bird Conservation Regions Related to Tamarac NWR



tegic plan to better manage populations of "species in greatest conservation need" in Minnesota. The plan was developed with the support of funding from the State Wildlife Grant Program created by Congress in 2001. The heart of the strategic plan is for a partnership of conservation organizations across Minnesota to work together to sustain the populations of the identified species. Members of the partnership include the Minnesota Department of Natural Resources, the U.S. Fish and Wildlife Service, The Nature Conservancy, Audubon Minnesota, and the University of Minnesota, as well as many other agencies and conservation organizations. The plan outlines priority conservation actions that might be undertaken by partners.

Midwest Region Fish and Wildlife Conservation Priorities

Every species is important; however the number of species in need of attention exceeds the resources of the Service. To focus effort effectively, Region 3 of the Fish and Wildlife Service compiled a list of Resource Conservation Priorities. The list includes:

- All federally listed threatened and endangered species and proposed and candidate species that occur in the Region.
- Migratory bird species derived from Service wide and international conservation planning efforts.
- Rare and declining terrestrial and aquatic plants and animals that represent an abbreviation of the Endangered Species program's preliminary draft "Species of Concern" list for the Region.

Appendix D lists Regional Resource Conservation Priority species relevant to Tamarac NWR and WMD.

Landscape Connectivity and Corridors

Forests throughout North America are becoming increasingly fragmented and in some cases isolated. Fragmented and isolated forests tend to take on characteristics of habitat islands unless corridors and connectivity to larger blocks of forest are maintained. Ultimately, biotic diversity is lost over time within these isolated forests. Tamarac NWR's position near the edge of three major biomes, coupled with increasing development by humans, makes it extremely susceptible to isolation from the rest of the forest province extending into Minnesota from northeastern North America. The Ponsford Prairie

is an open landscape to the east of the Refuge that was once historically a forested area. If development or agriculture were to expand to the northwest or southwest from the Ponsford Prairie it could threaten Tamarac NWR's connectivity to the rest of the intact forest.

If Tamarac NWR intends to maintain the biological integrity, diversity and environmental health, it is imperative that connectivity is maintained to the forested ecosystems of Minnesota. Refuge staff has discussed the possibility of maintaining the connectivity to other natural resource land management areas such as Itasca State Park, Chippewa National Forest, state forests (White Earth, Two Inlets, Smoky Hills), wildlife management areas (Hubbel Pond), county and tribal lands through corridors, conservation easements and stewardship planning with both land management agencies and private landowners.

Other Conservation Lands in the Area of Tamarac NWR

The Refuge is an integral part of a significant complex of federal, state, tribal and county lands administered for natural resources (Figure 8 on page 20). The Minnesota Department of Natural Resources manages the 3,342-acre Hubbel Pond Wildlife Management Area (WMA), which borders the Refuge to south, the Greenwater Lake Scientific and Natural Area, Itasca State Park, and three large state forests (White Earth, Two Inlets and Smoky Hills) that lie within 25 miles of the Refuge to the east. Many other small state WMAs lie within short distance of the Refuge as well. The Becker County Natural Resources Department is responsible for managing the county's nearly 75,000 acres of tax-forfeited lands, most of which lie within the eastern half of the county. A significant portion of this tax-forfeited land lies along the northwestern boundary of the Refuge. The northern half of the Refuge lie within the White Earth Reservation, although most of the land adjacent the Refuge in not in tribal ownership. The Chippewa National Forest, which is administered by the U.S. Forest Service, is located approximately 45 miles northeast of the Refuge. The Refuge staff work closely with these land management agencies as well as the Many Point Boy Scout Camp, a private entity, and other private citizens on issues of mutual concern.

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 (Table 1 on page 21).

Area Economy

Table 2 on page 22 shows the economy of the region surrounding the Refuge. The area population increased by 11.3 percent from 1995 to 2005, compared with a 10.0 percent increase for the state of Minnesota and a 11.4 percent increase for the U.S. as a whole. Area employment increased by 30.8 percent from 1995 to 2005, with the state of Minnesota showing a 16.0 percent increase and the U.S. a 17.0 percent increase. Area per capita income increased by 23.7 percent over the 1995-2005 period, while the state of Minnesota and the U.S. increased by 17.3 and 13.2 percent respectively.

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. Most climatic models predict that this area will warm by 4 degrees to 5 degrees Celsius within the next 50 years.

Geology and Glaciation

Formation of the regional terrain is the result of glaciation, specifically and most recently, 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 that 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

Figure 8: Conservation Lands in the Vicinity of Tamarac NWR

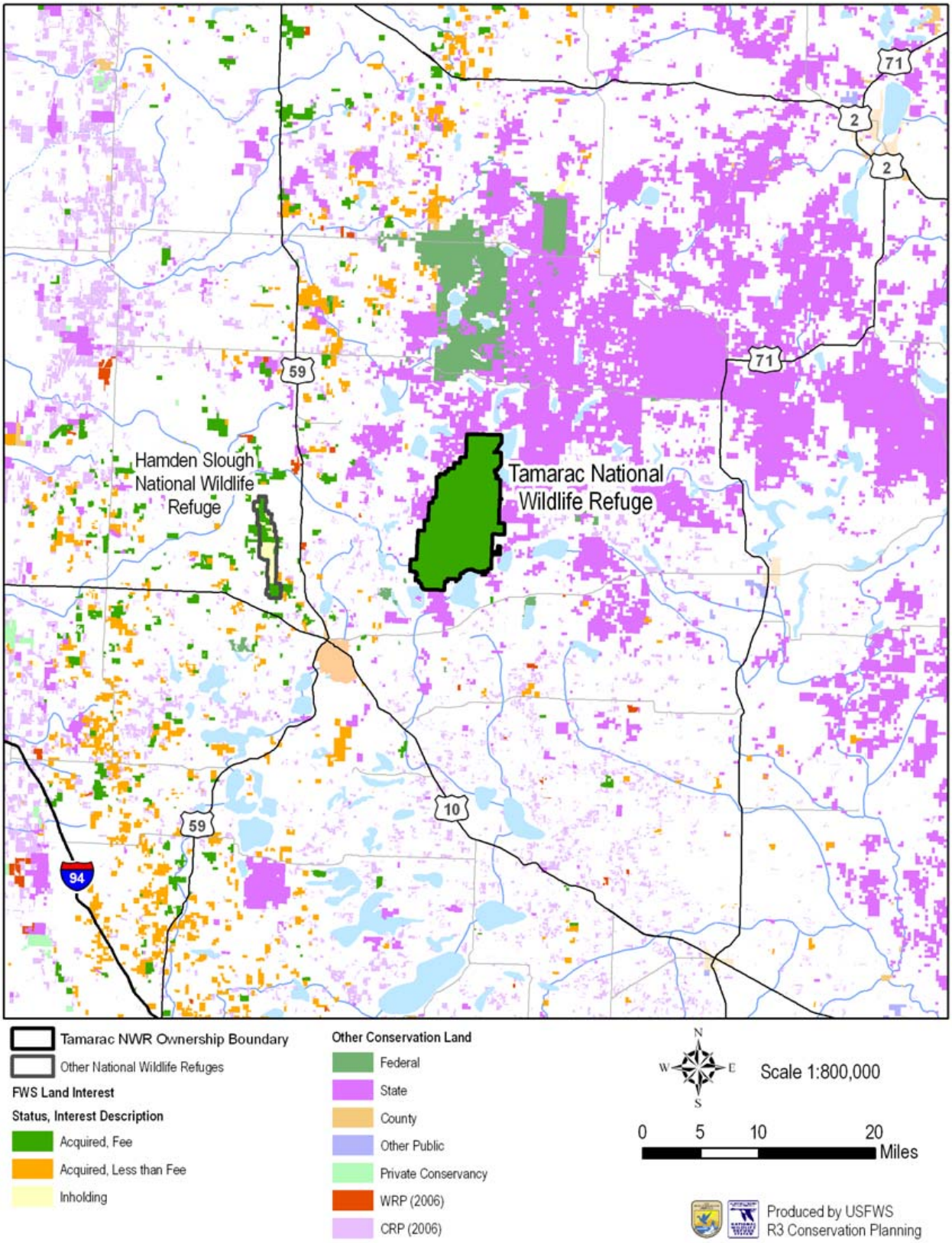


Table 1: Socioeconomic Characteristics of Becker County, Minnesota

Population	Becker County	Minnesota
Population, 2006 estimate	32,230	5,167,101
Population, percent change, April 1, 2000 to July 1, 2006	7.4%	5.0%
Population, 2000	30,000	4,919,479
Persons under 5 years old, percent, 2006	6.4%	6.7%
Persons under 18 years old, percent, 2006	23.2%	24.3%
Persons 65 years old and over, percent, 2006	16.2%	12.1%
Female persons, percent, 2006	50.2%	50.3%
White persons, percent, 2006 (a)	89.6%	89.3%
Black persons, percent, 2006 (a)	0.3%	4.5%
American Indian and Alaska Native persons, percent, 2006 (a)	7.3%	1.2%
Asian persons, percent, 2006 (a)	0.5%	3.5%
Native Hawaiian and Other Pacific Islander, percent, 2006 (a)	0	0.1%
Persons reporting two or more races, percent, 2006	2.2%	1.5%
Persons of Hispanic or Latino origin, percent, 2006 (b)	1.0%	3.8%
White persons not Hispanic, percent, 2006	88.9%	85.9%
Living in same house in 1995 and 2000, pct 5 yrs old & over	61.8%	57.0%
Foreign born persons, percent, 2000	1.0%	5.3%
Language other than English spoken at home, pct age 5+, 2000	4.4%	8.5%
High school graduates, percent of persons age 25+, 2000	82.9%	87.9%
Bachelor's degree or higher, pct of persons age 25+, 2000	16.7%	27.4%
Persons with a disability, age 5+, 2000	4,799	679,236
Mean travel time to work (minutes), workers age 16+, 2000	23.1	21.9
Households, 2000	11,844	1,895,127
Persons per household, 2000	2.49	2.52
Median household income, 2004	$40,182	$51,202
Per capita money income, 1999	$17,085	$23,198
Persons below poverty, percent, 2004	10.9%	8.1%
Source: U.S. Census Bureau State & County QuickFacts (2008)		

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.

Soils

A heavy mantle of glacial drift covers all of Becker County. The source material and the mode of deposition of the drift contribute to important differences in soil texture and nutrients that ultimately affect vegetative growth (McAndrews 1966). In general, Refuge soils run on the sandy side, from coarse sand to sandy loams that are well to excessively drained (Table 3 on page 22.). 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.

Table 2: Summary of Area Economy, 2005, Tamarac NWR

County	Population		Employment		Per Capita Income[a]	
	2005[b]	Percent change 1995-2005	2005	Percent change 1995-2005	2005	Percent change 1995-2005
Becker, Minnesota	31.9	10.0%	22.4	44.8%	$28,968	30.0%
Hubbard, Minnesota	18.8	13.7%	8.0	3.0%	$26,208	17.5%
Area Total	50.7	11.3%	30.5	30.8%	$27,588	23.7%
Minnesota	5,126.7	10.0 %	3,498.6	16.0 %	$37,290	17.3 %
United States	266,278.4	11.4 %	174,249.6	17.0 %	$34,471	13.2 %
Source: U.S. Department of Commerce 2007.						

a. In 2006 dollars.
b. Population and employment in thousands; Per Capita Income in 2006 dollar

Table 3: Distinct Classes of Soils Within Tamarac NWR Based Upon Moisture Capacity and Texture

Soil Moisture Class	Sum Acres	Acre %
01 - Dry Sand	9.2	0.02%
02 - Dry-Mesic Sand	728.8	1.69%
03 - Dry-Mesic Loam	15050.4	35.00%
04 - Mesic Sand	4613.1	10.73%
05 - Mesic Loam	1550.7	3.61%
06 - Wet-Mesic Sand	318.1	0.74%
07 - Wet-Mesic Loam	1444.5	3.36%
09 - Wet Loam	195.1	0.45%
10 - Peat	11200.4	26.05%
11 - Water	7891.9	18.35%
Total	43002.1	100.00%

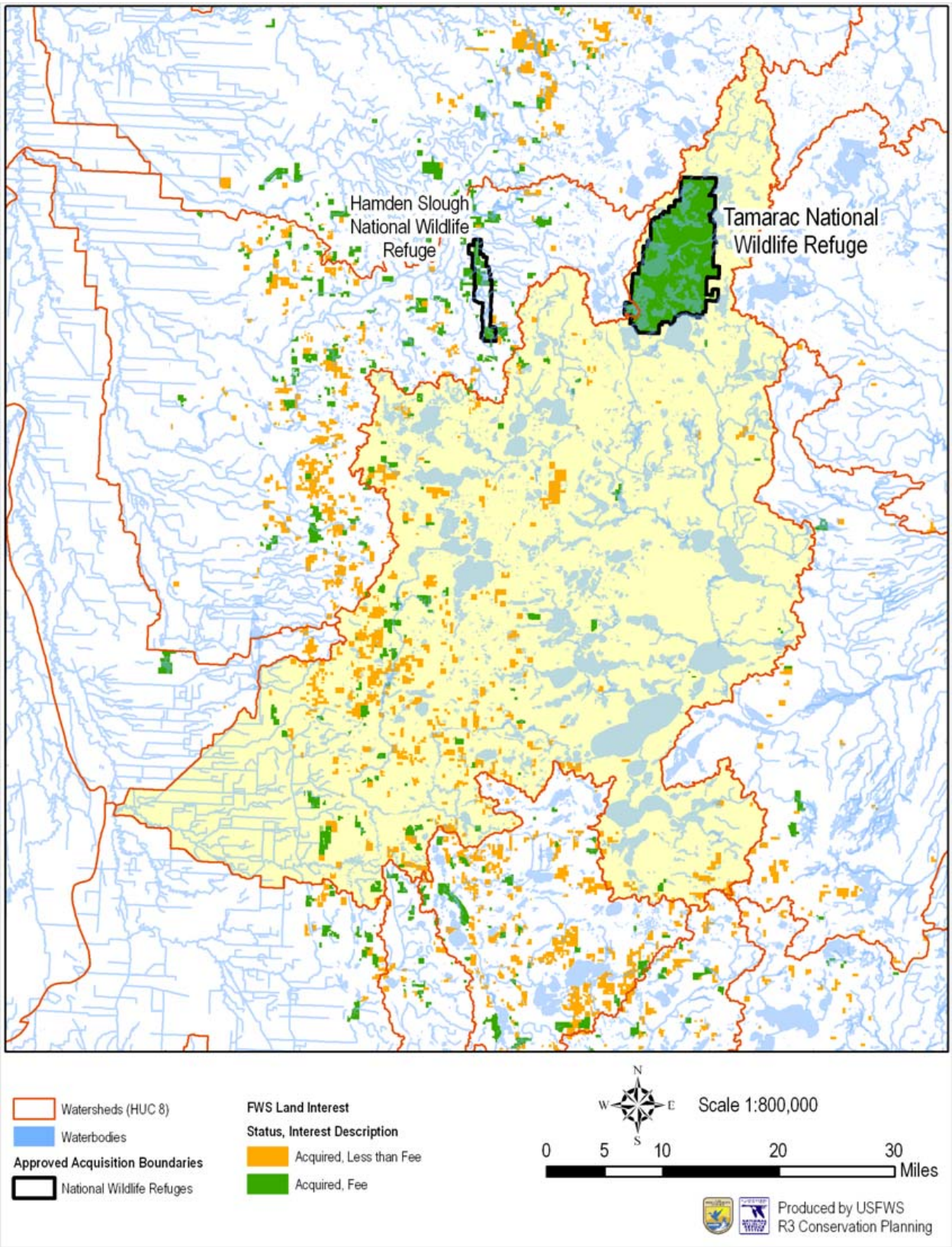
Soil map units delineated in soil surveys usually do not coincide exactly with habitat, although a strong relationship often exists. The reason for the lack of direct correlation is found in the concepts of soil taxonomy and soil mapping methodology. Soil properties that affect habitat type differentiation are those that affect conditions in plant growth, such as moisture and nutrients. Soil taxonomy, however, is not based directly on such functional properties, but rather on morphological features that can more readily be measure and classified (ie: type of horizon, color, structure and texture. These soil taxonomy parameters may or may not have a direct bearing on plant growth; however, careful examination of the moisture and nutrient parameters of soils is important in predicting plant growth, successional pathways and subsequent disturbance regimes.

Water and Hydrology

Tamarac NWR is located near or at the top of two major watersheds (Figure 9 on page 23). 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. These watersheds eventually drain 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 1,500 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

Figure 9: Location of Tamarac NWR in Relation to Major Watersheds of North-central Minnesota



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.

Refuge Habitats

Vegetation on the Refuge is diverse due to its location in the transition zone between northern hardwood and coniferous forests. (See Figure 10 on page 25, and Table 4 on page 27)

Pre-settlement cover types were comprised of mature stands of red and white pine, jack pine barrens, stands of aspen, birch, and mixed hardwoods, numerous lakes, conifer bogs and swamps. The extensive logging of red and white pine virtually eliminated the dominant pine cover types from the landscape. Following the harvest, these timbered lands were burned two to three times in as many years. This practice resulted in appreciable regrowth of aspen, birch, and hardwoods, but not conifers.

Current cover types are significantly altered from pre-settlement times (Figure 11 on page 26). Red and white pine has been reduced by 92 percent and jack pine coverage has been reduced by 89 percent. Significant increases have occurred in mixed hardwood and the aspen-birch cover types (plus 244 and 40 percent, respectively). The upland grass cover type has increased due to remnant openings that were created for farming at the time of settlement .

Forest

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*)
- American basswood (*Tilia americana*)

For the purpose of this plan, the 50 vegetative cover types were combined into 12 general habitat types (Table 4 on page 27). The vegetative cover types were derived from aerial photo interpretation conducted by the Upper Midwest Environment Sciences Center in LaCrosse, Wisconsin, based on 2005 aerial photography. These 12 major habitat types (Figure 10 on page 25) are described in the following paragraphs.

Upland deciduous forest (16,166 acres): This habitat type includes aspen, paper birch, oak, red and 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 (4,347 acres): This habitat type contains a mixture of hardwoods and softwoods, and includes an aspen/birch/spruce/fir mix, aspen/pine and forest upland broadleaf/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 type 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 (463 acres): This habitat type consists of a mix of lowland conifers and hardwoods, primarily black ash, and includes the lowland forested broadleaf/coniferous mix. The mixed lowland forested broadleaf/coniferous is heavily dominated by hardwoods in the overstory.

Upland coniferous forest (711 acres): This habitat type consists of jack pine, red pine, white pine, red cedar (non-native), white spruce/balsam fir and forested coniferous mix as the dominant 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

Figure 10: Current Land Cover, Tamarac NWR

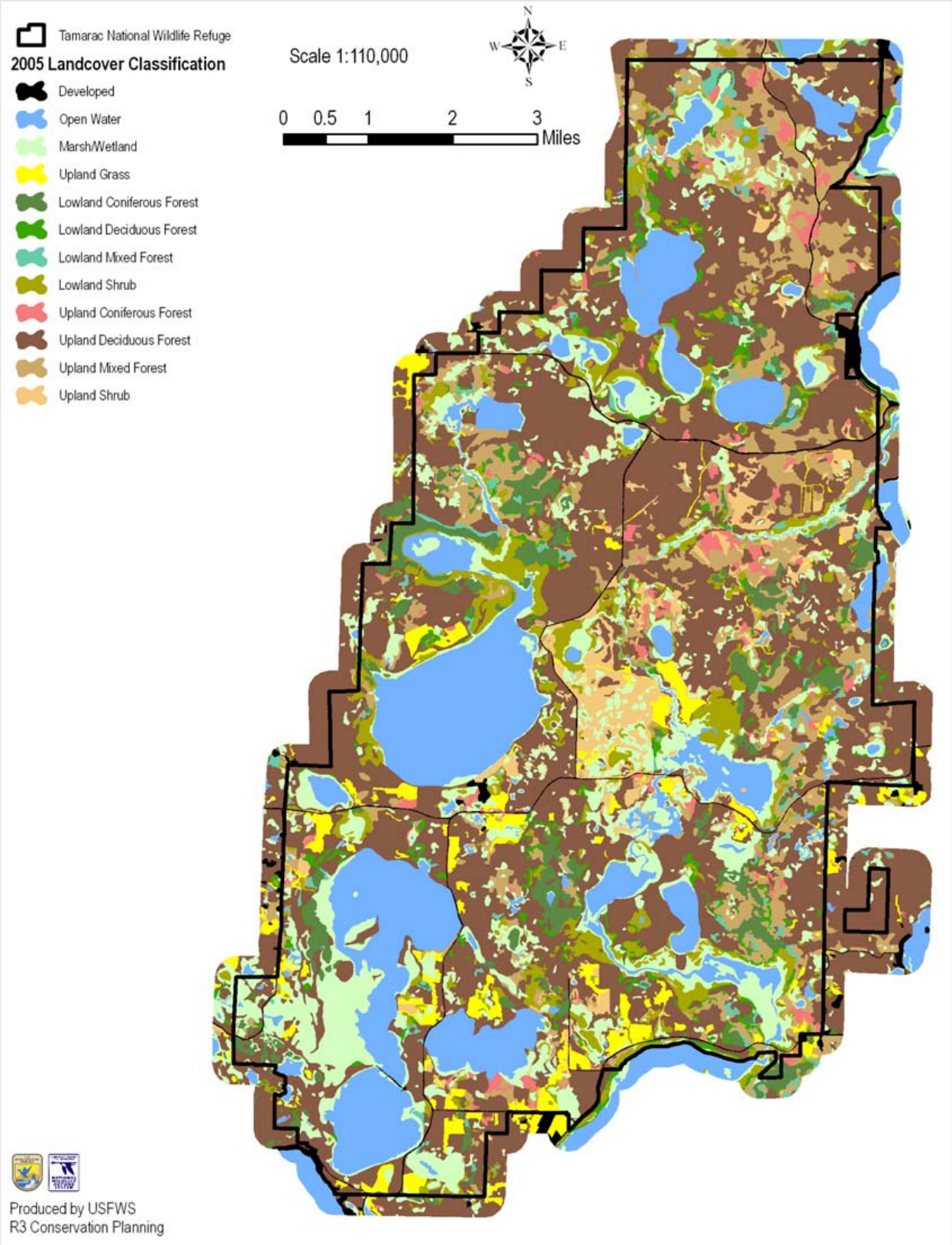
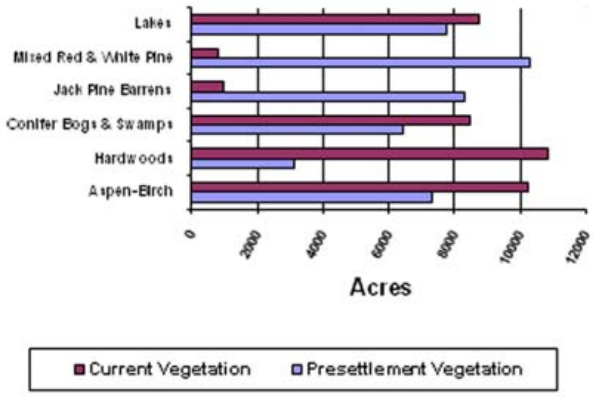


Figure 11: Tamarac NWR Habitat



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 coniferous forest (1,863 acres): This habitat type consists of pure stands of tamarack, mixed black spruce/balsam fir and lowland coniferous mixed stands. The lowland forested coniferous mix is dominated by lowland conifers such as tamarack, black spruce and balsam fir.

Wetlands

Thirty percent of the Refuge is comprised of large and small wetland complexes dominated by wild rice, sedges and cattail.

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

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.

Grassland

About 1,360 acres (3 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 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 that 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.

Shrub

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. A lack of fire within these habitats has resulted in brush species invading and becoming dominant in these areas.

Developed Land

Development (374 acres): This 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.

Refuge Wildlife

Birds

Tamarac NWR is especially important for migratory birds, both during the migrating and nesting seasons. Fifty-three species of birds that are on the Fish and Wildlife Service's Region 3 Regional Conservation Priority Species list 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

Table 4: Vegetative Cover Types of Tamarac NWR Based on 2005 Aerial Photography Interpretation

Number of stands	Total Acres	Major Habitat Type	Habitat Type	Number of stands	Total Acres
1559	16166	Upland Deciduous	Aspen (Upland)	786	6698
			Aspen/Oak	179	1785
			Basswood	5	9
			Forested Broadleaf Mix (Upland)	299	2346
			Northern Hardwoods	199	4264
			Oak	84	1035
			Paper Birch	1	1
			Red Maple/Sugar Maple	6	29
593	4347	Mixed Upland Forest	Aspen/Birch/Fir/Spruce	240	1579
			Aspen/Pine	190	1601
			Forested Broadleaf/Coniferous Mix (Upland)	163	1168
222	756	Lowland Deciduous	Black Ash	95	313
			Forested Broadleaf Mix (Lowland)	127	442
110	463	Mixed Lowland Forest	Forested Broadleaf/Coniferous Mix (Lowland)	110	463
171	711	Upland Conifer	Jack Pine	19	94
			Jack Pine Plantation	2	9
			Red Pine	33	221
			Red Pine Plantation	27	161
			Red Pine/White Pine	10	34
			White Pine	26	66
			Spruce/Fir	43	95
			Forested Coniferous Mix (Upland)	9	33
270	1863	Lowland Conifer	Spruce/Fir Swamp	7	116
			Tamarack	233	1625
			Forested Coniferous Mix (Lowland)	30	122
279	1519	Upland Shrub	Scrub/Shrub (Upland)	279	1519
536	2658	Lowland Shrub	Bog Birch	10	273
			Scrub/Shrub (Lowland)	442	2020
			Tag Alder	38	98
			Willow	46	266
180	1362	Upland Grass	Cool Season Grasses	71	604
			Grasses/Forbs	83	344
			Hayfields[a]	6	1
			Pasture[a]	4	6
			Warm Season Grasses	16	407

Table 4: Vegetative Cover Types of Tamarac NWR Based on 2005 Aerial Photography Interpretation

Number of stands	Total Acres	Major Habitat Type	Habitat Type	Number of stands	Total Acres
1104	6248	Marsh/Wetland	Cattail	119	897
			Giant Reed Grass (Phragmites)	47	108
			Mixed Emergents	6	26
			Rooted-Floating Vegetation	63	873
			Sedge Meadow/Bluejoint Grass	589	2885
			Sedge Meadow/Typha Mix	278	1457
			Reed Canary Grass	1	2
			Wet Meadow	1	3
243	7116	Open water	Water	86	3464
			Submergent Vegetation	110	2902
			Wild Rice	47	751
19	374	Development	Developed	16	46
			Roadside	3	328

a. Hayfields and pasture in this table were mis-identified in the aerial photo interpretation and are actually cool season grasses.

species of greatest conservation concern by the Minnesota DNR. Of the 258 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 included in Appendix C.

Waterfowl have been an important bird group throughout the history of the Refuge. Primary nesters include:

- Mallard Duck
- Wood Duck
- Blue-winged Teal
- Ring-necked Duck
- Canada Goose
- Trumpeter Swan

Duck nesting densities are among the highest reported for the woodland transition zone in Minnesota. Spring surveys indicate slightly more 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 more than 30 breeding pairs and an annual production of around 100 cygnets per year. Average brood size is nearly twice the national average.

The Refuge is currently cooperating on a Minnesota DNR research study to relate the distribution and welfare of a local population of ducks, specifically Ring-necked Ducks, to the pattern of Refuges (including state refuges) existing in north-central Minnesota. Understanding the factors influencing the distribution of locally raised Ring-necked Ducks in the fall may provide valuable insights into the distribution of refuges required to meet management objectives for Ring-necked Ducks in Minnesota.

As recently as the early 1970s, the Bald Eagle population was in jeopardy throughout the United States. Only one Bald Eagle nest was active on the Refuge. Since that time the number of eagle nests has increased to approximately 30 occupied territories and 25 active nests on an annual basis, producing 20-30 eaglets per year. Other raptors, such as Red-tailed Hawks, Red-shouldered Hawks, Broad-winged Hawks, Cooper's hawks, and Sharp-shinned Hawks breed and migrate through the Refuge.

The wetland ecosystems are particularly important to other waterbirds. These wetlands are ideal nesting sites for species including:

- Common Loons
- Great Blue Heron
- Forster's Tern
- Black Tern
- American Bittern
- Least Bittern
- Yellow Rail
- Sora Rail

Golden-winged Warbler. Photo Credit: FWS

- Virginia Rail
- Sedge Wren
- Swamp Sparrow

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.

The Refuge has been actively engaged in the Golden-winged Warbler research because of the high nesting densities found on the Refuge due to an abundance of early successional forest habitat within the Refuge's boundaries. The Golden-winged Warbler is currently listed as a Resource Conservation Priority species for Region 3 (USFWS) and is considered a neotropical migratory species of high continental conservation concern by Partners in Flight (PIF) (Rich et al. 2004). Since 1966, the Golden-winged Warbler has declined by approximately 3.5 percent per year across its breeding range. An estimated 76 percent of the global population of Golden-winged Warblers breeds within Bird Conservation Region 12 (BCR12), and approximately 40 percent the global population breed in Minnesota (Rosenberg 2004). Surveys indicate approximately 1 percent to 2 percent of this global population reside within the boundaries of Tamarac NWR.

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. The American Woodcock is also a Resource Conservation Priority species for the Midwest Region due to long-term declines in breeding populations. In Minnesota, there is more early successional forest than there ever were historically, yet the declines persist. The Refuge is currently engaged in research that is examining low productivity rates or "recruitment" as a possible cause for these declines.

Resident bird or year-round species include:

- Ruffed Grouse
- Wild Turkey
- Great-horned Owl
- Barred Owl
- Downy Woodpecker
- Hairy Woodpecker
- Pileated Woodpecker
- Blue Jay
- Black-capped Chickadee
- White-breasted Nuthatch.

Mammals

The Refuge supports 53 species of resident mammals and seven species of bats that migrate off-Refuge to overwinter. Some of the mammal species found on the Refuge are listed as RCPs 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, and 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 an overabundance of white-tailed deer state-wide. The Refuge has recently supported a relatively high density of deer (26 to 28 deer/mi^2 pre-fawn survey) and thus the adverse effects of browsing in forest understory are significant with huge ecological ramifications. Beaver can have significant effects on water levels which can directly impact the production of wild rice within lakes. Cottontail rabbits and snowshoe hare populations follow a cyclical pattern. Other 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 that 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 included 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 bullhead
- Yellow bullhead
- Black bullhead
- White sucker
- Northern pike
- Bowfin.

Numerous other fish species were also documented including shiners, dace, chubs, darters and other minnow species (Appendix C). Walleye and lake sturgeon are both listed as Regional Conservation Priority Species (USFWS) for Region 3; however, only the lake sturgeon is listed as a state listed species of special concern.

The Minnesota DNR currently stocks Wauboose and North Tamarac lakes with walleye fry on an every-other year cycle. Likewise, the White Earth Natural Resources Department stocks walleye fry in Lost and Teacracker lakes on a similar cycle. The White Earth Natural Resources Department in cooperation with LaCrosse FRO recently stocked lake sturgeon in Round Lake, which is immediately upstream of the Refuge on the Ottertail River. Although no lake sturgeon were stocked directly in the waters of Tamarac NWR, they have the potential to enter the Refuge via the Ottertail River.

Some of the issues that threaten the Refuge's fishery and waterfowl are undesirable nuisance fish species (bullheads, common carp and fathead minnows), poor survival of naturally produced walleye, and winterkills. All the Refuge water areas, with the exception of Lost and Wauboose Lakes have an average depth of 8 feet or less and are thus subject to frequent winterkills.

Carp are present within Ottertail River system, but so far restricted in distribution by a box culvert structure in the Hubbel Pond WMA, which is just south of the Refuge. The possibility exists that carp can bypass the box culvert via a ditch from Cotton Lake to Height of Land Lake, thus potentially entering the Refuge as far up the Ottertail River as the Chippewa Lake water control structure and could potentially destroy wetland habitats in Rice and Blackbird lakes. Other fish species, like fathead minnows and walleye, forage on amphipods, which are the primary food resource of migrant and breeding waterfowl. Fathead minnows may be present in lakes that were previously fishless systems.

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. Garter snakes and prairie skinks are common throughout the Refuge. Snapping and painted turtles are also common. The snapping turtle is listed a species of special concern by the Minnesota DNR.

Reptiles and amphibians are important food sources for many mammals, birds and fish. Their numbers and diversity are often indicators of the health of an ecosystem. Many species of reptiles and amphibians are declining on a state and nationwide scale.

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

A woodchuck takes a rest. Photo Credit: Dick Henry

Gray tree frog. Photo Credit: Dick Henry

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 and Endangered Species

As of July 2010, the gray wolf (*canis lupus*) is the only federally listed endangered species in Becker County. The status of a proposed delisting of the wolf is subject to court action. There are no other 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
- Snapping turtle

The Henslow's Sparrow is state-listed as endangered. The Peregrine Falcon, Wilson's Phalarope, Loggerhead Shrike, Horned Grebe and Common Tern are state-listed as threatened. Although some of the state-listed threatened or endangered species can be occasionally seen during migration, none of them have been known to breed on the Refuge. Several state-listed species of concern occur on the Refuge, including:

- Short-eared Owl
- Yellow Rail
- Cerulean Warbler
- Franklin's Gull
- American White Pelican
- Northern myotis
- Eastern pipistrelle
- Mountain lion
- Prairie vole
- Woodland vole

Refuge Resources of Concern

Resources of Concern were identified by literature review and expert opinion. Refuge resources of concern include special areas, habitats, ecosystems, and individual species. The National Wildlife Refuge System's Habitat Management Plan policy defines resources of concern as:

> "...all plant and/or animal species, species groups, or communities specifically identified in the Refuge purpose, NWRS mission, or international, national, regional, state, or ecosystem conservation plans or acts. Habitats or plant communities should be considered resources of concern when they are specifically identified in the Refuge purpose(s), support species or species groups identified in Refuge purposes, support Service trust species, and/or are important in the maintenance or restoration of biological integrity, diversity and environmental health."

To better focus on Refuge habitat management, the staff developed a list of Refuge Resources of Concern for Tamarac NWR (Appendix D). Some of these "priority" resources of concern could ultimately be known as "focal" species, which should be representatives of other species or guilds that are highly associated with the same habitat attributes or conditions. These species are not always species imperil or rare, but could be good indicators of a particular habitat type.

Threats to Resources

Invasive Species

Exotic and invasive plant species pose one of the greatest threats to the maintenance and restoration of the diverse habitats found on the Refuge. They threaten biological diversity by causing population declines of native species and by altering key ecosystem processes like hydrology, nitrogen fixation,

Bio-agents are released to control leafy spurge. Photo Credit: FWS

and fire regimes. Left unchecked, these plants can come to dominate areas and reduce the value of the land as wildlife habitat. There is often a seed source of many of these exotic/invasive species on the lands surrounding the Refuge, thus in order to be effective with our efforts, we must bring together a complex set of interests including private landowner, commercial, and public agencies to combat invasive species and restore native plants.

Three categories of undesirable species (invasive, exotic, noxious) are found within the Refuge. Invasive species are alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Executive Order 13112 – Invasive Species, dated February 3, 1999, directs federal agencies to use relevant programs and authorities to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, monitor invasive species infestations accurately and reliably, and promote public education on these species and methods to address them. Exotic species are those that are not native to a particular ecosystem. Service policy also directs the Refuge to try to maintain habitats free of exotic species. Noxious weeds are designated by the U.S. Department of Agriculture or the Minnesota Department of Agriculture as species which, when established, are destructive, competitive or difficult to control.

Baseline information on invasive species presence, distribution, density, etc. is crucial for setting priorities for control, developing management strategies, estimating impacts and evaluating management effectiveness. A long-term invasive weed mapping/monitoring program using GPS technology was initiated in 2005. On Tamarac NWR, there are currently numerous invasive species of concern and the Refuge uses an integrated approach to control these weeds. Control methods have included cultural (tillage, burning, cropping, mowing, haying, etc.), chemical and biological (bio-agents) methods. Canada thistle, plumeless thistle, purple loosestrife, leafy spurge and spotted knapweed are introduced species that occur on the Refuge that are classified as prohibited noxious weeds in Minnesota. Other invasive species known to occur on the Refuge include:

- hybrid cattail
- hoary alyssum
- Siberian peashrub
- Kentucky bluegrass
- yellow starthistle
- birdsfoot trefoil
- reed canarygrass
- perennial sowthistle
- common tansy
- quackgrass
- smooth brome

Although flowering rush is not known to occur on the Refuge, it is an imminent threat to the Refuge aquatic resources as it is fairly abundant in the lakes around the Detroit Lakes area. Eurasian milfoil is not common in the area but is a species of concern and poses a threat in the local area. The species is being monitored by the local Minnesota DNR. Detroit Lake typically sees significant boat traffic, and many of these boats use other lakes in the greater Detroit Lakes area, including Tamarac NWR, increasing the spread potential to the Refuge.

Canada and plumeless thistle are controlled through chemical and mechanical means, as well as through competition from native seeded warm season grasses including big and little bluestem, Indiangrass, switchgrass, etc. Purple loosestrife is controlled by hand pulling isolated plants prior to seed production or by chemical application on larger infestations. Leafy spurge and spotted knapweed are controlled primarily through the use of biological control agents. A few other invasive species are known to occur on the Refuge and the appropriate control strategy is applied accordingly; however the species listed above take priority due to proliferation and their threat to native plant communities.

Earthworms

In the Great Lakes region, native earthworm species have never been documented, and any native species of earthworms living in the region were extirpated when glacial ice sheets covered the Upper Midwest 11,000 to 14,000 years ago (NRRI 2007). Therefore, forests of the Great Lakes Region developed in the complete absence of earthworms. For thousands of years, no earthworms existed in this region until European settlers began arriving around the mid 1800s.

Researchers have documented dramatic changes in native hardwood forest ecosystems when exotic earthworms invade, including loss of native understory plant species and tree seedlings, changes in soil structure and declines in nutrient availability (Hale 2004). Exotic earthworms not only alter ecosystem components, but they also change some of the important underlying processes, such as fire, succession, and natural regeneration, that support the health and diversity of forest plants and animals. In addition, research suggests the changes caused by exotic earthworms may lead to a cascade of other changes in the forest that affect small mammal, bird and amphibian populations. Earthworm presence may also increase the impacts of herbivores like white-tailed deer and facilitate invasions of other exotic species, making them a potential threat to the biodiversity and long-term stability of forest ecosystems in the region. Recent research suggests earthworm can potentially affect water quality by mobilizing phosphorus levels.

The Refuge has a significant infestation of earthworms. At this time, there is no known technique for managing or eradicating these non-native earthworms. The Refuge intends to assess the earthworm distribution on the Refuge in the near future using protocol developed by researchers at the Natural Resources Research Institute in Duluth, Minnesota. Refuge staff will need to be cognizant of the potential impacts of earthworms to management success and desired future habitat conditions during all future forest planning and management on the Refuge.

White-tailed Deer

The Refuge is officially designated as a white-tailed deer management unit (251), but the Minnesota DNR and Tamarac NWR cooperatively manage the deer herd and administer harvest regulations within the Refuge. Recently, there has been an overabundance of white-tailed deer statewide. Relatively high densities of deer (26 to 28 deer/mi^2 pre-fawn survey) have occurred on the Refuge within the last decade. Over-browsing by deer could lead to significant ecological ramifications, particularly when coupled with earthworm infestation problems. Long-term over-browsing by deer reduces plant cover and diversity, alters nutrient and carbon cycling, and redirects succession to shift future overstory composition (Dussault and Waller 2004). The impacts of deer over-browse on plants can also cascade to affect species diversity, from insects to amphibians to migratory songbirds. Impacts on vegetative structure and abundance have been noted with deer exclosures on the Refuge.

Zebra Mussel

The zebra mussel, a non-native mussel from Russia, has been rapidly spreading across the Midwest. Zebra mussels pose serious ecological and economic threats to the aquatic resources of Minnesota. Heavy infestations can kill native mussels, impact fish populations, interfere with recreation, increase costs for industry, and alter aquatic ecosystems.

In September 2009, both adult and young zebra mussels were discovered in Pelican Lake, Ottertail County which is approximately 20 (straight-line) miles from the Refuge. This is the first discovery of zebra mussel within the Red River and Ottertail River watershed. Although the Refuge is a distance upstream from Pelican Lake, the approximation of Tamarac NWR to this new infestation has heightened the threat of zebra mussel invasion to the Refuge substantially. Pelican Lake typically sees significant boat traffic, many of which utilize other

Spotted knapweed. Photo Credit: FWS

lakes in the greater Detroit Lakes area, including Tamarac NWR, thus increasing the threat potential to the Refuge.

Other Forest Pests and Pathogens

Refuge staff continually monitor the health and condition of the forests on the Refuge and stay abreast of the regional status of insects and disease that affect the forests. The goal of the Refuge is to protect the health of our forests by preventing, where possible, the introduction of forest insects and diseases in the area.

Native epidemic pests have exhibited outbreak behavior throughout recorded history and although unpredictable, their outbreaks are expected to occur. However, human influence has subjected forests to exotic insect species that are prone to spectacular outbreaks. Disturbances such as climate change, fire suppression and even-aged forest management can increase the severity, frequency and distribution of exotic and native insects.

Forest tent caterpillars, gypsy moth, jack pine bud worms, Asian long-horned beetle, and emerald ash borers (EAB), oak wilt, white pine blister rust, Dutch elm disease, are just a few of the insects and diseases of concern to the Refuge. Currently, the emerald ash borer is the most serious forest pest concern in eastern U. S. It attacks and kills all ash trees. In 2009, EAB was discovered in Minnesota in the Twin Cities area. The spread to remainder of the state is imminent. Early detection of invasive insects and disease is key to effective control of these unwanted forest pests and pathogens.

Contaminants

Tamarac NWR is not near any major point-sources of pollution, and the Refuge has limited risk from spills. Instead, the Refuge is more likely to be impacted from air pollution that may originate from other sources well beyond the Refuge boundaries.

Mercury is a pervasive contaminant across Minnesota, necessitating a statewide Fish Consumption Advisory from the Minnesota Department of Health. Air pollution is the major source of mercury contamination to Minnesota's lakes and rivers. About 70 percent of the mercury in the air is the result of emissions from coal combustion, mining, and the incineration of mercury-containing products, the remaining 30 percent is derived from natural emissions. Only about 10 percent of Minnesota's mercury contamination originates from Minnesota emissions, however, 90 percent of Minnesota's emissions are deposited in other states and countries (Minnesota Pollution Control Agency, 2005).

Several lakes within the surrounding area of the Refuge are listed on the Minnesota Impaired Water list due to mercury as the pollutant. These lakes include Cotton, Island, Many Point, Toad, Floyd, Detroit and White Earth. The increasing presence of mercury within inland lakes has prompted the Minnesota Department of Health to issue a Fish Consumption Advisory. The advisory provides guidelines regarding the size and frequency of which fish species can be eaten safely. No formal testing of fish or wildlife for the presence of contaminants has been conducted on the Refuge.

In 2005, the Refuge initiated an environmental site assessment at the former Job Corps Conservation Center (JCCC). The goal of this project was to identify and remove any existing environmental contaminants that were still present within the JCCC area. The JCCC was a complex, administered by the U.S. Army Corps of Engineers, that was constructed in 1965 to house, educate and train youth. The area encompassed approximately 180 acres just north of Height of Land Lake. Although the JCCC program was terminated on the Refuge in 1969, the facilities were used by a Native American group until 1980, when the site was abandoned and the buildings were reclaimed, sold or demolished. Asphalt driveways, concrete foundations, telephone pedestals, buried pipes, underground storage tanks sewage lagoon (presently dry) and an inactive solid waste dump remained on the site.

Three underground storage tanks (fuel tanks) were removed in 2005 and the soil around them was tested. All soil tests were negative for benzene, ethyl-benzene, toluene, xylene, gasoline range organics and diesel range organics. Two water wells were also sealed with bentonite for contaminant prevention to the groundwater. In 2008, five injection wells (septic tanks) were inspected and closed by filling them with clean dirt. Concrete pads, industrial hoists and metal pipes were also removed from the site. In 2009, a site assessment by Tetra Tech. was conducted and concluded that the landfill needed to be tested to determine remediation action. Additional soil testing for lead and asbestos around the building demonstration sites was also recommended and one additional septic tank was identified for closure. The work is scheduled for 2010.

Climate Change and Tamarac NWR

Various forest ecologists with expertise in disturbance regimes and potential climate change impacts have suggested that this area will likely see significant ecological changes in the forest landscape and associated habitats for wildlife. One ecologist goes so far as to state "the only forest that may be left in

Minnesota after climate change runs its course, would be located in the Boundary Waters along the Canadian border in extreme northeastern Minnesota." Ironically, a study conducted by University of Minnesota Professor John Tester about 15 years ago documented that just a subtle change in abiotic factors, such as temperature and precipitation, impacted these major biomes. The study represented a gradient of ecotones within a 50-mile east-west transect that transitioned from boreal forest to deciduous forest to brushlands to tallgrass prairie. The difference in temperature between the boreal forest and tallgrass prairie was a mere 4 degrees Celsius. Significant differences were documented in plant and animal species.

For example, starting in the boreal forest and ending in the tallgrass prairie, four different grouse species with specific habitat needs were documented (Spruce Grouse, Ruffed Grouse, Sharp-tailed Grouse and Greater Prairie Chicken). The same pattern was noted in small mammals and other species groups. All of the future climate models predict this same area will warm by at least 4 degrees Celsius in the next 50 years. The ultimate question is what's in store for wildlife and their associated habitats in the future with potential climate changes? How does a land manager plan for future habitat management for wildlife within this tension zone, facing uncertainty with regard to climate change?

In addition, the Refuge was established in the mid-1930s as a result of the reinvigorated national waterfowl restoration program by the U. S. Fish & Wildlife Service to restore the nesting grounds of the waterfowl resource. This was during the Dust Bowl Era when the prairie potholes of the Dakotas were dry, thus significant waterfowl use was present in the shallow lakes of Tamarac NWR and the transition zone of Minnesota. Since that time, precipitation and water levels have returned to prairies, luring waterfowl populations back to the prairie potholes. Dr. Carter Johnson of South Dakota State University suggests the most productive habitat for breeding waterfowl are poised to shift from the prairie potholes to wetter eastern and northern fringes where many wetlands have already been drained (Johnson et al. 2005). How important will the transition zone of Minnesota be under the predicted climate models?

Midwest Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors.

The increase of carbon dioxide within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife Refuges, carbon sequestration constitutes the primary climate-related impact that refuges can affect in a small way. The U.S. Department of Energy's "Carbon Sequestration Research and Development" defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric carbon dioxide. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

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

One Service activity in particular – prescribed burning – releases carbon dioxide directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air (Boutton et al. 2006). Overall, there should be little or no net change in the amount of carbon sequestered at Tamarac NWR from any of the proposed management alternatives.

Several impacts of climate change have been identified that may need to be considered and addressed in the future:

- Habitat available for cold water fish such as trout and salmon in lakes and streams could be reduced.
- Forests may change, with some species shifting their range northward or dying out, and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat due to stronger and more frequent droughts.

Canadian tiger swallowtail butterfly. Photo Credit: R. Hickner

- Changes in the timing of migration and nesting could put some birds out of sync with the life cycles of their prey species.
- Animal and insect species historically found farther south may colonize new areas to the north as winter climatic conditions moderate.

The managers and resource specialists responsible for the Refuge 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. Adjustments in land management direction may be necessary over the course of time to adapt to a changing climate.

The following paragraphs are excerpts from the 2000 report: *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*, produced by the National Assessment Synthesis Team, an advisory committee chartered under the Federal Advisory Committee Act to help the US Global Change Research Program fulfill its mandate under the Global Change Research Act of 1990. These excerpts are from the section of the report focused upon the eight-state Midwest Region.

Observed Climate Trends

Over the 20th century, the northern portion of the Midwest, including the upper Great Lakes, has warmed by almost 4 degrees Fahrenheit (2 degrees Celsius), while the southern portion, along the Ohio River valley, has cooled by about 1 degree Fahrenheit (0.5 degrees Celsius). Annual precipitation has increased, with many of the changes quite substantial, including as much as 10 to 20 percent increases over the 20th century. Much of the precipitation has resulted from an increased rise in the number of days with heavy and very heavy precipitation events. There have been moderate to very large increases in the number of days with excessive moisture in the eastern portion of the Great Lakes basin.

Scenarios of Future Climate

During the 21st century, models project that temperatures will increase throughout the Midwest, and at a greater rate than has been observed in the 20th century. Even over the northern portion of the region, where warming has been the largest, an accelerated warming trend is projected for the 21st century, with temperatures increasing by 5 to 10 degrees Fahrenheit (3 to 6 degrees Celsius). The average minimum temperature is likely to increase as much as 1 to 2 degrees Fahrenheit (0.5 to 1 degree Celsius) more than the maximum temperature. Precipitation is likely to continue its upward trend, at a slightly accelerated rate; 10 to 30 percent increases are projected across much of the region. Despite the increases in precipitation, increases in temperature and other meteorological factors are likely to lead to a substantial increase in evaporation, causing a soil moisture deficit, reduction in lake and river levels, and more drought-like conditions in much of the region. In addition, increases in the proportion of precipitation coming from heavy and extreme precipitation are very likely.

Midwest Key Issues:

1. Reduction in Lake and River Levels

Water levels, supply, quality, and water-based transportation and recreation are all climate-sensitive issues affecting the region. Despite the projected increase in precipitation, increased evaporation due to higher summer air temperatures is likely to lead to reduced levels in the Great Lakes. Of 12 models used to assess this question, 11 suggest significant decreases in lake levels while one suggests a small increase. The total range of the 11 models' projections is less than a 1-foot increase to more than a 5-foot decrease. A 5-foot (1.5- meter) reduction would lead to a 20 to 40 percent reduction in outflow to the St. Lawrence Seaway. Lower lake levels cause reduced hydropower generation downstream, with reductions of up to 15 percent by 2050. An increase in demand for water across the region at the same time as net flows decrease is of particular concern. There is a possibility of increased national and international tension related to increased pressure for water diversions from the Lakes as demands for water increase. For smaller lakes and rivers, reduced flows are likely to cause water quality issues to become more acute. In addition, the projected increase in very heavy precipitation events will

likely lead to increased flash flooding and worsen agricultural and other non-point source pollution as more frequent heavy rains wash pollutants into rivers and lakes. Lower water levels are likely to make water-based transportation more difficult with increases in the costs of navigation of 5 to 40 percent. Some of this increase will likely be offset as reduced ice cover extends the navigation season. Shoreline damage due to high lake levels is likely to decrease 40 to 80 percent due to reduced water levels.

Adaptations: A reduction in lake and river levels would require adaptations such as re-engineering of ship docks and locks for transportation and recreation. If flows decrease while demand increases, international commissions focusing on Great Lakes water issues are likely to become even more important in the future. Improved forecasts and warnings of extreme precipitation events could help reduce some related impacts.

2. Agricultural Shifts

Agriculture is of vital importance to this region, the nation, and the world. It has exhibited a capacity to adapt to moderate differences in growing season climate, and it is likely that agriculture would be able to continue to adapt. With an increase in the length of the growing season, double cropping, the practice of planting a second crop after the first is harvested, is likely to become more prevalent. The CO_2 fertilization effect is likely to enhance plant growth and contribute to generally higher yields. The largest increases are projected to occur in the northern areas of the region, where crop yields are currently temperature limited. However, yields are not likely to increase in all parts of the region. For example, in the southern portions of Indiana and Illinois, corn yields are likely to decline, with 10-20 percent decreases projected in some locations. Consumers are likely to pay lower prices due to generally increased yields, while most producers are likely to suffer reduced profits due to declining prices. Increased use of pesticides and herbicides are very likely to be required and to present new challenges.

Adaptations: Plant breeding programs can use skilled climate predictions to aid in breeding new varieties for the new growing conditions. Farmers can then choose varieties that are better attuned to the expected climate. It is likely that plant breeders will need to use all the tools of plant breeding, including genetic engineering, in adapting to climate change. Changing planting and harvest dates and planting densities, and using integrated pest management, conservation tillage, and new farm technologies are additional options. There is also the potential for shifting or expanding the area where certain crops are grown if climate conditions become more favorable. Weather conditions during the growing season are the primary factor in year-to-year differences in corn and soybean yields. Droughts and floods result in large yield reductions; severe droughts, like the drought of 1988, cause yield reductions of over 30 percent. Reliable seasonal forecasts are likely to help farmers adjust their practices from year to year to respond to such events.

3. Changes in Semi-natural and Natural Ecosystems

The Upper Midwest has a unique combination of soil and climate that allows for abundant coniferous tree growth. Higher temperatures and increased evaporation will likely reduce boreal forest acreage, and make current forestlands more susceptible to pests and diseases. It is likely that the southern transition zone of the boreal forest will be susceptible to expansion of temperate forests, which in turn will have to compete with other land use pressures. However, warmer weather (coupled with beneficial effects of increased CO_2), are likely to lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited. Most climate models indicate that higher air temperatures will cause greater evaporation and hence reduced soil moisture, a situation conducive to forest fires. As the 21st century progresses, there will be an increased likelihood of greater environmental stress on both deciduous and coniferous trees, making them susceptible to disease and pest infestation, likely resulting in increased tree mortality.

As water temperatures in lakes increase, major changes in freshwater ecosystems will very likely occur, such as a shift from cold water fish species, such as trout, to warmer water species, such as bass and catfish. Warmer water is also likely to create an environment more susceptible to invasions by non-native species. Runoff of excess nutrients (such as nitrogen and phosphorus from fertilizer) into lakes and rivers is likely to increase due to the increase in heavy precipitation events. This, coupled with warmer lake temperatures, is likely to stimulate the growth of algae, depleting the water of oxygen to the detriment of other living things. Declining lake levels are likely to cause large impacts to the current distribution of wetlands. There is some chance that some wetlands could gradually migrate, but in areas where their migration is

limited by the topography, they would disappear. Changes in bird populations and other native wildlife have already been linked to increasing temperatures and more changes are likely in the future. Wildlife populations are particularly susceptible to climate extremes due to the effects of drought on their food sources.

Administrative Facilities

The primary facility on Tamarac NWR is a combined Visitor Center and Refuge Headquarters located on Highway 26. The Visitor Center portion features an exhibit area, an observation deck, a book shop and an auditorium/theater. The Headquarters portion contains office space for most of the Refuge staff. Workshops, garages, storage buildings, and additional offices are located just east of the Refuge Headquarters.

Visitor Services

Between 60,000 to 85,000 visitors per year visit Tamarac NWR. The number of people that visit per year is dependent upon many factors, some which we control, such as the number of programs offered and outreach efforts.

The Refuge's Visitor Center is open year-round. In the winter and spring, the Visitor Center is open Monday through Friday from 8 a.m. to 4 p.m. In the summer and fall, the hours are extended to 10 a.m. to 5 p.m. on weekends.

Attractions include informational and interpretive displays such as a children's touch table, a Bald Eagle's nest, a 'sounds of the Refuge' display, Trumpeter Swan mounts and more.

The Visitor Center also features a 12-minute orientation to the Refuge theater presentation.

Other facilities include:

Tamarac NWR Visitor Center. Photo Credit: FWS

- Old Indian Hiking Trail on County Road 29 winds through maple-basswood and diverse forest for approximately 1.5 miles.
- All roads and trails in the Visitor Use Area are open for hiking year-round and snowshoeing during winter months. Roads and trails in the Sanctuary Area are open for hiking, snowshoeing or skiing from September through February.
- Blackbird Auto Tour Drive, a 5-mile long, self-guided interpretive trail which travels through forested areas and follows the edge of lakes, marshes and bogs. The tour is open from April 15 through December 15, road conditions permitting.
- Two observation decks, each with spotting scopes and interpretive panels.
- Trails and parking areas available for hunting waterfowl, deer and small game.
- Boat access available at Tamarac, Rice, Lost, Waboose, Blackbird, Height of Land, Cotton, Egg, Two Island, Day, Pine and Carmen Lakes.
- Information kiosks at the Visitor Center, the southern entrance on Highway 29 and the western entrance on Highway 26.
- The Chippewa site, along the banks of the Otter Tail River, offers tables, grills and restrooms.
- The Pine Lake Ski Trail is open seasonally and offers two occasionally groomed loops approximately 2 and 6 miles. A parking lot and trail head map are located on County Road 29.
- Eleven historic monuments.

Current Management

Consistent with its authorizing legislation, Tamarac NWR conducts a broad array of wildlife and habitat management activities while providing for a variety of visitor services. Efforts to balance competing demands for natural resources, wildlife, and protection from environmental hazards are crucial. Refuge management has made significant progress in implementing planned activities over the years since establishment. Refuge planning and management, however, are a continual work in progress and evolve over time, depending on feedback and monitoring as well as changing values, needs, and priorities in wildlife management at the Refuge, regional, and national scale.

Habitat Management

Land management on the Tamarac NWR has shifted over time from the wholesale logging of the

Bald Eagle and eaglet. Photo Credit: D. Braud

late 1800s, to pioneer settlement and agricultural attempts, to the edge management of early wildlife management, and on to the landscape and disturbance ecology of today.

As our knowledge and understanding of landscape ecology and wildlife management evolve over time, and as circumstances and values "on the ground" change, the direction of habitat management tends to change as well. By keeping the "Wildlife First" motto at the forefront of refuge management the Tamarac NWR is adhering to the refuge purpose. Although the Refuge's original focus was on waterfowl (ducks and geese), other migratory birds, such as forest passerines, and resident wildlife, such as wolves and deer, have received an increasing emphasis in Refuge management over the years. In addition, a more holistic approach has been proposed for the future through ecosystem management principles and philosophies. The Refuge will accomplish these purpose(s) and mission by ensuring that the biological integrity, diversity, and environmental health of the Refuge are maintained and, where appropriate, restored.

The U.S. Fish and Wildlife Service's biological integrity policy (U. S. Fish and Wildlife Service 2001) directs the agency to "maintain and restore, where appropriate, the biological integrity, diversity and environmental health of the National Wildlife Refuge System (NWRS). Biological diversity can be referred to as the variety of life including its processes; whereas, biological integrity refers to the "biotic composition, structure and functioning at genetic, organism and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms and communities. Environmental health in the policy refers to the composition, structure, and functioning of soil, water, air, and other abiotic features comparable with the historic conditions, including the natural abiotic processes that shape the environment. Unlike many locations in the upper Midwest, Tamarac NWR has the unique ability to manage for biological integrity based upon the ecosystem approach, without overemphasizing single species management.

From the time of Refuge establishment, until the mid 1960s when acquisition boundaries were complete, much of the Refuge management focused on land acquisition and management of the waterfowl resources. From 1979 to 1992, the Refuge was managed under the guidance of the Tamarac NWR Master Plan. The primary management objective under this plan was the production and maintenance of waterfowl. This often was thought of as the more water that could be placed on the landscape, the more waterfowl that could be produced. Secondary objectives were directed toward maintaining an ecological balance between resident species their habitat and providing public opportunities such as hunting, fishing and wildlife observation.

Currently, Tamarac NWR operates under the guidance of the Refuge Management Plan (1992). This plan put forth the current mission for Tamarac NWR:

> "Manage Refuge habitats to maximize biodiversity, with emphasis on endangered species and waterfowl production and maintenance, while providing visitor opportunities, compatible with Refuge purposes, that produce high quality education, interpretation and recreation experiences."

Management emphasis of this plan focused on furthering the purposes for which Tamarac NWR was established, primarily production and maintenance of migratory waterfowl, with only endangered species having a higher priority than waterfowl.

The goals and the specific objectives stated in the 1992 Refuge Management Plan were pursued by an aggressive habitat management program involving wetland, forest, grassland and fire management and a diverse public use program to provide a wide variety of recreational, interpretive and educational programs. These Refuge habitat goals were essentially divided and managed via three succinct management disciplines through individual step down plans: forest management plan (1994), grassland management plan (1990) and marsh & water management plan (1992), which provided more specificity to habitat management.

Wetland Management

In the early years of Refuge management, the management philosophy focused on constructing water control structures to create more waterfowl habitat. Refuge management philosophies have changed, and today, wetlands are being managed based on historical distribution and hydrological

regimes to the extent possible. The basic purpose of water level management on the Refuge has been to enhance the area's natural ability to grow wild rice and maintain aquatic ecosystems for the benefit of migrating waterfowl and other wetland dependent species.

A total of 30 shallow lakes are managed on the Refuge using one of three management strategies:

- Active water manipulation
- Removal of problem beaver dams as necessary
- No water level manipulation

The 1992 Marsh and Water Management Plan clearly articulated which strategy will be used for each lake and subsequently, lakes with active water manipulation have "target" water levels prescribed for different time periods throughout the year. According to the plan, eleven lakes/pools were to be addressed annually. However, only six lakes have management capability via water control structures and only four of those have been actively manipulated in recent years. With the exception of South Tamarac, which is controlled by a pumping station, all lakes are managed through natural gravity flow and runoff and are considered gravity flow systems.

Throughout Refuge history, water control structures have been used to manipulate water levels to maximize wild rice production. Initially, as each water control structure became functional elevations were established for each lake based on flooding a majority of the pool to a depth of 4 feet or less. Later some of the approved elevations changed based on observations and experiences of Refuge staff. Historically, approved levels were generally held constant throughout the year. From 1959 to the mid 1980s, management tactics focused on moving high spring runoff through Refuge lakes as rapidly as possible and stabilizing water levels throughout the growing season stabilizing water levels so that the growth of wild rice would benefit waterfowl by providing brood cover and food for migrants.

Tamarac NWR wetland. Photo Credit: George Read

Since that time, management efforts have attempted to allow these natural fluctuations to occur in order to sustain the long-term viability of wild rice production, particularly in the Rice, Blackbird, Flat and Little Flat Lakes. Wild rice evolved through a cyclic process of water level fluctuations depending upon precipitation, runoff, and evaporation in any given year. For example, in a 10-year period, there were likely a couple drought years, a couple flood years, and some years with water levels in between these extremes. Recent research (Carson 2002) indicates stable water levels over time jeopardize the long-term viability of a wild rice dominated lake by allowing undesirable species to outcompete wild rice.

Under today's strategy, annual water level prescriptions are not rigid, but rather targets that provide the flexibility for wetland enhancement and management of aquatic ecosystemsl. The primary intent is to allow water to flow through naturally during peak periods such as spring run-off or heavy rain events, rather than restrict the flow. It is recognized that these water control structures do pose a fish barrier problem, but that seems to be an advantage with common carp in the Ottertail River systems just below the dam in Hubbel Pond Wildlife Management Area.

Open Landscape Management

The Refuge currently manages about 2,800 acres (6.5 percent of the Refuge) as upland grass/brush habitat. Most of these areas are remnants of the early settler clearings or small farms which followed the virgin timber harvest or the late 1800s. Early management of grassland "openings" in the landscape was through intensive farming efforts. Food plots were established as part of an aggressive goose restoration program in the 1950s. Once Canada Geese were successfully restored in the area, many of these food plots were slowly converted to dense nesting cover (DNC) for the benefit of nesting waterfowl. In recent years, many of these DNC fields have been converted to stands of warm season grasses and forbs, and most have been maintained primarily by prescribed burning.

A plan to continue converting half of extant Refuge grassland to forest was proposed in 1984, but not approved, and instead a decision was made to rehabilitate existing grasslands and reclaim additional grassland habitats through timber removal and fire use. In 1981, a prescribed fire program was initiated as a tool to maintain and rehabilitate grasslands. The primary goal of the current Grassland

Management Plan (1990) was to provide a variety of quality grasslands, by 1999, totaling 2,500 acres and eventually 5,000 acres for the benefit of nesting waterfowl. Additional goals were to:

1. Strive for a 4.6 to 1 forest to grassland ratio which would represent habitats observed by Refuge founders.
2. Provide habitat suitable for reestablishment of Prairie Grouse populations, either by natural immigration or eventual restocking
3. Provide openings in unbroken forest cover to benefit Woodcock, deer, grouse and other resident wildlife.

Many grassland areas are small and scattered throughout the Refuge. These patches are too small to be of value to most area-sensitive grassland bird species and some upland nesting waterfowl due to their juxtaposition in a forested landscape. Currently, there are 83 designated grassland units on the Refuge with an average size of 17 acres (median of 7.6 acres). Sixty-eight percent (57 of 83) of these grassland units are less than 20 acres in size, and only ten of these grasslands are greater than 40 acres in size with the largest tract consisting of 88 acres. Historically, there probably was not any upland grass habitat at the Refuge during the era immediately prior to European settlement. However, grass/brush habitats would likely fall within the range of natural variability due to catastrophic disturbances and may have been present for short periods of time until succession quickly progressed.

The 1000-acre Tract

One attempt to create a sizeable, contiguous unit of grassland/brushland that could be managed long term by prescribed fire to enhance habitat for upland nesting ducks, especially Mallards, and recolonization of Prairie Grouse was conceived through establishment of the 1,000-acre Tract. Following the logging of the native red and white pine stands in the late 1800s, subsequent fires and settlement of the Refuge, Pinnated and Sharp-tailed Grouse were observed on the Refuge. The Pinnated Grouse persisted into the 1940s and Sharp-tailed Grouse until the 1950s when the developing second growth forest closed in eliminating suitable habitat for them. Nearly a hundred years later (late 1980s) significant portions of the 1,000-acre Tract were logged a second time. This tract was a forested/wetland area in the central portion of the Refuge that was cleared of most the trees by 1990 to create a brushy grassland area of 1,000 acres that would be burned at least 3 times from 1990-1995 to kill woody regeneration and to stimulate native grasses and forbs on uplands, as well as kill willows, create open water for pairs [waterfowl] and enhance marsh vegetation in wetlands.

This tract was chosen because of the relative openness of the area and the presence of a remnant parcel (52 acres) of native big bluestem that suggested that the area historically developed under some open landscape conditions. The relative openness of several other anthropogenic grassland fields that were already established adjacent to the unit was significant in the tract's selection. Indeed, recent research indicates this 52-acre remnant parcel developed under "open' grassland conditions, but this was the only area within entire 1,000-acre Tract indicative of this condition. In addition, most experts would agree that big bluestem is ubiquitous to a variety of habitat types including forest habitats in northern Minnesota.

Prior the creation of the 1000-acre Tract, the unit was dominated by aspen with varying densities of mature burr oak and scattered white and red pines present within the stands. Also present on the higher ridges was a closed canopy community of jack pine with paper birch inclusions. A complex of more than 100 wetland basins and 52 acres of old settler field openings were also present. Logging excluded many of the oaks and large red and white pines along the ridges. These trees were left as future seed trees should Prairie Grouse not return.

Essentially, this management adopted a "cookie-cutter" approach where a block of forest habitat was fragmented within an interior forested landscape. The intensity and timing of prescribed burns have only stimulated the shrub species present on the unit rather than eliminated or reduced them as originally intended. Overall, this tract is not contributing greatly to regional or even local waterfowl

Tamarck NWR. Photo Credit: FWS

populations. Tamarac NWR is positioned in a forested landscape and Sharp-tailed and Pinnated Grouse have not pioneered or re-established into the area. A new management scenario for this area, either through natural succession or active restoration, will be considered in this CCP.

Forest Openings

Thirty-two forest openings, totaling 63 acres, were established in the northern portion of the Refuge from 1990 to 1991. These openings are very similar to the smaller grassland units mentioned previously but are smaller in size. The openings were typically placed in a variety of forest types and generally centered on recently abandoned logging decks and ranged in size from 1 to 3 acres with an irregular shape. In most cases, these openings represent a "hard edge" or transition from grass to forest without much woody vegetation within the opening itself. These openings were created out of a need to provide early successional stages and edge habitat within a continuous forest habitat primarily for the benefit or ruffed grouse, woodcock, bear and white-tailed deer.

Maintenance of these openings included tree removal, prescribed fire, herbicide, tillage, grading, mowing and seeding to stop woody invasion. Prescribed fire, herbicide and mowing have been the primary treatments in recent years, although invasive species, particularly thistle species, have invaded many of these openings thus requiring additional mechanical or chemical treatment. With limited budgets, these openings can be very costly to maintain. There are enough natural openings on the landscape; therefore anthropogenic openings do not need to be maintained. The natural openings on the landscape provide enough habitat on the landscape for these relatively common species and the Refuge should focus on maintaining "unbroken" or non-fragmented forest habitat. Temporary openings created through on-going silvicultural practices on the Refuge provide the same amount of habitat if not more at no additional cost to the Refuge and require no maintenance.

Croplands

Similar to the "edge-management" philosophy of the grasslands, wildlife biologists (particularly waterfowl managers) for decades encouraged the cultivation of crops, particularly grains, as a nutritious food source both for upland game and migrating ducks and geese. When national wildlife refuges were established, agricultural lands were acquired and often maintained to produce food for wildlife. However, by the 1980s, wildlife biologists generally, and the U.S. Fish and Wildlife Service specifically, were adopting more holistic approaches to wildlife management. They realized that artificial food production often had undesirable outcomes even among those species targeted to benefit, such as overpopulation or overcrowding and thus susceptibility to disease and other problems, e.g., outbreaks of botulism or avian cholera.

At the same time, croplands often came at the expense of more robust, sustainable, and diverse natural communities and the non-game organisms that inhabit them. In recent years, the Service and wildlife biologists in other agencies have tended to discourage grain and crop cultivation. Today, only one small cropland field is maintained on the Refuge for the benefit of watchable wildlife. It is located off the Blackbird Auto tour route. All other cropfields within the Refuge have been converted to grassland, many of which will ultimately be converted to forest. In recent years, the management philosophy at Tamarac NWR, paralleling that of other refuges around the country, has become more oriented toward fostering or simulating natural processes, like wildland fire, to achieve desired landscapes and to restore scarce habitats.

Forest Management

The long range goal identified in the current Forest Management Plan (USFWS 1994) was to provide diverse patterns of vegetation and openings throughout the entire Refuge. The goal was to be accomplished through management ranging from preservation to very active forest management via timber harvest to promote early successional stages. In general, the current purposes of forest management are to provide protection and generate new habitat areas for endangered species, as well as managing for a variety of forest species, through the use of sustained yield principles of forest management. Under the 1994 plan, the development of open crowned canopies and block clearcuts to provide habitat for a diversity of wildlife was promoted, along with the growth and retention of abundant tree cavities for cavity nesting waterfowl and other birds.

Management of upland and lowland hardwoods was to be directed toward mixed, uneven-aged stands with all age classes represented to insure a continuous supply of natural cavities. From the mid-1980s through the late 1990s, timber harvest of aspen on the Refuge was accelerated due to an increase in aspen pulp markets. From 1987 to 1990, over a thousand acres of aspen was harvested per year, primarily through clear-cutting practices. In order to alter the age class diversity, some of these aspen regenerating sites were mowed with a hydroaxe or knocked down with a roller chopper; however, this practice was fairly limited. Forest management objectives associated with these efforts were primarily concerned with managing for

Winter day at Tamarac NWR. Photo Credit: Pam Lehmann Callaway

early successional habitats on a rotational basis for Golden-winged Warblers, American Woodcock and Eastern Towhee. Timber harvest of mixed upland hardwoods was through selective harvest techniques where single trees or clusters of trees were harvest from within a larger stand of trees.

Some clear-cutting of decadent jack pine occurred in recent history, followed by prescribed fire in an attempt regenerate jack pine. These efforts were met with limited success. Selective harvest of red pine occurred infrequently as well, primarily as a thinning operation to increase basal area of the remaining red pines. For the most part, white pine has been preserved on the Refuge to provide nesting trees for bald eagles. Although harvest strategies exist in the Forest Management Plan for lowland hardwoods and lowland conifers, these cover types have been left relatively undisturbed. Specific management strategies for each of the major cover types were identified in the 1994 plan.

Representative areas of all forest cover types were allowed to succeed to mature forest with no active management in an effort to insure the needs of all wildlife species were being considered. These specific areas include the Wilderness Area, Research Natural Areas and "Old Growth Unit". Although the "Old Growth Unit" really does not meet true old growth criteria in a true sense of the term, it was an area set aside to be managed as a diverse forested area which possesses a high probability of becoming, over time, acceptable habitat for interior forest birds.

Currently, there is no mandate that the NWRS harvest trees or manage specifically for timber production. The Refuge has the unique opportunity to manage the land for wildlife management purposes, which may include various management strategies such as preservation, timber harvesting, prescribed fire, etc. The 1997 Refuge Improvement Act and subsequent Biological Integrity policy provide the foundation for this determination, along with the land's inherent capability.

The distribution and abundance of cover types are significantly altered from pre-settlement times primarily due to timber harvest, farming, grazing and fire suppression. Consequently, in many forest patches, the compositional and structural patterns that now exist are considerably different relative to pre-European benchmark conditions. For example, many of the timber harvest efforts on the Refuge have converted climax communities or later seral stages to early successional stages. Subsequent management has attempted to maintain them at the young stage while fire suppression has essentially eliminated a natural process within fire dependent plant communities. These efforts have created an imbalance of cover types within the native plant communities in relation to the range of natural variation.

Although forest communities have changed in composition across much of northern Minnesota, opportunities exist for sustainable management and conservation of these communities. Large tracts of native plant communities provide opportunities for ecosystem management, through silviculture, fire and hydrological management that mimic natural cycles in forests and forested wetlands, thereby, perpetuating all of the beneficial functions that native plant communities provide. Specifically, on Tamarac NWR management efforts include the restoration of these native plant communities, including the composition, structure and ecological processes associated with these communities.

Habitat Restoration

Many of the management efforts on the Refuge focus on restoring ecosystems, wildlife habitats and populations that have declined or have been completely lost. Since the inception of the National Wildlife Refuge System's biological integrity policy in 2001, increasing emphasis has been placed on restoring native ecosystems and their associated natural processes. Where feasible, management that restores or mimics natural ecosystem processes or function to achieve Refuge purpose(s) is favored; however, it may be necessary to modify the frequency and timing of natural processes at the Refuge scale to fulfill Refuge purpose(s) or to contribute to biological integrity at larger landscape scales. Endangered plants and animals, as well as rare communities, are the highest contribution that

Tamarac can make to preservation of local and landscape levels of biological integrity.

The boreal hardwood forest in Minnesota, particularly the coniferous component, is becoming a rare and unique habitat and the preservation and restoration of these systems helps the Refuge adhere to the biological integrity policy. Restoration of endangered species (ie: Bald Eagles and Trumpeter Swans), as well as rare communities (ie: jack pine barrens, red and white pine cover types, etc), has and will continue to be at the forefront of management at Tamarac. The majority of the habitats on the Refuge have been modified by humans to some extant; however, most of these habitats are not degraded and could be managed as intact ecosystems, with potential for restoration near the historic range of natural variation rather than an arbitrary point in time, such as pre-settlement conditions.

Given the continually changing environmental conditions and landscape patterns of the past and present (e.g., rapid development, fire suppression, climate change), relying on natural processes may not be feasible or always the best management strategy for conserving wildlife resources. Uncertainty about the future requires that a refuge manage within a natural range of variability rather than emulating an arbitrary point in time. This approach maintains processes that allow species, genetic strains, and natural communities to evolve within changing conditions, rather than trying to maintain stability.

Fish and Wildlife Management and Monitoring

Fish and Wildlife Management

Fishery Management

The goal of the Refuge fisheries program is to provide and maintain a diverse, yet balanced, fish population capable of supporting a quality sport fishery. Lakes currently supporting catchable sizes of game fish (and open to public fishing) in most years include: Lost, Two Island, Wauboose, Blackbird, North Tamarac and Pine. The Minnesota DNR currently stocks Wauboose and North Tamarac Lakes with walleye fry on an every-other year cycle. Likewise, the White Earth Tribal Natural Resources Department stocks walleye fry in Lost and Teacracker lakes on a similar cycle. The Minnesota DNR and White Earth Tribal Natural Resources Department routinely conduct fish surveys on these lakes that are stocked. The LaCrosse Fisheries Resource Office (USFWS) has conducted fish survey assessments on some of the other priority lakes within the Refuge on a five year rotation.

Wildlife Management

Wildlife population management is predicated on the fact that habitat is the most critical factor limiting a desired species response. Therefore, most refuges focus on managing the habitats rather than the wildlife species. Wildlife management on national wildlife refuges has evolved "from managing for a few species to managing for many species using natural processes" (U.S. Fish and Wildlife Service 1999). Today, many refuges focus on restoring land to certain desired conditions through direct habitat management for the benefit of wildlife, rather than setting specific population objectives. Emphasis is placed on maintaining or restoring native plan communities that sustain the area's biological diversity at the landscape scale.

Predator and Exotic Wildlife Management

Tamarac NWR has a trapping program, administered through a 1991 Trapping Plan, with the primary purpose to control predation on ground-nesting birds. Trapping also helps control the number of muskrat and beaver which cause damage to roads and water control structures. The plan provides specific guidance for administering the recreational/commercial trapping program of the White Earth Band of Objiwa on the Refuge, and contains guidelines for other trapping by Refuge staff or other permittees.

The Refuge has a trapping history that dates back to the time of Refuge establishment. Starting around 1975, the program was modified such that only enrolled members of Minnesota Objiwa were able to obtain a permit. Non-tribal members may be offered trapping opportunities if the alternate list of tribal applicants is exhausted (pending Refuge manager discretion). Trapping of beaver, muskrat, mink, raccoon, red fox, coyote and otter is authorized under the trapping plan. Low fur prices in recent years have diminished interest in trapping on the Refuge and as a result fewer furbearers have been taken in recent years. Beaver and muskrat comprise most of the harvest on an annual basis.

The Refuge is divided into seven zones with only one authorized trapper per zone. On those portions lying within the White Earth Reservation, permittees are governed by seasons, bag limits, methods of take and license requirements established by the White Earth Tribal Council. On the remainder of the Refuge, regulations of the Minnesota DNR are applicable. The trapping season typically runs from mid-October through April each year.

Fish and Wildlife Monitoring

In support of the Service's mission, the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System

Improvement Act of 1997, specifically directs the Service to "...monitor the status and trends of fish, wildlife, and plants in each refuge." It is nearly impractical for most refuges to monitor all species within a given refuge, therefore refuges must prioritize monitoring efforts. Ideally, guidance for prioritizing inventory and monitoring is derived directly from management objectives established in the CCP and HMP, which incorporate the Refuge System mission, refuge purpose, the refuge's role as a part of the NWRS, refuge resources of concern (both wildlife and habitat), ecosystem function and integrity (i.e.: native plant community intactness and their natural processes), and the context of the surrounding landscape.

The Refuge staff currently conduct approximately 33 surveys on an annual basis that are guided through an approved 1992 Inventory and Monitoring Plan (IMP). The station's IMP identifies and prioritizes survey objectives and includes a set of approved survey protocols.

Four basic types of inventories are conducted on Tamarac NWR:

- basic species lists through presence/absence detection
- qualitative surveys lacking statistical vigor
- quantitative surveys characterized by a high level of statistical vigor
- cooperative surveys which follow predetermined protocols established by their respective coordinating offices or agencies.

The surveys within the Refuge's IMP are generally conducted by Refuge staff with some assistance from Refuge volunteers.

Studies and Investigations

The intent of additonal studies and investigation beyond routine monitoring is to promote research (or investigation) that relates to a specific refuge management concern and uses the results to inform management decisions (applied research). Tamarac NWR recognizes the important and much needed role research has in the management of federal lands. The following paragraphs describe a few of the studies and investigations (research) that are either ongoing or have taken place in recent years.

Water Quality

To address water quality concerns, the Refuge initiated a water quality monitoring program in 2007.

Currently, the Refuge, in cooperation with the Tamarac Interpretative Association and Minnesota Pollution Control Agency, monitors various water chemistry parameters for 11 lakes and 7 stream sites within the boundaries on a weekly basis throughout the ice-free period. These water quality assessments are also incorporated in evaluation of the water quality in the entire Red River Basin.

Obtaining lake samples for the Tamarac NWR water quality monitoring program. Photo Credit: FWS

Climate Change

In 2009, the Refuge joined a partnership with the Terrestrial Wetland Global Change Research Network (TWGCRN) via Upper Midwest Environmental Sciences Center (UMESC) to begin to address the needs of the FWS and the Refuge regarding climate change and understanding effects and options within regional, national, and international contexts.Tamarac NWR functions as a research node in the TWGCRN, a growing network of U.S. and Canadian scientists, organizations, and research sites using multidisciplinary methods to assess the impacts of climate change across a vital portion of North America and management options for mitigating negative effects. The primary objective is to implement a long-term, integrated assessment of the effects of climate on a set of indicators of landscape conditions at Tamarac NWR via installation of digital sound recorders, water-level loggers, and temperature loggers at ten individual wetlands. This study allows the Refuge to obtain crucial information on the status of Refuge biodiversity (using birds and amphibians as indicators) relative to climatic, hydrologic, and habitat conditions inside and outside the Refuge. It enables the Refuge staff to manage terrestrial and aquatic conditions within the Refuge to maximize conservation benefits and to identify essential habitat connectivity to areas outside the Refuge so Refuge staff can collaborate with

Cleaning out a culvert plugged by beavers. Photo Credit: FWS

partners and landowners to maximize conservation benefits at larger landscape scales.

Pathways for Ecological Restoration of Native Plant Communities

In 2009, Tamarac NWR initiated a project through Wildlands Ecological Services, which used the Minnesota Ecological Classification System (ECS) to determine the distribution of native plant communities (NPC) within the Refuge in an effort to assess the restoration potential, including ecological processes associated with those communities.

An important consideration within ECS is the inclusion of ecological processes as an organizing principle (e.g., fire regime, successional or seral stage, hydrology, etc.). Instead of basing management decisions solely on cover types or other single attributes, ECS will enable Refuge staff to understand how a variety of conditions are interacting and the site potential that results from those interactions. The expected completion date for this project is March 2011.

Survivability of Spotted Knapweed Biological Agents to a Spring Prescribed Fire

A graduate student from the University of Wisconsin–Green Bay, initiated a study in 2006 to examine the "Survivability of Spotted Knapweed Biological Agents to a Spring Prescribed Fire". As land managers began to integrate biological control agents into their weed management programs, questions arise to whether or not prescribed fire has an effect on these agents. Tamarac NWR is one of six study sites distributed between Minnesota and Wisconsin. Areas were sampled for spotted knapweed bio-agent densities and vegetative cover before and after burn treatments. Preliminary results indicate that soil and unburned areas provide refugia from low intensity fires, thus there appears to be no detrimental effect for most knapweed biological control agents. These results will be used to formulate a more comprehensive integrated weed management scheme for spotted knapweed control in grassland systems, incorporating prescribed fire, biological control, and cultural methods to decrease the time-lag in site restoration.

Golden-winged Warbler Breeding Ecology

Tamarac NWR launched a multi-year research study in cooperation with Concordia College to:

- Assess the cumulative contribution of small isolated patches of Golden-winged Warbler habitat to the overall population on Tamarac NWR.
- Develop a fine-scale model of Golden-winged Warbler habitat selection on Tamarac NWR.
- Document seasonal changes in breeding ecology.
- Evaluate the detection area correction factor ("listening distance") established by Partners in Flight for estimating the population of Golden-Winged Warblers throughout the continental U.S.

In May 2010 project was near completion.

The University of Minnesota-Crookston launched a similar project examining Golden-winged Warbler ecology and management. This effort is through a comprehensive approach coordinated through collaboration of federal and state agencies, academia and industry stakeholders across the breeding range of the Golden-winged Warbler. The primary objective is to examine responses of Golden-winged Warblers and associated species to a host of early successional habitat types and conditions with the goal of developing suitable habitat management prescriptions.

In addition, researchers hope to document genetically pure-populations by developing a genetic atlas. Tamarac NWR is one of seven studies monitored across the breeding range. Basic demographic data (return rates, territory size, clutch size, nest success, young produced per successful nest, annual reproductive output, parasitism rates and hybridization rates) is currently being collected in New York, West Virginia, Pennsylvania, Tennessee, Wisconsin, Michigan and Minnesota. The study is scheduled to be completed by December 2010.

Post-fledging Ecology of Ring-necked Ducks in Minnesota

The Minnesota DNR Fall Use Plan recognized sizable populations of resident breeding ducks as a cornerstone to improving fall duck use. Although breeding Ring-necked Duck (*Aythya collaris*) populations have been increasing continentally, they

appear to be declining in Minnesota (Zicus et al. 2005). Factors influencing resident populations are poorly understood, and efforts to better understand their status began in 2003 with development of a breeding-pair survey for Ring-necked Ducks in Minnesota. Minnesota's Fall Use Plan identified the need to better understand the role of refuges in duck management. The influence of north-central Minnesota refuges on the distribution and welfare of resident Ring-necked Ducks is largely unknown, as well as the influence that the distribution of the resident population might have on that of migrant Ring-neck Ducks arriving in the fall.

The intent of this project is to relate the distribution and welfare of a local population of ducks to the pattern of refuges existing in north-central Minnesota. Understanding factors influencing the distribution of locally raised Ring-necked Ducks in the fall may provide valuable insights into the distribution of refuges required to meet management objectives for Ring-necked Ducks in Minnesota.

Incorporating the aid of radio telemetry, the objectives of this study were to:

- Characterize post-fledging movements of local Ring-necked Ducks prior to their fall departure
- Estimate survival of locally produced birds during this period
- Relate the survival of locally produced birds to their relative use of or proximity to established refuges (federal and state) in north-central Minnesota.

Tamarac NWR is one of two federal refuges and 12 state refuges involved in the study which encompasses a significant portion of the core of the Ring-necked Duck breeding range in Minnesota. The project is scheduled to be completed in December 2009.

Disease Monitoring and Control

West Nile Virus

West Nile Virus appeared in northwestern Minnesota in 2002, reported first in horses. Spread by mosquitoes, this exotic virus infects mammals, including humans, and birds. Members of the Corvidae family (crows and jays) seem to be especially vulnerable.

Avian Influenza (H5N1)

Avian influenza, the H5N1, highly pathogenic strain of "bird flu," has received a great deal of attention in recent years. It has not yet been detected in North America, but because migratory waterfowl, shorebirds and other birds could potentially introduce the virus, an early detection sampling strategy was developed. The Refuge has

Visitors discover turtle egg shells on a wildlife excursion. Photo Credit: FWS

participated in surveillance monitoring efforts of this disease from 2006 to 2009 primarily by collecting cloacal and/or oropharyngeal during waterfowl banding activities. Primary targets sampled include Mallard, Green-winged Teal and Wood Ducks. All samples were submitted to the USGS National Wildlife Health Center located in Madison, Wisconsin for analysis.

Visitor Facilities

Visitor activities on Tamarac NWR vary with the season (see Figure 12 on page 48 and Figure 13 on page 49).

Hunting

Hunting on the Refuge is very popular with local residents and many visiting hunters. All hunting is done in accordance with federal, state, and White Earth tribal regulations and seasons. 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 identified as a separate harvest unit by the Minnesota Department of Natural Resources.

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. The Refuge is open to a special state youth waterfowl hunt every year.

Fishing

Fishing is a popular activity in this region of Minnesota and on Tamarac NWR as well. Regulations of the Minnesota Department of Natural Resources and, where applicable, the White Earth Reservation

Figure 12: Current Visitor Services Facilities – Fall and Winter

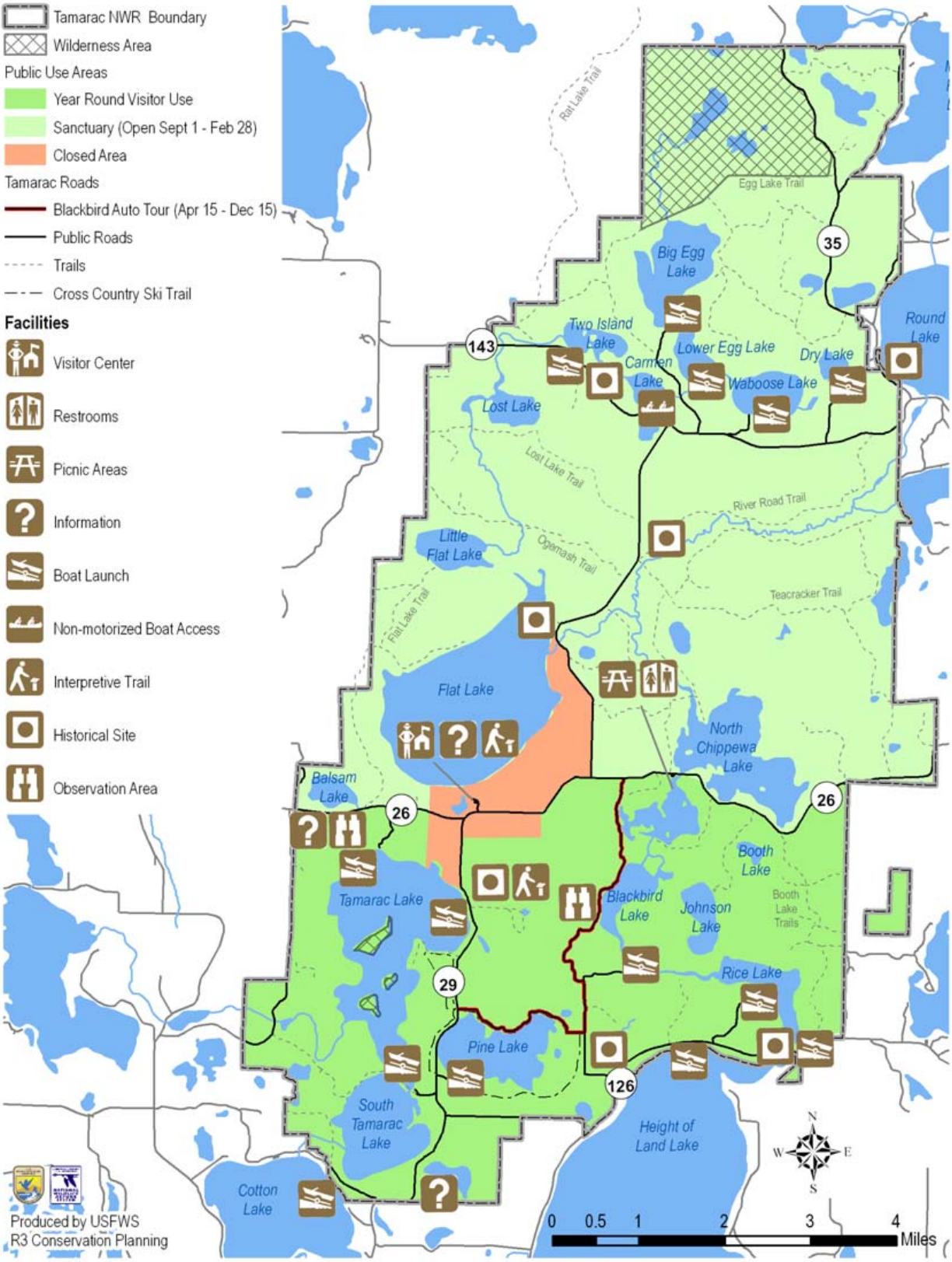
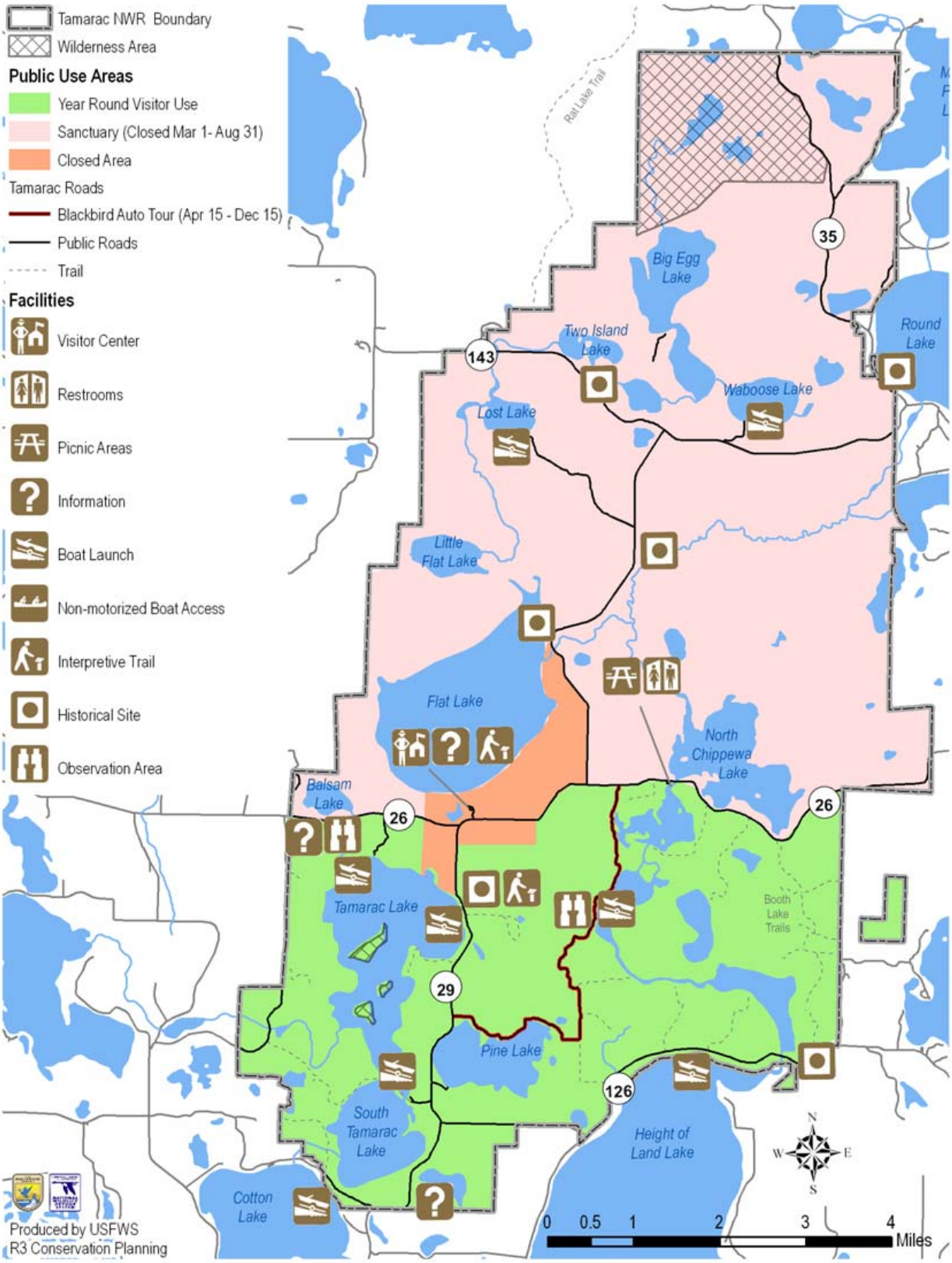


Figure 13: Current Visitor Services Facilities – Spring and Summer



are in effect regarding licensing, creel limits, tackle restrictions and season. 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.
- 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.
- 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.

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 trails or hike in search of wildlife. During the winter, visitors can get into cross-country skis or snowshoes to observe wildlife.

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

Wildlife Photography

The trails and observation platforms 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.

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.

Special 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. Events in the community and presentations to civic groups are all part of the outreach efforts. Some of the 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.

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, tree planting, 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.

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 Chambers, 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.

Volunteer Contributions

The Fish and Wildlife Act of 1956, as amended by the Fish and Wildlife Improvement Act of 1978 and the National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1988, authorized the Service to accept volunteer services. Congress reauthorized the Volunteer and Community Partnership Enhancement Act in 2004, affirming its desire to involve Americans as stewards of our nation's natural resources and wildlife. As a result, the Refuge System expanded its volunteer program, environmental education programs, recreational opportunities, and community-based partnerships increased.

White-tailed deer welcome visitors. Photo Credit: Dick Henry

The expanding volunteer program at Tamarac NWR includes more than 100 volunteers, both individual and group, that donate more than 6,000 hours to the Refuge. Tamarac NWR volunteers are individuals who want to give back to their community, parents and grandparents wanting to model environmental stewardship, retirees willing to share a wealth of knowledge, concerned citizens of all ages who are interested in making meaningful contributions while learning about conservation, and passionate people who enjoy the outdoors and want to spread the word about Tamarac NWR and its greatest natural treasures. Volunteers on the Refuge assist with providing information to the public at the Visitor Center, environmental education activities, interpretive and outreach programs as well as administrative tasks. They are photographers, equipment operators, and journalists. They get involved in habitat restoration efforts, biological programs and maintenance tasks. Volunteers of Tamarac NWR become advocates in the community for Refuge management actions and provide vital help in fulfilling the Refuge mission.

Partnerships

Tamarac NWR staff invest a significant amount of energy and time representing the Refuge in its role as a partner with other government and resource agencies as a neighbor and large landowner in the community. Refuge staff participate as team members of various committees and groups ranging from watershed districts to Minnesota tourism promotion efforts.

Interagency Coordination

Tamarac NWR staff work closely with professionals from the various conservation agencies to ensure the continued resilience of the natural resources to environmental challenges.

- Assist U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and local county soil and water conservation districts with Farm Bill program implementation.
- Participation in Buffalo-Red River Watershed meetings.
- Collaboration on water quality issues with the Red River Basin Water Quality Team, which advises Minnesota Pollution Control Agency on water quality management, improvement and protection strategies for the watersheds of Minnesota's Red River Basin.
- Cooperation with the U.S. Department of Agriculture and the Minnesota Department of Agriculture on invasive species monitoring and management, including use of biological control

White Earth tribal members harvest wild rice. Photo Credit: FWS

agents, establishment of insectaries, and infestation monitoring.

- Coordination on a wide variety of surveys, studies and restoration efforts with outside parties including the U.S. Forest Service, Minnesota DNR, Pelican River Watershed District and U.S. Geological Survey.

Tribal Activities

Tamarac NWR maintains a special relationship with the White Earth Reservation. The north half of the Refuge lies within the original boundary of the White Earth Indian Reservation, established in 1867. A unique agreement referred to as the "Collier Agreement" was instituted during Refuge establishment. This agreement affords White Earth band members priority privileges to trap furbearers and harvest wild rice on the Refuge (see Appendix H). Over the years, the Refuge and White Earth Natural Resources Department have forged a strong cooperative relationship managing these two activities.

Trapping: A drawing for up to seven trapping permits is conducted every October at Refuge headquarters. The Refuge is divided into seven separate trapping zones that have been historically reserved for tribal members only. The White Earth Reservation Tribal Council establishes seasons and regulations for trap zones within the reservation boundary of the Refuge. The state enforces state seasons and regulations outside the reservation boundary. In addition, Refuge Special Use Permit regulations further control trapping activities, such as limiting motorized vehicle use to protect habitats and minimize disturbances and imposing more restrictive snaring regulations to prevent accidental catch of gray wolves. The Refuge trapping season runs from October through April 30 each year. The most common furbearers harvested are beaver, otter, muskrat, mink, raccoon, and red fox. Drawing attendance, trapping effort, and success varies greatly year to year depending on fur market futures. Over the past 20 years, harvest rates have averaged approximately 330 furbearers per year. Beaver are the most sought after species representing 57 percent of the harvest over this period.

Tribal wild ricing: The White Earth Natural Resources Department (WENRD) hosts a Refuge permit drawing for wild rice harvest every August. Two to three hundred tribal members attend the drawing each year. The number of permits issued is based on the abundance, quality, and distribution of the wild rice beds within the Refuge. A WENRD staff annually assesses wild rice production on the Refuge and determines how many boats each lake or stretch of river can sustain. Refuge permits have been reserved for White Earth enrolled members and are issued per boat (two people per canoe). Over the past 10 years, boat numbers and open waters have ranged from 49 to 95 boats on 9 to 15 lakes and rivers. After the WENRD opens Lower Rice Lake, in Clearwater County, to wild ricing, the Refuge issues additional permits to enrolled members. Ricing season normally begins in late August and concludes by mid-September. The Refuge assists with the drawing, issues permits, and mows trails and boat landings for access. In addition to sponsoring the drawing and managing the harvest, WENRD also keeps boat landings clean, opens and closes trail gates, and posts required notices.

Other activities outside the scope of the Collier Agreement include:

Leech harvest: Beginning in 1987, the Service has permitted commercial leech harvest on the reservation portion of the Refuge for enrolled White Earth band members. The WENRD holds a drawing for four leech trapping zone permits. The event is annually attended by 150-250 tribal members. Tribal interest is high due mostly to the Refuge's Mallard Lake which has produced as many as 8,200 pounds of leeches in a single year. Bait venders typically pay $4 to $12 per pound. Similar to wild rice, leech harvest success is quite variable and has ranged from 1,200 to over 8,700 pounds over the past 20 years. Leech harvest is open from ice out through the end of August. Compared to other

tribal activities, adherence to permit requirements has been very poor, in particular, the problem of personal property abandonment on Refuge lakes and wetlands. Other concerns have been raised regarding impacts this activity has on wildlife, such as disruption of Trumpeter Swan nesting and the take of snapping turtles that destroy leech bags.

Hunting and fishing: The Refuge and White Earth Natural Resources Department cooperatively manage tribal hunting and fishing over the reservation portion of the Refuge.

Other requested uses: The Refuge controls access to closed areas and also issues Special Use Permits on a case by case basis for other requested uses, such as collection of plants for medicinal use.

Cooperating Organizations

Tamarac NWR partners with several organizations on efforts of mutual interest.

The Refuge friends group, Tamarac Interpretive Association (TIA), was established in 1992 to serve as an advocate of Tamarac NWR and the Service. The mission of TIA is to facilitate activities and programs that interpret, protect and restore the natural and cultural resources of the Refuge. The Tamarac Interpretive Association also raises funds and offers volunteer support for conservation work that might otherwise go undone. Through a cooperative association agreement, the group runs the Wildlife Gifts and Book Store in the visitor center. Store items offer visitors a variety of books, videos, and tools that help educate and engage people with the Refuge. The group provides funding for educational supplies, biological work and more. TIA assists with recruiting volunteers for environmental education, interpretive programs, events, biological and maintenance activities on the Refuge. TIA is an essential link to the community as they foster relationships with community leaders, businesses and organizations promoting the mission of the Service and stewardship of Refuge lands.

Trumpeter Swans. Photo Credit: Greg Stetz

Tamarac NWR staff are involved with the Pine to Prairie Birding Trail, a unique partnership between the NW Minnesota communities of Detroit Lakes, Fergus Falls, Pelican Rapids, Roseau, Thief River Falls and Warroad; participating agencies U.S. Fish & Wildlife Service, Minnesota Department of Natural Resources Non-game Wildlife Program, Explore Minnesota Tourism; the birding entities of the Minnesota Ornithologist's Union, Audubon Minnesota, Lakes Area Birding Club and the Agassiz Chapter of the National Audubon Society. The birding trail is an exceptional opportunity to provide wildlife tourism opportunities and associated economic activity for visitors and residents of northwest Minnesota, while showcasing the tremendous natural resources of northwest Minnesota. In 2009, partnering with the Province of Manitoba, this trail expanded into Manitoba to create the newest international birding trail in North America.

Currently Tamarac NWR has strong partnerships with the universities, such as University of Minnesota – Crookston, University of Minnesota - St. Paul, Bemidji State University and Concordia University, to investigate resource management issues of the Refuge. Working with academia and college students at these universities also provides the Refuge an opportunity to aid in the development of individuals interested in pursuing careers in natural resource management.

Tamarac NWR works with several entities in the promotion of tourism opportunities in the surrounding area. These entities include, but are not limited to, Becker County Historical Society, Park Rapids and Detroit Lakes Chambers of Commerce, Lake Country Scenic Byway, North Country National Scenic Trail, Becker County Parks and Recreation, and the City of Detroit Lakes.

Tamarac NWR works closely with local area schools (Perham, Frazee, Detroit Lakes, Holy Rosary, Lake Park – Audubon, Waubun-Ogema-White Earth, Mahnomen, Pine Point, Naytahwaush, Moorhead, and Glyndon-Dilworth) to deliver standards-based environmental education programs for school age children. Other environmental educational opportunities are made available through Tamarac NWR's partnership with Natural Innovations, a community-driven organization committed to assisting individuals and organizations in developing a better understanding of how the health of humans and the environment are interrelated. Natural Innovations is comprised of environmental education professionals from local governmental agencies (Becker County Environmental Services,

Minnesota Pollution Control Agency, and Minnesota DNR), environmental businesses (RMB Laboratories) and citizen volunteers.

Tamarac NWR works with other non-governmental organizations, such as Duck Unlimited, Woodcock Minnesota, The Wildlife Management Institute, Ruffed Grouse Society, Minnesota Waterfowl Association, Becker County Sportsmen Club, local Lake Associations, and the Izaak Walton League in support of conservation initiatives such as habitat restoration, wetland protection, environmental education, water quality monitoring and public use opportunities.

Archeology and Cultural Resources

Evidence found on 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. 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 survey provided background on the periods of habitation in Minnesota and identified prehistoric and historic sites on Refuge lands.

Archeologists in Minnesota have divided prehistory into several cultural periods, based on the artifacts left behind by different human groups and the kinds of economic activities in which they were primarily engaged. In the Becker County area, these periods are: The "Paleo-Indian" (before about 5,000 B.C. commonly characterized by mammoth, extinct giant bison and other "big game" hunting, by nomadic groups using distinctively chipped stone spear points and tools); the "Archaic" (cs. 5,000 – 1,000 B.C.; adaptation to changing and increasingly diverse environments); the "Woodland" (ca. 1,000 B.C. – 1,400 A.D.; the advent of pottery, and the construction of earthen burial mounds, by seasonally nomadic groups who practiced some limited horticulture in southern areas of Minnesota, and began the intensive use of wild rice in northern areas); and the "Mississippian" (ca. 1,400 – 1,700 A.D.; influences coming into the area from more southern groups practicing organized horticulture, and generally living in large semi-sedentary villages in many parts of the American Midwest). These prehistoric periods are followed by the "Protohistoric" period (ca. 1,700 – 1,870 A.D.; beginning with the first White-European contact and continuing during the fur trade expansion) and the "Historic" period (after 1,870 A.D.; the time of the European homesteading and the displacement of the Native American inhabitants).

In late prehistoric times, the Tamarac NWR area was occupied by the ancestors of the historic Sioux, or Dakota/Lakota, who were based in the Mille Lacs area and were in the process of fragmenting into the various historic bands when the French Jesuits and fur traders first arrived there at the end of the 17th Century. By the mid 1700s, the Ojibwe (or Chippewa) moved into Minnesota from the east as a direct result of the spread of the French fur trade. By 1800, the Ojibwe were known to hunt regularly in the plains areas west of the Mississippi. The Otter Tail Band of the Pillager Ojibwe was probably well established in the Tamarac NWR area before 1820.

The first documented European occupants of the area were traders of the Northwest Fur Company, who established a trading post at White Earth Lake in October, 1802. At about the same time, a small independent post at Shell Lake was started. However, actual European "settlement" did not occur in the region until around 1868. The logging industry made an appearance in Becker County relatively early, to take advantage of the expansive forest stands. Commercial pine and oak were probably first cut within the county by about 1870. By about 1908, the forests of the area had been extensively logged and the logging era ended. There were several attempts at farming within the Refuge, but farming never achieved much prominence due to the dense forest, marginal soils and numerous wetlands.

An inventory of archeological collections from Tamarac NWR was completed under contract by the Institute of Minnesota Archeology (1993). There have been five archaeological projects including reconnaisance and collections from Tamarac NWR since 1978, totaling an inventory of 1432 artifacts and ecofacts. Currently, these collections are being curated by the Minnesota Historical Society at Fort Snelling and the Department of Anthropology, Hamline University, St. Paul, Minnesota. Due to the overlap in habitation by both Ojibwe and Siouan speakers, most of the archaeological components present cannot be related to any particular historic tribe or tribal activity. There is evidence that a large number of historic Ojibwe sites are present within the Refuge, however, no cultural materials in the collections can be assigned to the Ojibwe.

From these reconnaissance projects, historic (post 1700s) and prehistoric sites have been identified. Among the historic sites, those associated with logging activities (road, camps, dams, and ditches) are most abundant. Other types include clearings, foundations, unidentified sites, settler's communities, bridges, cemetery or grave, standing struc-

tures, a CCC camp, and a school. Habitations comprise nearly one-third of the prehistoric sites, followed by seasonal camps. The remaining sites include trails, clearings, cemetery/grave, and unidentified sites. There are stone markers on the Refuge that identify some of these historic sites. The markers were placed in the mid-1960s with the cooperation of Becker County Historical Society and Minnesota State Historical Society.

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 (RHPO) advises the Regional Director about procedures, compliance, and implementation of cultural resources laws. The Refuge Manager assists the RHPO by informing the RHPO about Service undertakings, by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

Law Enforcment

Federal and state laws and tribal conservation codes governing the Tamarac NWR are enforced to protect its priceless natural and cultural resources, facilities, other assets, and public visitors.

The Refuge currently staffs one dual function Refuge officer. The region's Zone Officer for Minnesota is stationed at the Refuge, lending enforcement assistance and guidance as needed. Formal and informal assistance agreements are in place with state and tribal officials to facilitate cooperation and effective law enforcement response to incidents and emergencies.

The primary mission of Refuge officers is to protect visitors, render aid and assistance, and deter or interdict criminal activity. Officer presence, recognition, and interface with the public provides not only the most effective method of soliciting voluntary compliance to Refuge regulations, but it also boosts visitor confidence and security, enhancing their Refuge experience. No regular patrols are scheduled, however officcers do carry out tours of duty during high activity periods such as summer weekends, holidays, and popular hunting seasons. While the Refuge is regarded as a safe, low crime environment, officers frequently address a broad spectrum of incidents including accident investigations, citizen assistance, missing person searches, fishing and hunting infractions, trespass, and drug and alcohol violations.

Loon. Photo Credit: D. Braud

Of prominent importance are enforcement of federal statutes found under the National Wildlife Refuge Administration Act, Migratory Bird Treaty Act, and Lacy Act. Refuge officers also enforce the conservation provisions and restrictive covenants attached to federal wetland easements and Farmers Home Administration (FmHA) conservation easements which are spread across the Tamarac WMD. Conservation provisions primarily restrict agricultural use and development on easement lands. Enforcement operations are crucial to preserving these important natural resources situated in a broken and over developed landscape.

Chapter 4: Future Management Direction: Tomorrow's Vision

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

Tamarac NWR Goals, Objectives and Strategies

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

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

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

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

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

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

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

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

Tamarac NWR Goals

Goal 1: Wildlife

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

Goal 2: Habitat

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

Goal 3: People

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

Goal 1: Wildlife

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

This goal exemplifies the Refuge staff's commitment to "thinking globally and acting locally." On the local and regional scales, it implements the broad mission of the National Wildlife Refuge System to conserve America's wildlife and enhance biodiversity. Tamarac NWR can most effectively do its share as part of the national conservation strategy by focusing on those migratory species indigenous to the particular habitat types found in north-central Minnesota. In addition to migratory species, resident species will be considered in management efforts, but will not take precedence over migratory species, unless the resident species is threatened, endangered or of special concern. In emphasizing Conservation Priority Species in Region 3 of the Refuge System, Tamarac NWR is contributing to wildlife conservation at an appropriate regional scale by trying to assist those species in greatest need of attention. Note: Not all species associated with the conservation priority species for Region 3 are indigenous to Tamarac NWR, nor will the Refuge manage for all the species on the list. A subset of the regional priority species has been selected for

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

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

Objective 1.1 Trust Resources: Waterfowl

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

Rationale

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

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

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

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

Strategies

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

Objective 1.2 Other Trust Resources – Non- waterfowl

Implement a monitoring and research program to track the presence, abundance, population trends, and/or habitat associations of Trust Resources, including but not limited to Region 3 Conservation Priority Species, habitats, communities and ecosystems. Priority for monitoring will be given to those species identified as Refuge resources of concern.

Rationale

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

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

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

Gray wolf on Tamarac NWR. Photo Credit: Donna Dustin

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

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

Strategies

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

Objective 1.3: Gray Wolves

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

Rationale

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

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

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

Strategies

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

Objective 1.4: Deer Management

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

Rationale

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

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

Strategies

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

Objective 1.5: Fish

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

Rationale

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

Invasive animals such as common carp and zebra mussels pose a current and looming threat to native fish and mussel species and have the potential to disrupt the aquatic ecosystem. They can also have a direct link to the quality of fishing by displacing various game fish, or destroying important habitat for fish and wetland-dependent birds which people observe or hunt. Carp roll in the marsh sediments and create a cloudy environment and uproot aquatic plants. Little sunlight can penetrate the water and fuel the marsh food web, few organisms thrive in such conditions, and the biological diversity of wetlands is reduced, including the production of wild rice. Carp are present within Ottertail River system, but so far restricted in distribution by a box culvert structure in the Hubbel Pond WMA, which is just south of the Refuge.

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

Strategies

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

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

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

Goal 2: Habitat

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

Objective 2.1. Upland Grass

Reduce anthropogenic grassland habitat from 2009 levels (1,362 acres) by 947 acres (minus 70 percent) and manage the remaining 415 acres for the diversity of species present, including Region 3 Conservation Priority Species (Table 5 on page 62 and Figure 14 on page 63).

Rationale

The Refuge currently manages about 2,400 acres (5.5 percent) as upland grass/brush habitat. These areas are mostly remnants of the pre-Refuge farming era and have been maintained by mowing and prescribed burning. Many of these areas are small and scattered throughout the Refuge and as such, are too small to be a value to most area-sensitive grassland bird species due to their juxtaposition in a forested landscape. These grasslands were originally intended to provide upland nesting habitat for dabbling ducks; however surveys in the late 1980's and early 1990's indicated limited use by mallards and blue-winged teal (primarily due to the condition of the habitat). Many of the smaller grassland units may be biological "sinks" due to high predation rates.

Blue flag iris. Photo Credit: J. Tabaka

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

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

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

Habitat Type	Current Management Direction (Acres)	Future Goal		Change	
		Acres	Percent of Total	Acres	Percent by Type
Developed	374.0	367.0	1.0	-7.0	-2.0
Lowland Coniferous Forest	1,863.0	1,863.0	4.0	0	0
Lowland Deciduous Forest	756.0	707.0	2.0	-49.0	-6.0
Lowland Mixed Forest	462.0	462.0	1.0	0	0
Lowland Shrub	2,658.0	1,815.0	4.0	-843.0	-32.0
Marsh/Wetland	6,248.o	6,964.0	16.0	716.0	11.0
Open Water	7,116.0	7,116.0	16.0	0	0
Upland Coniferous Forest	711.0	1,327.0	3.0	616.0	87.0
Upland Deciduous Forest	16,167.0	16,486.0	38.0	319.0	2.0
Upland Grass	1,362.0	415.0	1.0	-947.0	-70.0
Upland Mixed Forest	5,865.0	6,060.0	14.0	195.0	3.0
Total	43,582.0	43,582.0			

waterfowl management on the Refuge will be redirected toward forest waterfowl species by providing quality habitat for ring-necked ducks, wood ducks, trumpeter swans with less emphasis on grassland nesting waterfowl.

Strategies

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

Objective 2.2. Upland 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.

Rationale

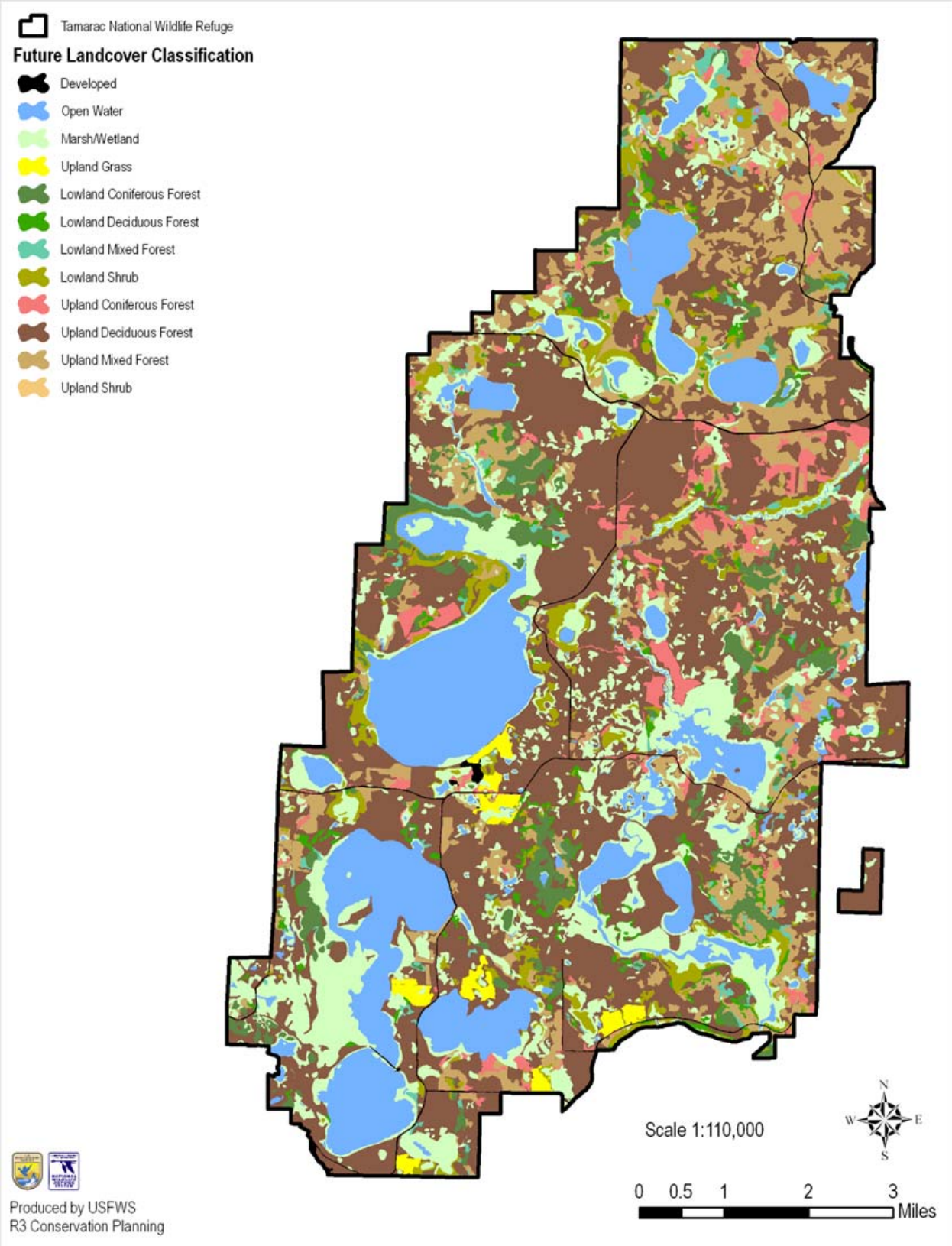
In 1990, this forested/wetland area in the central portion of the Refuge was cleared of trees to create a brushy grassland area of 1,000 acres for the benefits of upland nesting waterfowl, Sharp-tailed Grouse and Greater Prairie Chicken. Prior the creation of the 1,000 Acre Tract, the area consisted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

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

Strategies

1. Re-forest the 1,000 Acre Tract in small patches and allow some open areas to regenerate naturally. Work with the regeneration

Figure 14: Future Land Cover Goals, Tamarac NWR



(oaks) and seed sources (red pine) that is currently present there to restore the area back to jack pine, red pine, white pine, and red and bur oak with aspen pockets.

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

Objective 2.3. Forest Openings

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

Rationale

From 1990 to 1991, 32 forest openings totaling 63 acres were established in the northern portion of the Refuge with funding provided by the DNR and local chapters of the Minnesota Deer Hunters Association. These openings were created out of a need to provide early successional stages and edge habitat within a continuous forest habitat primarily for the benefit of Ruffed Grouse, American Woodcock, black bear and white-tailed deer. These openings are very similar to the smaller grassland units mentioned above and are slightly smaller in size. The openings were typically placed in a variety of forest types and generally centered on recently abandoned logging decks and ranged in size from 1 to 3 acres with an irregular shape. In most cases, these openings represent a "hard edge" or transition from grass to forest without much woody vegetation within the opening itself.

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

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

Strategies

1. Convert small forest openings within the forest through reforestation or natural succession based upon site characteristics such as soil type, drainage, surrounding habitat types, etc.

Enhancing habitat through a prescribed burn. Photo Credit: FWS

2. If tree planting is implemented, use soil maps and other references such as the Minnesota's Native Plant Communities guide and Kotar's habitat typing manual to determine the most suitable forest habitat type and associated successional pathways and natural disturbances

Objective 2.4. Food Plots

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

Rationale

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

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

Strategies

1. Restore the North Chippewa fields to forest cover types utilizing the Native Plant Communities handbook for guidance

2. Maintain the Blackbird Auto-tour site as a watchable wildlife area (food plot)

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

Increase dominance of upland conifer (particularly red, white and jack pine but also white spruce and balsam fir to some extent), by increasing both acreage (plus 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. Note: Overall changes of major habitat types will be reflected as an increase in acres for upland conifer (red, white, and jack pine) and mixed upland forest (ie: aspen/pine, forested broadleaf/coniferous mix, aspen/birch/fir/spruce, etc.) and a decrease in acres for upland deciduous (aspen, northern hardwoods, basswood, oak, forested broadleaf mix, etc.).

Rationale

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

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

Opportunities exist to allow some of the other habitat (cover) types to convert to red, white or jack pine dominated communities either naturally or through silvicultural practices. Additional opportunities exist for planting pine, such as abandoned agriculture fields and upland grassland slated for conversion to forest. Since upland conifer historically occurred as a component within other habitat types (hardwood-dominated stands), opportunities also exist for enhancing the structural diversity

American Woodcock. Photo Credit: FWS

within these hardwood stands by increasing the white pine, red pine, white spruce and balsam fir component (basal area) through creation of canopy gaps and understory planting (particularly where seed trees exist). Many of the remaining jack pine forests on the Refuge have become closed jack pine systems versus the jack pine barrens that once existed. In the case of the jack pine barrens, infrequent fire occurrences have altered this community type and succession has been allowed to occur. Therefore, the Refuge staff intends to restore the jack pine barren community and its associated disturbance regime where feasible. In any of these situations, landscape juxtaposition, soil type, moisture, and the nutrient regime should be conducive to these conifers prior to any management effort or treatment. Red, white and jack pine compete best on outwash or glacial moraines where soils are sandy and gravely, moisture regimes are dry to dry mesic and the nutrient regime is poor to medium.

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

Strategies:

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

Objective 2.6. Upland Deciduous Forest

Over the next 15 years, increase upland deciduous forest by 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 Towhee, etc., as well as other forest interior species such as Red-eyed Vireo, Ovenbird, etc.

Rationale

The hardwood cover types of upland deciduous forest are much more abundant on the Refuge and throughout the Pine Moraines and Outwash Plains of northern Minnesota, than was historically present. The aspen cover type is approximately 40 percent more abundant on the Refuge (plus 40 percent) compared to pre-settlement times, whereas the proportion of hardwoods (basswood, maple, oak, etc.) has dramatically increased (plus 244 percent) from pre-settlement times. In terms of the dominant cover type, the northern hardwood cover type may not have changed as significantly in acreage estimates as the dry oak forests (which are located in the central portion of the Refuge) has. However, the structural diversity has changed significantly within the northern hardwood cover type through previous silvicultural practices.

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

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

Species comprising the oak cover type include burr oak, red oak, and northern pin oak. Most of these stands (with the exception of red oak) occur on dry sandy soils that historically supported jack and red pine and due to fire suppression have slowly succeeded to mixed oak/jack pine or oak dominated forest. Therefore, some mixed oak-jack pine sites will be converted to jack pine barrens by removing the oak component and thinning the jack pine to low stocking densities. These habitat types were historically fire dependent systems with a rotation of mild surface fires of about 22-30 years. Under this strategy, prescribed fire would be re-introduced into the system to manage early successional jack pine barrens which could provide nesting habitat for upland nesting waterfowl and passerines. Since red oak is an under-represented species throughout the Refuge, red oak stands will be maintained where they exist and the red oak component will be increased within the northern hardwood cover types.

Strategies

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

Objective 2.7. Mixed Upland Forest

Increase acreage (plus 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.

Rationale

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

Strategies

1. Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
2. Maintain and promote structural and compositional diversity where it currently exists in mixed upland forests, including coarse woody debris and snags.
3. Transition some later age-classes of aspen stands to mixed upland forest habitat types through silvicultural practices and understory tree planting.
4. Use prescribed fire where and when appropriate.
5. Retain snags and cavity trees to insure a continuous supply of natural cavities wood ducks, hooded mergansers, and other cavity nesting birds.

Objective 2.8. Lowland Conifer

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

Rationale

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

Strategies

1. Use the Minnesota Ecological Classification System (ESC) framework and the native plant community field guide to understand the successional pathways and natural disturbance regimes associated with native plant communities and to guide management decisions that emulate natural disturbance regimes and patterns.
2. Restoring the natural hydrology associated with these communities, where and when feasible
3. Management techniques should emulate natural disturbance regimes and patterns
4. Promote research or investigation to determine the hydrological impacts of Refuge roads and other facilities (ie: water control structures) on lowland conifer habitats

Objective 2.9. Lowland Deciduous

Maintain acreage of lowland deciduous (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.

Rationale

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

Strategies

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

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.

Rationale

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

Strategies

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

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 (1,815 acres) for the benefit of shrub/shrub wetland dependent species, including Region 3 Conservation Priority Species such as the American Bittern, American Woodcock, Golden-winged Warbler and Black-billed Cuckoo as well as numerous species in greatest conservation need.

Drake Wood Duck. Photo Credit: FWS

Rationale

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

Strategies

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

Objective 2.12. Marsh/Wetland

Increase this habitat type by 716 acres (11 percent) from 2009 levels (6,248 acres) by converting the lowland brush habitat type for the benefit of wetland dependent species, including Region 3 Conservation Priority Species such as the American Bittern, Northern Harrier, Forster's Tern, Black Tern Sedge Wren, Yellow Rail, Le Conte's Sparrow and Nelson's Sharp-tailed Sparrow.

Rationale

Many of the Refuge's low-lying sites (primarily former sedge fens dominated by Carex and other graminoid species) have transitioned or succeeded to lowland shrub, which although has value to wildlife, is not a habitat that is regionally scarce like sedge meadows. Much of this transition can be attributed to fire suppression within these wetland habitat types that are characterized by emergent vegetation. Sedge meadows constituted more than three-quarters of Minnesota's original wetlands and were indispensible habitat for plants like lilies, irises and native orchids. Furthermore, non-forested wetland habitat ranks the highest in regard to species richness or total number of species using this habitat within the Pine Moraines and Outwash Plains subsection (CWCS 2006).

Strategies

1. The management of water levels on the Refuge will follow one of three management strategies: 1) no water level manipulation, 2) removal of problem beaver dams as necessary and 3) active water level manipulation.
2. Actively managed water levels via water control structures at Dry, Lost, Ogemash and Chippewa Lakes.
3. Establish a benchmark (where not previously identified) for all identified lakes so that water levels can be referenced from year-to-year.
4. Complete a comprehensive hydrological assessment to assess water flow, water quality and water capability of all major wetland areas (lakes and rivers).
5. Complete a comprehensive survey of Refuge wetlands by mapping all aquatic resources, including wooded potholes, drainage systems and other hydrologic features.
6. Use prescribed fire to maintain open sedge meadows for benefit of wetland dependent birds such as yellow rails and American bitterns.
7. Explore opportunities for controlling cattail in specified wetlands through physical removal and/or minimal chemical treatments.
8. Examine any potential sedimentation build-up at water control structures and explore opportunities for removal.
9. Document ECS native plant community habitat types for all aquatic habitats.
10. Restore wetlands and emulate natural hydrologic regimes where possible.

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

11. Use the water level management database which is being developed by the USFWS Biological Monitoring Team.

Objective 2.13. Open Water

Maintain the open water (lacustrine) habitat type (7,116 acres) based on 2009 levels for the long-term sustainability of wild rice and other native aquatic plants by emulating natural hydrological regimes and maintaining and/or restoring water quality where feasible for the benefit Region 3 Conservation Priority Species such as the Bald Eagle, Common Loon, Trumpeter Swan, Mallard, Blue-winged Teal, Wood Duck and Lesser Scaup.

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

Rationale

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

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

Strategies

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

Objective 2.14. Invasive Species

By 2025, reduce the area infested with target invasive plants (e.g., purple loosestrife, leafy spurge, spotted knapweed, thistle species, etc.)

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

and animals by 50 percent from the documented 2005 level and rapidly respond an where possible control new infestations of these and other highly invasive species as they occur.

Rationale

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

Invasive species management on the Refuge in the future will focus on early detection and rapid response, essentially meaning complete control and eradication of new infestations or satellite areas followed by control of large, central infestations. Subsequent to complete eradication of invasive species, the goal for invasive species management on the Refuge is to promote biological control agents as primary treatment and reduce the dependency of chemical applications.

Strategies

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

Goal 3: People

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

Objective 3.1. Hunting

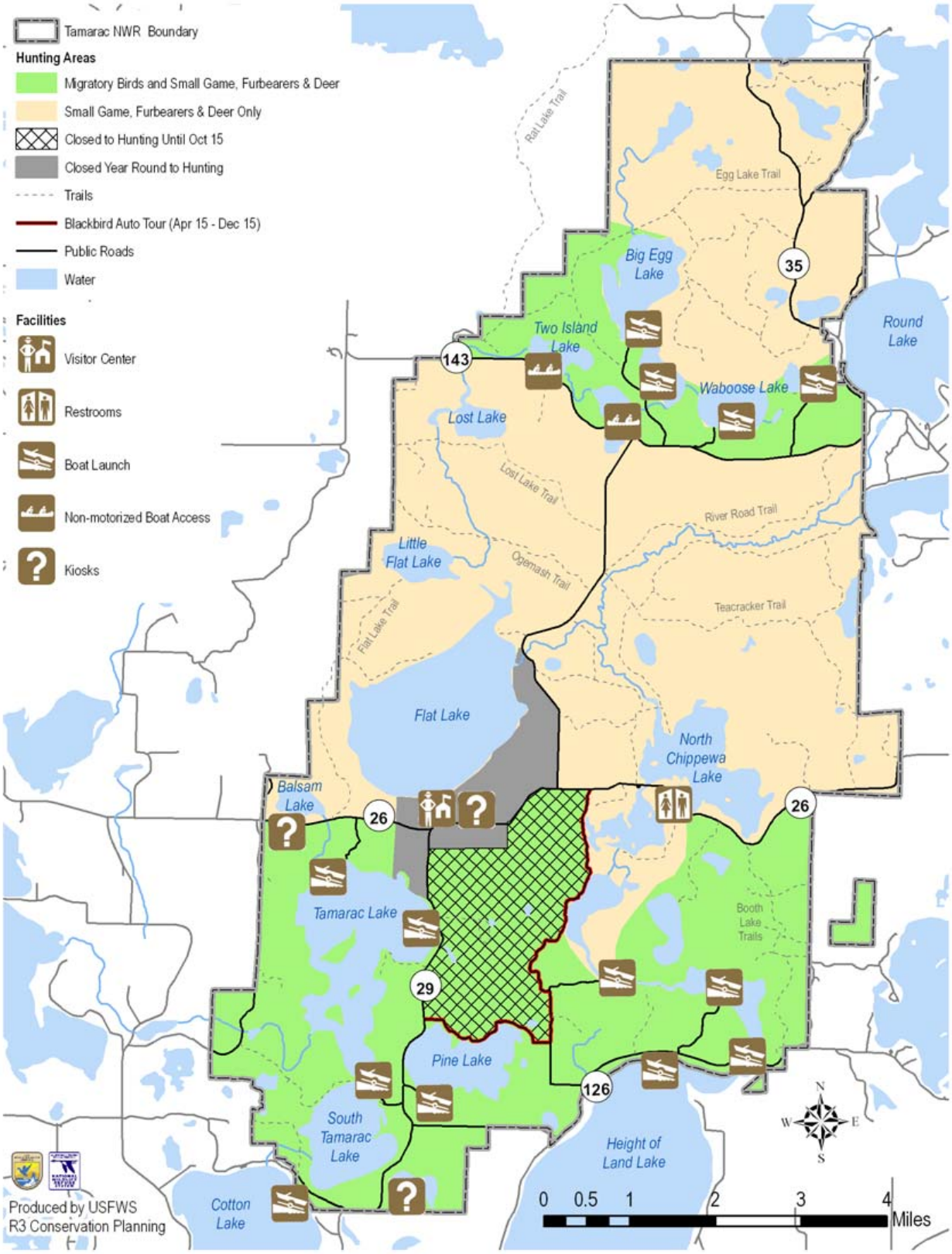
Annually, provide no less than 7,000 quality hunting experiences on the Refuge. Seventy-five percent of hunters will report no conflicts with other users, a reasonable harvest opportunity and satisfaction with the overall experience.

Rationale

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

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

Figure 15: Hunting Areas on Tamarac NWR



Strategies

1. Continue annual small game hunting opportunities (grouse, woodcock, snipe, rabbit, hare, squirrel).
2. Continue waterfowl hunting opportunities.
3. Continue annual firearms, muzzleloader and archery white-tailed deer hunting opportunities.
4. Explore assisted/contracted accessible hunts during regular seasons in open hunting areas.
5. Consider wild turkey accessible hunts on southern portion of the Refuge.
6. Designate Rice, Johnson and as open to hunting, but only primitive boat access will be maintained. This will protect the wild rice resource and minimize resources impacted by improved access.
7. Maintain Two Island Lake as open to hunting with a primitive access.
8. Improve hunter safety including deer drive safety, and the perception of safety of non-hunters, by providing new educational materials and events (brochures, signage, programs).
9. Develop operational definition of success and measures for hunting through a survey of hunter satisfaction.
10. Enhance public understanding of Refuge hunting opportunities by increasing the quality of maps, signs and wording within brochures and on the Refuge web page.

Hunters track down that trophy deer. Photo Credit: FWS

11. Hire a full-time law enforcement office to share duties on the Refuge and District.
12. Establish hunter and vehicle counts, through staff and volunteers, at all hunting access points to gain an index on hunting pressure and collect additional hunting data.

Objective 3.2. 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.

Rationale

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

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

Strategies

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

Objective 3.3: Wildlife Observation and Photography

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

Rationale

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

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

Strategies

1. Maintain 5-mile Blackbird Auto Tour Route.
2. Make the complete Blackbird Auto Tour Route one way traffic.
3. Continue annual amateur photo contest in cooperation with the Refuge friends group, Tamarac Interpretive Association.
4. Improve South Tamarac Lake area for wildlife observation.
5. Open the closed area south of County Road 26 (keep it closed to hunting) and create a primitive hiking trail that merges with the North Country Trail.
6. Develop an all-season hiking trail from the Tamarac Lake ski trail.
7. Develop accessible trail and observation area at Chippewa site.
8. Promote birding on the Refuge through promotion of the Pine to Prairie Birding Trail which includes wildlife observation on the Refuge, birding festival and publications.
9. Modify the Refuge web site to include current and accurate information about wildlife observations and opportunities available to the public. Link the Refuge web site to other important wildlife observation web sites.
10. Maintain 5 miles of hiking trails.
11. Maintain 8 miles of groomed ski trails.
12. Maintain viewing platforms with scopes and interpretive panels.
13. Provide guided photo opportunities and/or workshops.
14. Develop operational definition of success and measures for wildlife observation. and photography through a survey of visitor satisfaction.
15. In cooperation with the Tamarac Interpretive Association, maintain quality interpretive and educational materials offered for sale in the Tamarac Wildlife Gifts and Bookshop that enhance wildlife watching.
16. Work with local units of government on the development of regional trails that link to the Refuge.
17. Promote undisturbed and undeveloped shorelines.
18. Add a restroom facility at Pine Lakes ski trail parking lot.

Objective 3.4. Interpretation

Annually provide no fewer 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.

Rationale

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

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

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

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

Strategies

1. Continue to provide interpretive programs, events, festivals, tours for Refuge visitors, with a message that emphasizes habitat diversity, natural patterns and processes, and wildlife management.
2. Conduct at least two special events, 8-12 Refuge tours, and 12-24 programs on-site to interpret the Refuge, its habitat diversity, natural patterns and processes, and wildlife management.
3. Add interpretive panels to the Old Indian Trail.
4. Train volunteers to provide Refuge tours.
5. Maintain and update interpretive signs/panels on nature trail and viewing platforms.
6. Provide and maintain kiosks that orient visitors and help interpret habitats, wildlife, management, and regulations (Figure 16 on page 77).
7. Replace dated Refuge orientation slide show to new video format and offer a variety of wildlife-related videos for the visiting public.
8. Update Visitor Center Exhibits to enhance the overall message of the visitor center to reflect the biology of the Refuge including the latest research activities.
9. Develop operational definition of success and measures for interpretation through a survey of visitor satisfaction.

Objective 3.5. Environmental Education

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

Rationale: Tamarac NWR has an expanding environmental education program. Since 2005 the environmental education contacts on the Refuge have tripled. In 2009, 5,605 onsite environmental education visits by school groups occurred on the Refuge. The Refuge routinely turns away school groups due to the lack of staff available to conduct environmental education activities. The Refuge currently has two staff to handle all responsibilities of the visitor services program, including promoting and conducting environmental education, interpretation and volunteer management. See Figure 16 and Figure 17 on page 78 for an overview of future visitor facilities.

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

Strategies

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

Objective 3.6. 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

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

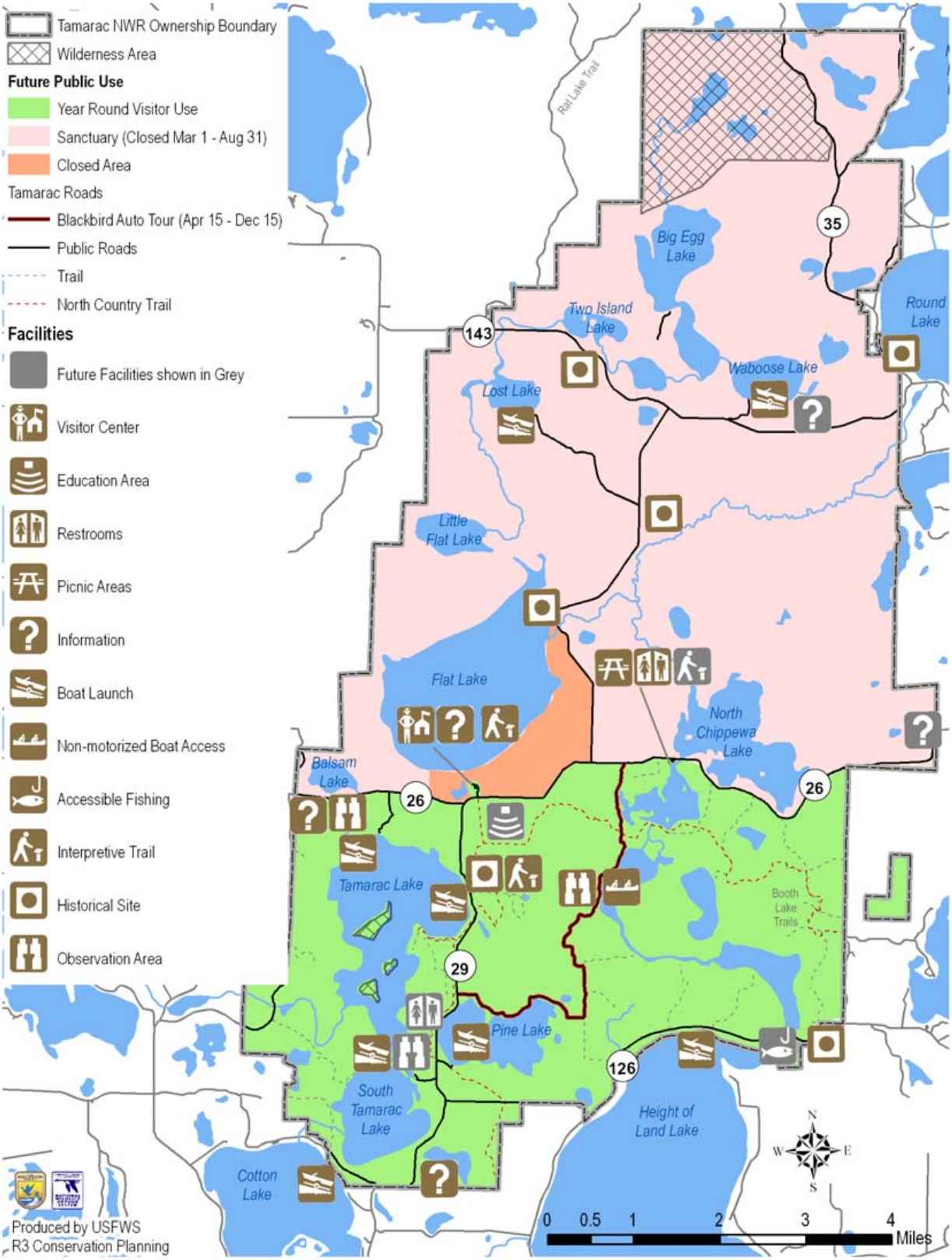
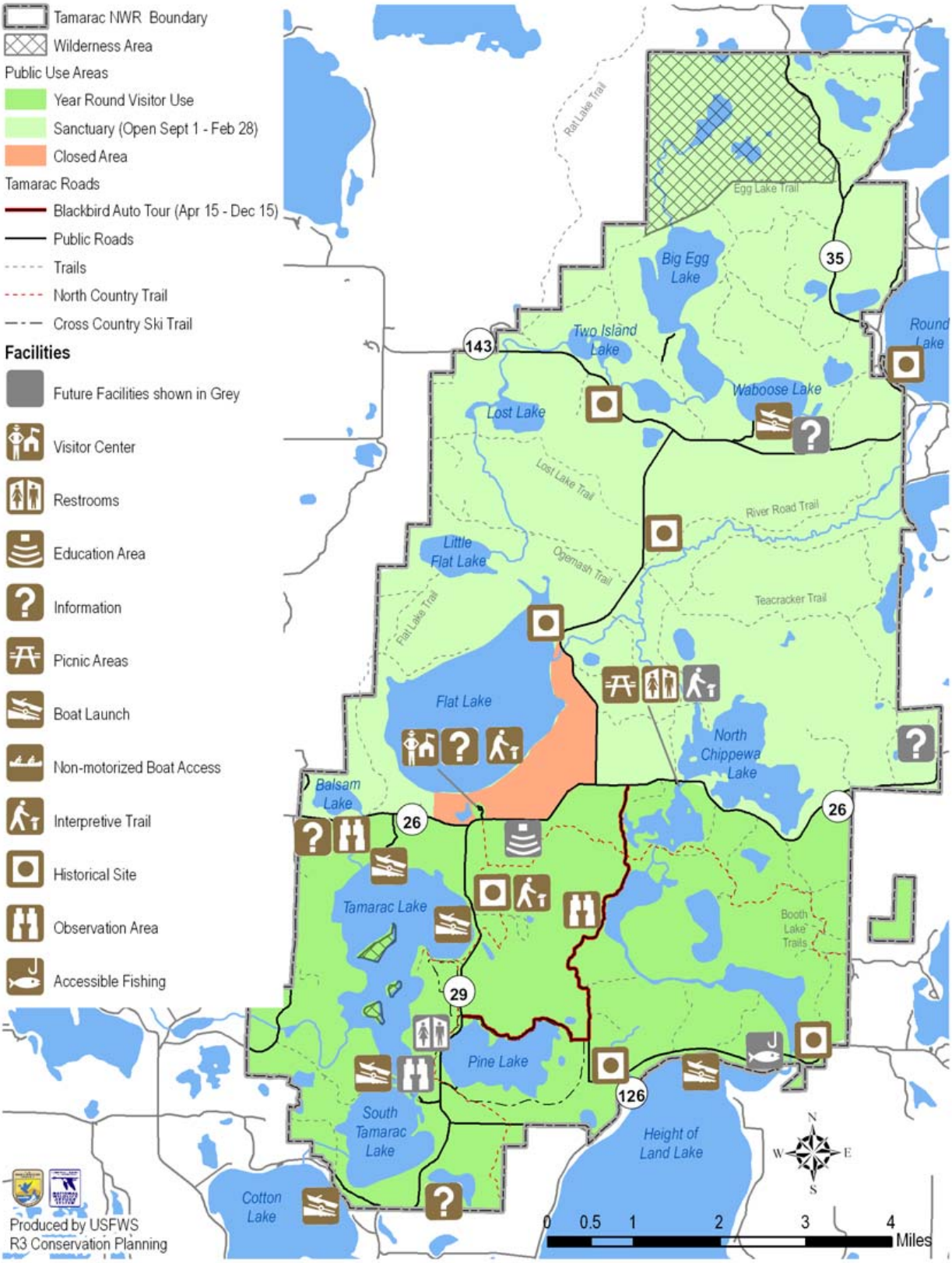


Figure 17: Future Visitor Services Facilities – Fall and Winter, Tamarac NWR



Improvement Act of 1997. All public access and secondary uses must be compatible with the mission of the Refuge.

Rationale

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

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

Strategies

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

Objective 3.7 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.

Rationale

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

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

Strategies

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

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.

Rationale

Cultural resources are an important facet of the country's heritage. Tamarac NWR, like all national wildlife refuges, remains committed to preserving archeological and historic sites against degradation, looting, and other adverse impacts. The guiding principle for management derives from the National Historic Preservation Act of 1966 as amended, 16 U.S.C. 470 et seq. and the Archeological Resources

Protection Act of 1979 as amended, 16 U.S.C. 47011-mm, which establish legal mandates and protection against identifying sites for the public, etc. The Refuge must ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. It is also essential that new site discoveries are documented. In order to meet these responsibilities, the Refuge intends to maintain an open dialogue with the Regional Historic Preservation Officer (RHPO) and to provide the RHPO with information about new archeological site discoveries. The Refuge will also cooperate with federal, state, and local agencies, American Indian tribes, and the public in managing cultural resources on the Refuge.

Strategies

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

Objective 3.9. American Indian Cultural Practices

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

Rationale

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

Strategies

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

Chapter 5: Plan Implementation

New and Existing Projects

This CCP outlines an ambitious course of action for the future management of Tamarac NWR and Wetland District. The ability to enhance wildlife habitats and to maintain existing and develop additional quality public use facilities will require a significant commitment of staff and funding from the Service. The Refuge and District will continually need appropriate operational and maintenance funding to implement the objectives in this plan.

This section provides a brief description of the highest priority Tamarac NWR and Wetland Management District projects as chosen by the Refuge staff.

Tamarac NWR Operating Needs and Visitor Facility Enhancement Projects

Enhance Environmental Education and Interpretive Capacity and Capability

Construction of an environmental education facility will serve more than 10 rural Minnesota communities where interaction with environmental science institutions is limited. Teachers, volunteers and Refuge staff are engaged and ready to expand the educational opportunities at Tamarac NWR, but need a facility for students to process their observations and include children of all learning and physical abilities.

Each year children from more than 10 rural school districts participate in environmental education and stewardship projects on the Refuge. As a partner with educational institutions, Tamarac NWR ensures these school programs adhere to national science standards and graduation standards as set forth by the Minnesota Department of Education. The programs have become so popular with local schools that capacity has been exceeded. The small visitor center on site can only host between 25 and 50 children and there are no facilities for conducting meaningful hands-on activities including laboratory projects or specimen examination. A typical school field trip includes 100-150 children or the whole grade at that school. The pavilion would be utilized in conjunction with the visitor center, 25 miles of trails and natural resources of the 43,000 acre Refuge to provide learning stations for the full grade of students at the school. A pavilion would provide the space for these investigative activities that bring a deeper understanding to the science they are exploring.

Installing a boat launch pad at Tamarac NWR. Photo Credit: FWS

There is growing concern that members of the public will be unprepared for increasing environmental responsibilities in the coming years. As environmental issues and programs become more complex and pervasive we need to nurture our youth for the challenge. Connecting children and nature develops an environmentally literate community able to make decisions about the environment based on science and contribute as stewards of our federal lands. Additionally, research shows that children's learning capabilities are heightened when placed in an outdoor educational environment. The outdoor experential learning environment stimulates creative thinking, promotes superior motor fitness, improves problem solving skills and increases self-esteem and happiness.

Estimated Cost - $500,000. Strategy 3.5.7

Provide Public Safety, Security and Resource Protection Through Increased Law Enforcement Capability

Hire a full-time law enforcement officer to protect wildlife, lands, facilities, employees and the general public on the 43,000-acre Tamarac NWR. Currently the station has one dual function officer. Directors Order No. 155 requires the Service to reduce dependency on dual-function Refuge officers and progress towards a full-time officer workforce. A full-time officer would be able to do more regular and intensive law enforcement on the Refuge and Wetland Management District throughout the year. The Refuge is responsible for managing and monitoring easements throughout a five county District extending from Tamarac NWR north to the Canadian border, distance of approximately 175 miles. Tamarac NWR has experienced a steady increase in public use and recreation and is now exceeding 85,000 visitors annually. Hunting violations, off-road vehicle use, littering and traffic violations are increasing on Refuge lands. Additionally, the population growth in the surrounding communities is placing additional strain on wildlife habitats and trust resources. A full-time officer would be able to better build more cooperative relationships with neighboring enforcement agencies. Half of Tamarac NWR is within the original boundary of the White Earth Indian Reservation. This officer would include the enforcement of all fishing, hunting and non-consumptive use regulations as well as coordinating/enforcing leeching, ricing, and trapping rights exercised by members of the White Earth Indian Reservation. This would require close coordination with Tribal Conservation Officers and Police.

Estimated Cost – $150,000. Strategies 3.1.11(Refuge) and 3.2.2 (District)

Develop Strategic Forest Management Program

Hire a full-time Forest Ecologist to develop a forestry program that is ecologically, economically, and socially responsible as a means of sustaining the integrity of Tamarac NWR's forest ecosystems and the human communities dependent upon them. This individual would develop management plans to ensure the restoration, preservation, protection and enhancement of the Refuge forest resources. The individual would perform systematic forest surveys and inventories, conduct site evaluations, and oversee forest regeneration activities. In the early 1890s loggers harvested most of the area's giant red and white pines. Settlers followed the loggers. Attempts to farm met with little success due to marginal soils, many wetlands and dense forests. These activities dramatically changed the landscape. This is a key position to ensuring the biological integrity of Tamarac NWR's forest resources.

Estimated Cost - $120,000. Strategy 2.5.1

Develop a New Audiovisual Program at Tamarac NWR Visitor Center

Develop a new audiovisual program for use as an interpretive tool in the visitor center auditorium using state of the art equipment and technical expertise. The Refuge's current audiovisual program is nearly 25 years old and does not accurately depict Service or Refuge information including its biological programs. The audiovisual program is unquestionably the highlight of the Visitor Center experience and serves as an extremely important interpretive and education tool. Approximately 85,000 people visit the Refuge each year to enjoy the scenic beauty and abundant wildlife including Trumpeter Swans, Bald Eagles and wolves.

Estimated Cost - $120,000. Strategy 3.4.7

Update Visitor Center Exhibits

Enhance the overall message of the visitor center to reflect the biology of the Refuge including the latest research activities. The current visitor center exhibits highlight Tamarac NWR's wildlife species and their habitats but do not interpret the management, research and ongoing programs associated with them. Through the collection and display of video and interactive exhibits incorporating the latest technology, visitors will gain a better understanding and appreciation of Tamarac NWR's role in fulfilling the mission of the Service. Annually Tamarac NWR's visitation exceeds 85,000. The Refuge is situated at the convergence of three continental biomes – tall grass prairie, eastern deciduous and boreal forests, offering tremendous opportunity to view a diversity of wildlife and habitats. Visitors are attracted not only locally, but from North Dakota-Minnesota metropolitan communities of Fargo and Moorhead located 50 miles west. The estimated metropolitan population is 200,000.

Estimated Cost - $60,000. Strategy 3.4.8

Hydrological Geomorphic (HGM) Assessment of Tamarac NWR Lakes and Rivers

Conduct a comprehensive hydro-geomorphic assessment of the lakes and streams of Tamarac NWR. Since Refuge establishment in 1938, the aquatic ecosystems within the Refuge have been altered through water control structures, dikes and road construction. This assessment would evaluate ecosystem restoration and management options by comparing historic conditions to present-day conditions. Through this assessment the structure, function and ecological processes that are needed to restore the wetland communities would be identified, as well as the limitations of restoration management. Tamarac NWR sits at the top of two watersheds that flow into the Red River of the

North. This information would also provide valuable data for use in the Red River Valley Flood Management planning efforts.

Estimated cost - $80,000. Strategy 2.12.4

Aquatic Resources and Water Quality Investigation

Hire a seasonal biological technician. Tamarac NWR is situated at or near the top of two major watershed (Buffalo and Ottertail) within Minnesota; therefore, most people presume that water quality remains in pristine condition. However, a baseline water quality survey conducted by the Minnesota Pollution Control Agency recommended that several lakes be included on the "impaired waters" list (303d list), although further data would be needed to complete an assessment of the lakes. There are 21 natural lakes and three rivers within the Refuge, yet little is known about the ecology and water quality of these habitats, nor how these aspects affect trust resources. The project would support multiples studies, surveys and investigations that would collect information on biotic and abiotic resources of these systems, including aquatic vegetation, invertebrates, fish, waterbirds and water quality, all of which would be used to measure long term changes in aquatic systems.

Estimated cost - $88,000. Strategy 2.12.4

Climate Change Adaptations for Biodiversity Conservation at Tamarac NWR

Tamarac NWR's location at the convergence of three major biomes (boreal forest, eastern deciduous forest and tall grass prairie) make it well suited for studying the impacts of climate change and identifying options for land managers to mitigate negative impacts. Implement a long-term, adaptive management driven monitoring program of upland and wetland plant communities, as well as the fauna of these communities. Habitat management activities will be tailored to adaptation actions such as resistance, resilience and facilitation strategies promoting native plant communities in the face of a changing climate. Emphasis will be placed on, but not limited to, the long-term viability of upland conifers and wild rice wetland systems. Additionally, interpretive programs will be developed for delivery on the Refuge showcasing the significance of climate change on Refuge resources. Interpretive signs and/or other medium such as brochures will be developed.

Estimated costs: $100,000 Strategy 2.2.5

Wetland Management District Operating Needs Projects

Enhance Wetland Management District

Hire one full-time wetland district manager to plan, organize, and implement management actions and provide oversight on 45 conservation easements within the Refuge's five-county Management District. This position would engage, coordinate, and partner with state and local government officials and conservation interest groups to further the Service's conservation mission, including future acquisitions of fee title and easements. Oversight of a vigorous and successful Partners for Fish and Wildlife Program, including supervision of the private lands biologist, would also be the responsibility of this position. There is currently no staffing on the five-county – 6,500,000 acre management district and active management and partnership development has been limited. Natural resource deterioration, habitat fragmentation, and lost community partnership opportunities will continue to occur without active management involvement.

Estimated cost: $120,000. WMD Strategy 1.3.1

Survey FSA Easements

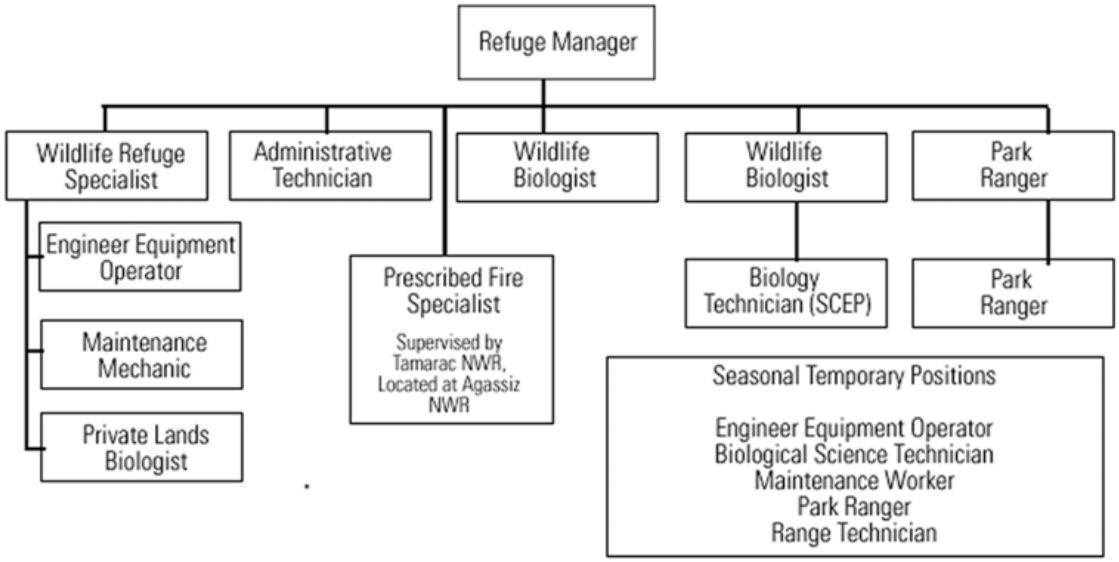
Survey the boundaries of the 14 FSA (formerly FmHA) easements on Tamarac WMD. Most of the FSA easements were not sufficiently surveyed when the Service acquired the management responsibilities and are in need of resurvey. In addition, some easements were not surveyed at all. Consequently, law enforcement operations are jeapordized and valuable habitats threatened. Landowners do not have accurate knowledge of the boundaries of these easements and in many cases are altering the protected habitats. Without clear documentation of the easement boundary, law enforcement does not have a defensible case in court.

Estimated cost - $126,000. WMD Strategy 1.2.3

Future Staffing Requirements

Implementing the vision set forth in this CCP will require changes in the organizational structure of the Refuge and District. Existing staff will direct their time and energy in new directions and new staff members will be added to assist in these areas. The following are organizational charts and tables of the current staff of the Refuge and District, Fiscal Year 2010, as well as staff needed to fully implement this plan by Fiscal Year 2025 (Figure 18 and Table 6 on page 84).

Figure 18: Current Staffing Chart (2010), Tamarac NWR and WMD



Step-down Management Plans

Step-down management plans describe specific actions that support the accomplishment of Refuge and District objectives. The management plans identified in Table 7 will be reviewed, revised, or developed as necessary to achieve the results anticipated in this draft CCP.

Partnership Opportunities

Partnerships have become an essential element for the successful accomplishment of Tamarac NWR and WMD goals, objectives, and strategies. The objectives outlined in this draft CCP need the support and the partnerships of federal, state and local agencies, non-governmental organizations and individual citizens. This broad-based approach to managing fish and wildlife resources extends beyond social and political boundaries and requires a foundation of support from many. Tamarac NWR and WMD will continue to seek creative partnership opportunities to achieve its vision for the future.

Notable existing partners include the Tamarac Interpretive Association, Minnesota Department of Natural Resources, University of Minnesota, Natural Innovations, RMB Laboratories, and Ducks Unlimited.

Table 6: New Staff Required to Fully Implement the CCP by 2025, Tamarac NWR and WMD

Position	FTEs
Law Enforcement Officer	1.0
Forest Ecologist	1.0
Wetland Management District Manager	1.0
Total	3.0

Wilderness Review

We reviewed Refuge lands outside of the designated wilderness area for suitability as additional wilderness. This evaluation is presented within Chapter 3. No additional lands were found suitable for designation as wilderness as defined in the Wilderness Act of 1964.

Monitoring and Evaluation

The direction set forth in this CCP and specifically identified strategies and projects will be monitored throughout the life of this plan. On a periodic basis, the Regional Office will assemble a station review team whose purpose will be to visit Tamarac NWR and the Wetland Management District and

Table 7: Step-down Management Plan Schedule, Tamarac NWR

Step-down Management Plan	Plan Completed/ Updated	Anticipated Revision
Wilderness Management Plan	1987	2012
Visitor Services Plan	X	2012
Hunting Plan	1990	2013
Law Enforcement Plan	1984	2012
Furbearer Management & Trapping Plans	1994	2011 Tamarac Habitat Management Plan
Marsh & Water Management Plan	1992	
Forest Management Plan	1994	
Grassland Management Plan	1990	
Wildlife Inventory Plan	1992	
Fisheries Management Plan	1991	
Fire Management Plan	2001	2010
Cultural Resources Management Plan	X	2016
Safety Plan	2009	2012
Disease Control Plan	1987	2017

evaluate current Refuge activities in light of this plan. The team will review all aspects of Refuge management, including direction, accomplishments and funding. The goals and objectives presented in this CCP will provide the baseline from which this field station will be evaluated.

Plan Review and Revision

The CCP for Tamarac NWR and the Wetland Management District is meant to provide guidance to Refuge managers and staff over the next 15 years. However, the CCP is also a dynamic and flexible document and several of these strategies contained in this plan are subject to such things as drought, floods, windstorms and other uncontrollable events. Likewise, many of the strategies are dependent upon Service funding for staff and projects. Because of all these factors, the recommendations in the CCP will be reviewed periodically and, if necessary, revised to meet new circumstances.

Chapter 6: Tamarac Wetland Management District

Introduction and Background

The Tamarac Wetland Management District (Tamarac WMD), established in 1987, stretches over 10,600 square miles in Beltrami, Cass, Clearwater, Hubbard and Koochiching Counties (Figure 19 on page 87). The Tamarac WMD is responsible for administering 8,908 acres of wetland and conservation easements distributed throughout these five north central Minnesota counties. The Tamarac WMD is one of eight wetland management districts within Minnesota (Figure 19 on page 80). In addition to easement enforcement and management activities, Tamarac WMD personnel also perform consultation roles for Farm Service Agency (FSA) Farm Bill programs, restore wetlands on private lands, and render technical assistance to landowners who desire to enhance wildlife habitat on their property. As the Tamarac WMD possesses no land in fee title, it presents the paramount challenge of working effectively with private landowners to achieve Service and District goals.

District Purposes

Tamarac Wetland Management District was established in 1987…

- "... as Waterfowl Production Areas" subject to "... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c)

District Vision

Tamarac Wetland Management District is a picturesque canvas of a natural landscape transitioning from boreal peatlands to mixed forests of aspen, birch and pine. This diverse landscape affords the District unique opportunities to develop innovative partnerships centered on habitat restoration and water quality improvements. The District working with landowners and partners will strive to maintain healthy ecological systems providing habitat continuity beyond boundaries to support a diversity of wildlife. The District will serve as a model of land stewardship and restoration practices while providing demonstration sites for scientifically proven wildlife and natural resource conservation techniques.

Red fox kits. Photo Credit: FWS

Planning Background

Issues and alternatives were developed for the Tamarac WMD in tandem with Tamarac NWR. For a complete description of the process, please see Chapter 2 of the Draft CCP. The issues identified related to the WMD are:

- Land Acquisition
- Partners for Fish & Wildlife Program
- Habitat Restoration Direction
- Invasive Plants
- Management Emphasis

District Environment and Current Management

District Environment

The landscape of the Tamarac WMD is comparable to Tamarac NWR in many ways in that it is

Figure 19: Location of Tamarac WMD in Relation to Other FWS Lands

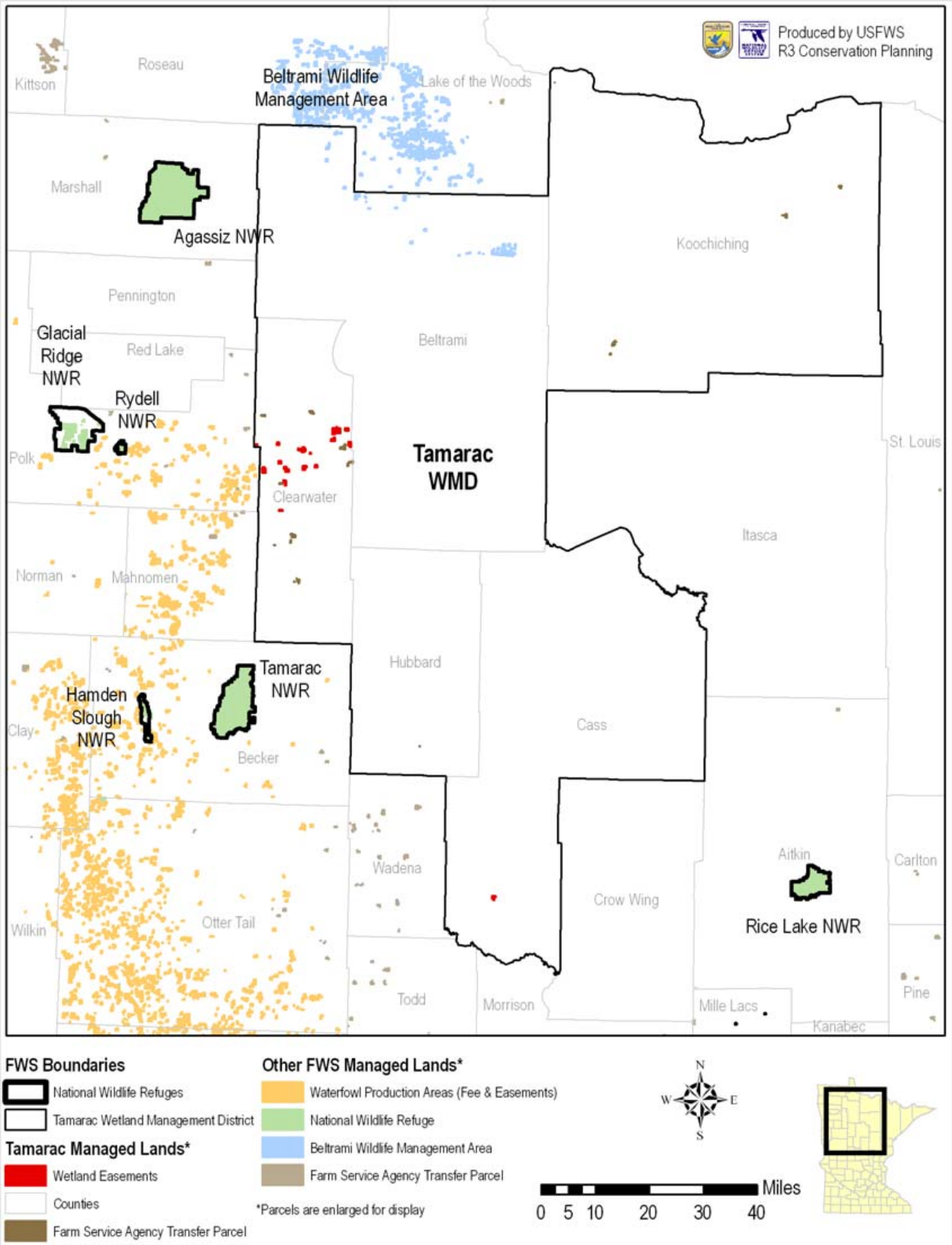
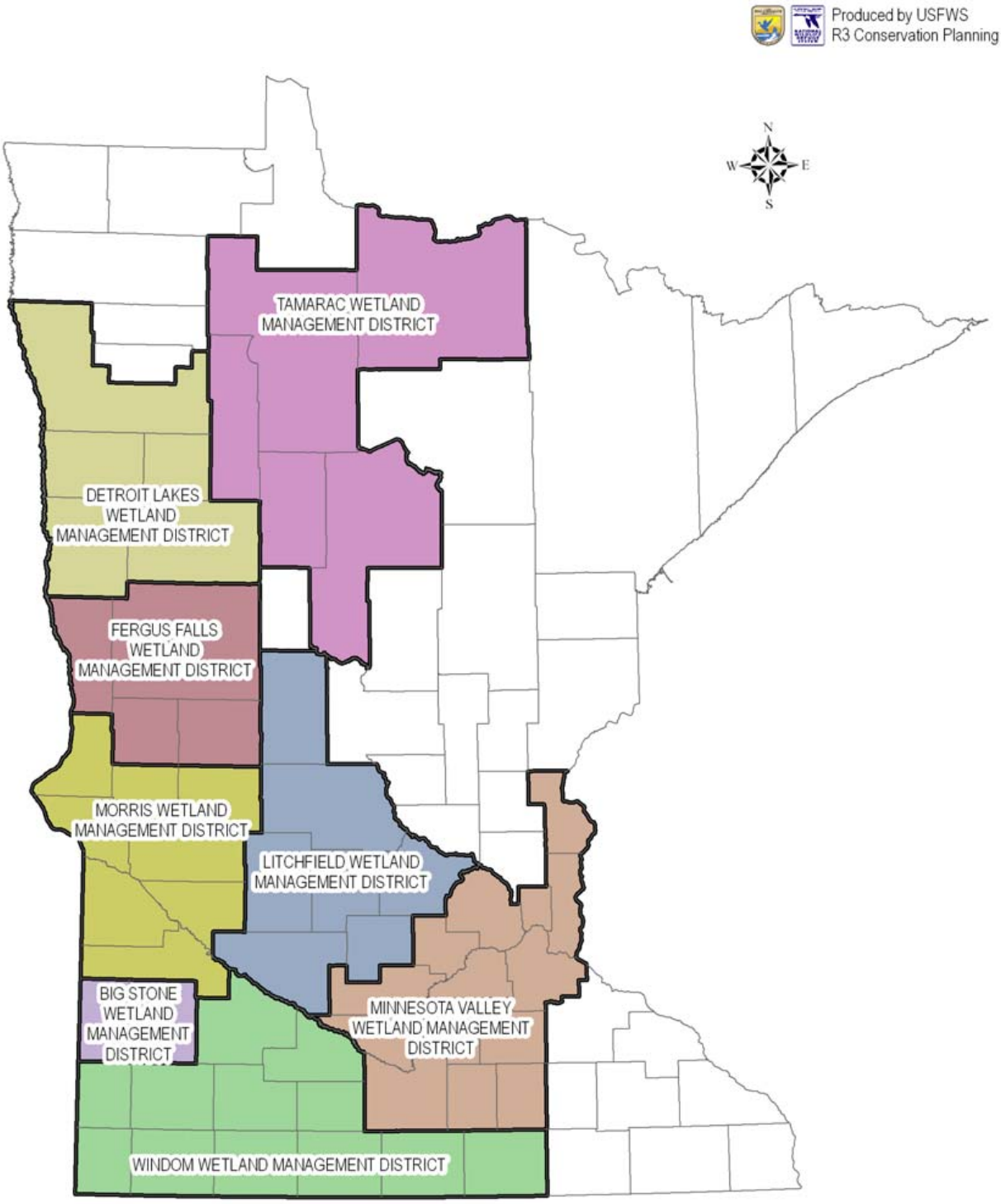


Figure 20: Overview of Wetland Management Districts in Minnesota



largely forested, sharing many of the same habitat cover types, and replete with lakes, rivers, and wetlands. The environment, however, is significantly different in a number of respects, such that it supports extensive conifer dominated peatlands, intense agricultural areas, and excessive development for recreational purpose.

The District stretches across five north central Minnesota counties, over 170 miles north to south, and 115 miles east to west. 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 portions 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 district. 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 District 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 District feeds 16 of Minnesota's 81 major surface watersheds.

A Marsh Wren sings. Photo Credit: Jim Williams

Current Wetland Management District Programs: Where We Are Today

The Tamarac WMD is nestled along the western edge of the Laurentian Mixed Forest Province in northwestern Minnesota. While no lands have been acquired in fee-title, the Tamarac WMD does manage or oversee 22 wetland easements (4,836 tract acres) and 23 former Farmers Home Administration (FmHA) inventory properties (4,072 acres) within its five-county management area.

Wetland easement tracts are legal boundary descriptions that encompass wetlands protected from draining, filling, leveling, and burning activities. Wetland easements are recorded as tract acres to account for increases in wetland surface area and to afford the Service some control over drainage activities within the tract boundary that impact easement wetlands. Former FmHA inventory properties fall into two general categories: conservation easements and deed restrictive covenants. Conservation easements protect both upland and wetland acres where the Service reserves restoration, habitat management, and enforcement rights. On deed restrictive covenants, the Service bears no management rights, but does ensure compliance with restrictive covenants and possesses the right to reenter, restore, or repossess the property upon a covenant breach.

Extensive patches of open land and thousands of wetlands pock- mark and fragment the northern hardwood and boreal forest landscape of the District. Tamarac WMD private land activities have focused principally on wetland restoration. As much as possible, wetlands have been restored to historic

A wetland restoration project gets under way. Photo Credit: FWS

water levels to regain natural hydrological functions. Upland habitat improvement projects such as grassland establishment, the development of woodland stewardship plans, and wildlife benefiting grazing systems have been confined to FmHA conservation easement lands. Woodland management plans have generally centered on managing forest stands with little emphasis on ecological plant communities and natural processes.

Habitat Restoration and Management

The Tamarac WMD has restored more than 1,100 drained wetlands over the past 20 years. The bulk of this work has occurred in Clearwater County. Valuable partnerships are periodically forged with the Minnesota DNR, the Natural Resource Conservation Service, county soil and water conservation districts, and sportsmen clubs in support of the Partners for Fish and Wildlife Program (PFW). The PFW program has been, and continues to be the essential tool to restore degraded wetland habitat, as well as key in establishing the Service's presence and priorities across this large geographic area. Former crop fields on FmHA conservation easements have been sown to low diversity stands of both native and non-native grasses and exotic forbs. These seed mixes grew fast in a variety of soil types, controlled weeds, minimized annual maintenance needs, and provide effective, although not ideal, waterfowl nesting cover. A number of grazing plans have been developed which largely limit grazing duration and intensity on easements where grazing rights are retained by the landowner. Annual grazing dates generally run July 15 to September 1 to protect nesting waterfowl and ensure adequate vegetation re-growth for winter cover needs of resident wildlife. Little forest management has occurred except on state owned FmHA easement tracts.

Wetlands

Both restored and unaltered wetlands on private and easement lands are maintained at predicted natural water levels wherever possible. In the case of restoration, this is normally achieved by installing fixed-crest water control structures. Restoration techniques most commonly employed include the construction of earthen dams or "ditch plugs", installation of corrugated metal pipe structures, and placement of riprap spillways to control human-induced surface drainage. Clemson leveler devices are sometimes embedded into earthen dams to neutralize beaver activities that over-inundate wetland basins and suppress important aquatic plant communities. Due to logistical constraints, active water level manipulation is not conducted. Allowing wetland water levels to bounce according to variable precipitation events, yields the best collective benefits for waterfowl, wading birds, reptiles, amphibians, and aquatic mammals. While used little to date, prescribed fire can play an important role in maintaining these aquatic ecosystems.

The District also participates in water quality partnerships to improve riparian and stream habitat on private lands.

Grasslands

Grassland management has been limited to FmHA easement lands and fall into two general categories: abandoned cropland and hayland that has reverted or is being maintained as tame grass and exotic broadleaf plant communities; and former agricultural fields that have been re-seeded to variable mixes of native big bluestem and switch grass, and non-native wheat grasses, birdsfoot trefoil, red clover, and alfalfa. On a few state-owned FmHA easements, more diverse stands of native grasses and forbs have been established and are maintained through the use of prescribed fire. Landowners retain limited haying and/or grazing rights on many privately owned FmHA easements, that when exercised, does offer some management benefits by repressing noxious weeds and invigorating grasses. These practices, however, are commonly carried out too long or too intensely for ideal habitat maintenance. With landowner cooperation, attempts to modify their operations with modern, science-based practices are being employed that improve wildlife habitat, but also satisfy agricultural business needs. The Tamarac WMD PFW program has not engaged in any grassland management projects on private lands to date.

Forests

During the FmHA inventory property transfer period of the 1990s, Tamarac WMD staff co-developed with USDA officials a number of woodland stewardship plans. These plans are generally single

or co-dominant species oriented and in need of revision. On state owned deed restricted easements, where the Service maintains only conservation oversight, limited select cutting for wood products has occurred. Historically, the Tamarac WMD PFW program has not actively pursued forest improvement projects on private lands, but opportunities abound for future involvement.

Wetland Management District Public Recreation, Environmental Education, and Interpretation

All lands and projects administered by the Tamarac WMD are privately or state owned. Whether under easement or a PFW agreement, landowners completely control public access and use. Landowners are permitted to enjoy wildlife-dependent recreational activities such as hunting, trapping, fishing, bird watching, and wildlife interpretation, in accordance with state regulations. While staff is not an active participant, Clearwater County conducts environmental education work-shops at a facility on the Lawrence FmHA conservation easement which they own. Their programs center on fostering good soil, water, and wildlife resource stewardship.

Wetland Management District Goals, Objectives and Strategies

Future Management Direction: Where We Want To Go Tomorrow

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

- Alternative 1: Restoration and Management of Habitat that Expands Beyond Migratory Bird Benefits by Incorporating Natural Ecological Processes Where Possible
- Alternative 2: Pre-settlement Ecological Processes
- Alternative 3: Current Management Direction (No Action)

The Environmental Assessment (Appendix A) describes and evaluates each alternative. Alternative 1 is the preferred alternative and it forms the basis for the Tamarac WMD CCP. The goals, objectives and strategies are presented on the following pages. The planning team established goals for major management areas, objectives for achieving those goals, and the specific strategies that will be employed by Tamarac WMD staff. The goals are organized into the broad categories of wildlife, habitat, and people.

Goals, Objectives and Strategies

Alternative 1: Restoration and Management of Habitat that Expands Beyond Migratory Bird Benefits by Incorporating Natural Ecological Processes Where Possible.

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

Objective 1.1

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.

Rationale

Protection and enhancement of migratory bird habitat is the primary purpose of the Tamarac WMD.

Strategies

1. Research, acquire, and incorporate existing migratory bird data from sources such as Minnesota Waterfowl Breeding Pair Counts, Breeding Bird Survey (BBS) routes, Minnesota Breeding Bird Atlas surveys, etc., into the Tamarac WMD database system. Process baseline migratory bird data and carry out priority area assessments within the Tamarac WMD to direct program actions.
2. Develop guidelines from acquired migratory bird information that will focus conservation actions and facilitate adaptive management strategies.

Restored wetlands provide resting areas for migratory waterfowl. Photo Credit: FWS

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.

Rationale

Tamarac WMD activities have focused primarily on private land habitat restoration that benefits waterfowl and other wetland dependent species. As much as possible, wetlands have been restored to natural water levels that will fluctuate in reaction to seasonal and annual precipitation variations.

Strategies

1. Use the Partners for Fish and Wildlife (PFW) and Small Wetland Acquisition Programs (SWAP) to expand restoration and protection of crucial waterfowl habitats. Emphasize habitat restoration, enhancement, and acquisition actions around core wetland complexes which may include establishing or increasing secure nesting cover to elevate migratory bird productivity.
2. Identify, prioritize, and leverage funding for wetland improvement projects through diverse and innovative partnerships with governmental agencies, conservation organizations, civic groups, and private landowners.
3. Emphasize wetland conservation work within impaired waters or high priority watersheds that collectively accrues wetlands values for wildlife, water quality, flood abatement and recreational use and compliment state, county, or watershed and conservation organization priorities.
4. Assess, prioritize, and pursue enhancement and protection of the most imperiled shallow lakes in the Tamarac WMD, particularly those supporting critical wild rice resources.
5. Map and assess drained wetland resources, ownership, and restoration opportunities, forming a comprehensive database for strategic management planning.
6. Evaluate wetlands restored through the PFW Program, pursue extensions to expired habitat development agreements, and generate new habitat restoration opportunities.
7. Working through partnerships, improve riparian and stream habitats within the District.

Objective 2.2 Wetland Management

Maintain hydrological function of wetlands, currently totaling more than 4100 acres, under easement or PFW agreements. Acreage maintenance will increase annually as additional lands are restored and preserved.

Rationale

Inspection, maintenance, and enforcement activities are crucial to maintaining wetland investments and values. Routine landowner contacts and building good relationships generate partnerships, new opportunities, natural resource stewardship, and compliance.

Strategies

1. Annually inspect all easement wetlands through aerial reconnaissance or ground checks for conservation reservation compliance. Attempt to review all restored wetlands under an active PFW agreement once every 5 years to assess restoration effectiveness, wetland condition, wildlife use, fish impacts, and agreement compliance.
2. Recognize existing or potential fish impacts to wetlands on private and easement lands, and where feasible, employ restoration techniques or existing water control structures alterations to minimize fish impacts to wetland systems.
3. Include wetland habitats in prescribed burning plans on conservation easements and highly significant private land projects where

Working with a private landowner. Photo Credit: FWS

excessive woody encroachment is degrading critical wetland habitat.

4. Carry out the incorporation of the PFW program application into the GIS database system for efficient planning and management of PFW projects and easements.

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.

Rationale

Grassland management has been limited on Tamarac WMD. Some abandoned cropland has reverted to tame grass and exotic broadleaf plant communities or has been re-seeded with low diversity mixes of native and non-native vegetation on easement lands. Where grazing and haying rights are retained by easement landowners, grassland enhancement may be the best option to provide benefits for migratory birds. There are also opportunities to establish diverse grasslands on private lands.

Strategies

1. Renovate conservation easement grasslands with diverse mixes of native grasses and forbs where other management alternatives are infeasible.
2. Use soils, historical documentation, and other information to evaluate potential sites for the establishment grasslands on private lands that will benefit wetland/grassland RCP species. Cost share assistance for grassland restoration on private lands will require a minimum block size of 40 acres and the presence of a significant wetland complex.
3. Work with landowners and the USDA to develop and implement rotational grazing systems on conservation easement and private lands that will improve the quality of grasslands and recruitment of related RCP species.

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.

Rationale

Historically, Tamarac WMD programs have concentrated on managing habitats for wetland dependent wildlife species. The District has had limited participation in forest improvement projects, however, opportunities abound to benefit forest dependent RCP species. A number of woodland stewardship plans developed for some former FmHA properties, are now out-dated and require revision.

Strategies

1. Acquire knowledge of the geographical distribution of Tamarac WMD landscape features such as basic land cover types, land use and ownership, watersheds, and other key spatial attributes to direct conservation actions.
2. Complete the development and manage the WMD- GIS database system.
3. Use Upper Midwest Great Lakes Land Conservation Cooperative and other partners to investigate, identify, and prioritize forest habitat enhancement projects that benefit RCP species viably residing within the Tamarac WMD.
4. Work with partners to develop and complete one PFW project per year that benefits early successional habitat or interior forest migratory birds of District priority.

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.

Rationale

Few FmHA conservation easements within the District possess habitat management plans and those that do are out-dated. Site-specific planning and management implementation is essential to restoring and maintaining these important conservation lands of the National Wildlife Refuge System.

Strategies

1. Conduct condition assessments of plant community attributes on conservation easements and prioritize disturbance treatment needs to recover key lost ecosystems components.
2. Implement various management actions such as prescribed burning, mowing, or shearing on conservation easements that maintain disturbance dependent habitats. Remove rock piles and other unnatural hostile predator habitat that threaten waterfowl production.
3. Where the Service only oversees a restrictive deed covenant, work closely with the easement

Wood Duck drake. Photo Credit: FWS

owners to employ habitat development and enhancement practices that compliment Service goals for RCP species.

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.

Rationale

Invasive species are considered one of the greatest threats to natural ecosystems. Executive Order 13112 – Invasive Species, dated February 3, 1999, directs Federal agencies to use relevant programs and authorities to prevent the introduction of invasive species, detect and respond rapidly to control populations of such species, monitor invasive species infestations accurately and reliably, and promote public education on these species and methods to address them. Numerous exotic plants and pathogens have been identified in the District, with many being invasive. More invasive species are predicted to arrive in the area in the future.

Strategies

1. Develop a prioritization matrix that will identify invasive species of concern and strategies to minimize impacts that degrade Tamarac WMD habitats projects.
2. Participate in county weed management cooperatives that focus on controlling the spread of invasive plants threatening priority District habitats. Advocate for the use of non-chemical methods such as biological and cultural controls.
3. Provide technical assistance to landowners who bear noxious weed control responsibilities, emphasizing non-chemical alternatives such as, mowing, grazing, use of biological agents, or the application of Service-approved low toxicity herbicides.
4. Identify and inventory invasive species on FmHA conservation easements. Employ various control or eradication methods for species that fall under Service management responsibility.
5. Employ the use of Clemson leveler devices to manage nuisance beaver activity negatively impacting wetland ecosystems, upland habitat, and personal property on easement and private lands.

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.

Rationale

As of 2010, no lands have been acquired in fee-title and no additional easements have been conveyed since the 1990s within the Tamarac WMD. There are opportunities for growth. Where critical habitat is threatened and other program options are not viable, acquisition provides an invaluable tool for perpetual protection.

Strategies

1. Develop landscape based strategies for acquisition of easements or fee-titled lands that profit RCP species, support local and state clean water initiatives, improve shallow lake ecosystems, abate forest fragmentation, and restores wildlife corridors.
2. Establish goal acres for each Tamarac WMD county for easement and Waterfowl Production Area (WPA) acquisition and incorporate into the Tamarac WMD HMP.
3. Acquire a minimum of one perpetual easement or one WPA per year over the next 15 years. Continue to identify and pursue opportunities to purchase additional wetland easements in the Tamarac WMD.

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.

Rationale

Environmental education, interpretation and outreach are important and valuable activities for landowners, neighbors and visitors to WMD lands. We should embrace opportunities to use the restored habitats on the WMD to demonstrate sound wildlife conservation techniques and land stewardship.

Strategies

1. Build a partnership with the Clearwater County Soil and Water Conservation District (SWCD) to enhance their soil and water stewardship education program, promote Tamarac WMD programs, and generate support for Service trust resource objectives. The Lawrence FmHA Conservation Easement is used as a land conservation demonstration site and activity center for the SWCD's education program. Assist the SWCD in pursuing grant opportunities to upgrade and enhance their educational facility and program.

2. Educate and engage TIA in Tamarac WMD management and outreach activities. Explore partnership opportunities for restorations, grant programs, and volunteer stewardship projects.

3. Promote greater public awareness and support of the Service's mission and Tamarac WMD objectives through a variety of media including website, literature distribution, newspaper, radio, TV, and interpretive presentations to target audiences.

4. Inform and involve private easement owners in management planning so they appreciate and support Tamarac WMD objectives to restore, enhance, and protect Federal trust resources through ecologically sound natural resource management practices.

5. Tamarac WMD staff will conduct a minimum of one environmental education, interpretive, or outreach activity per year in the District.

Objective 3.2 Enforcement

The Tamarac WMD will inspect all easements as well as future acquired lands each year to ensure the perpetuation of entrusted wildlife resources and government property. Violations that involve theft, damage, alteration, or destruction of wildlife, habitat, or government property will be immediately addressed and resolved within one year from the date of detection.

Rationale

Refuge officers need to enforce the conservation provisions and restrictive covenants attached to Federal wetland easements and former FmHA inventory lands within the District. Conservation provisions primarily restrict agricultural use and development on easement lands. Enforcement operations are crucial to preserving these important natural resources.

Strategies

1. Tamarac WMD staff will inspect easements and any future acquired lands at least once annually through aerial reconnaissance or ground checks to confirm compliance and identify contraventions.

2. Hire a full-time Refuge law enforcement officer whose duties will be shared by the refuge and Tamarac WMD.

3. Relocate or survey, and post all former FmHA conservation easement boundaries to solicit landowner compliance with easement reservations and to facilitate any needed litigation.

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.

Rationale

Partnerships have become an essential element for the successful accomplishment of Tamarac WMD goals, objectives, and strategies. The objectives outlined in this draft CCP need the support and the partnerships of federal, state, tribal, and local agencies, non-governmental organizations and individual citizens. This broad-based approach to managing fish and wildlife resources extends beyond social and political boundaries and requires a foundation of support from many entities. Tamarac WMD will continue to seek creative partnership opportunities to achieve its vision for the future.

Strategies

1. Hire one full-time wetland district manager to plan, organize, and implement management actions and provide oversight on all Service easements within the District. This position would engage, coordinate, and partner with state and local government officials and conservation interest groups to further the Service's conservation mission, including future acquisitions of fee title and easements.
2. Use operational and grant funding to cost share a variety of habitat improvement projects within the District.
3. Render technical assistance to state and Federal agencies involving programs such as RIM, WCA, CRP, WRP, EQIP, WHIP, and other Farm Bill responsibilities that advance Service population and habitat goals for Federal trust resources.
4. Pursue or contribute to partnerships that enhance or preserve vulnerable and critical resources of Service importance. Examples of potential conservation partnership projects include riparian restoration, fish passage, remnant native prairie preservation, shallow lake enhancement, and white pine forest restoration.

Plan Implementation

This CCP outlines an ambitious course of action for the future management of the Tamarac WMD. The ability to enhance wildlife habitats will require a significant commitment of staff and funding from the Service. The Refuge and District will continually need appropriate operational and maintenance funding to implement the objectives in this plan.

Chapter 5 provides a brief description of the highest priority Tamarac NWR and WMD projects as chosen by the Refuge.

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

Table of Contents

Chapter 1: Purpose and Need 101
1.1. Background 101
1.2. Purpose 101
1.3. Need for Action 101
1.3.1. Tamarac National Wildlife Refuge Goals 104
1.3.2. Tamarac Wetland Management District Goals 104
1.4. Decision Framework 104
1.5. Authority, Legal Compliance, and Compatibility 104
1.6. Scoping of the Issues 104

Chapter 2: Description of the Alternatives 110
2.1. Formulation of Alternatives 110
2.1.1. Tamarac NWR 110
2.1.2. Tamarac WMD 110
2.2. Tamarac NWR Management Alternatives 110
2.2.1. Alternative 1: Management of Habitat in Context of Providing Migratory Bird Benefits and Complemented with Priority Public Use 110
2.2.2. Alternative 2: Pre-settlement Ecological Processes 110
2.2.3. Alternative 3: Focused Management for Priority Migratory Birds 111
2.2.4. Alternative 4: Current Management Direction of Conservation, Restoration, and Preservation (No Action) 111
2.2.5. Alternative(s) Considered But Not Developed 111
2.3. Tamarac WMD Management Alternatives 122
2.3.1. Alternative 1: Restoration and Management of Habitat by Facilitating Natural Ecological Processes but also Providing for Migratory Bird Benefits. 122
2.3.2. Alternative 2: Pre-settlement Ecological Processes 122
2.3.3. Alternative 3: Current Management Direction (No Action) 122

Chapter 3: Affected Environment 126
3.1. Tamarac National Wildlife Refuge 126
3.1.1. Introduction 126
3.1.2. Climate 126
3.1.3. Geology and Glaciation 126
3.1.4. Soils 126
3.1.5. Surface Hydrology 127
3.1.6. Archeological and Cultural Values 127
3.1.7. Social and Economic Context 127
3.1.8. Natural Resources 127
3.1.8.1. Historic Habitat Conditions 127
3.1.8.2. Current Habitat Conditions 130
3.1.8.3. Fish and Wildlife Communities 131
3.1.9. Refuge Recreation 132
3.1.9.1. Hunting 132
3.1.9.2. Fishing 132
3.1.9.3. Wildlife Observation 133

3.1.9.4. Wildlife Photography 133
3.1.9.5. Environmental Interpretation 133
3.1.9.6. Environmental Education 134
3.1.9.7. Outreach 134
3.1.9.8. Volunteer and Friends Contributions 134
3.1.9.9. Archaeological and Cultural Resources Management 134
3.2. Tamarac Wetland Management District 134
3.2.1. Geology, Topography, Hydrology, and Land Use 134
3.2.2. Climate 135
3.2.3. Natural Resources 135
3.2.3.1. Plant Communities 135
3.2.3.2. Fish and Wildlife Communities 136

Chapter 4: Environmental Consequences 137
4.1. Effects Common to All Alternatives 137
4.1.1. Air Quality 137
4.1.2. Environmental Justice 137
4.1.3. Climate Change Impacts 137
4.1.4. Cultural Resources 137
4.1.5. Other Common Effects 138
4.1.5.1. Cumulative Impacts Analysis 138

Chapter 5: List of Preparers 143

Chapter 6: Consultation and Coordination with Stakeholders 144

Figure 1: Location of Tamarac NWR 102
Figure 2: Location of Tamarac WMD 103
Figure 3: Watersheds Affecting Tamarac NWR 128
Figure 4: Potential Natural Vegetation, Tamarac NWR 129

Table 1: Comparison of Tamarac NWR Objectives by Management Alternative 112
Table 2: Comparison of Tamarac Wetland Management District Objectives by Management Alternative 123
Table 3: Overview of Issues By Alternative 125
Table 4: Summary of Environmental Consequences for Management Alternatives for Tamarac National Wildlife Refuge 139

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

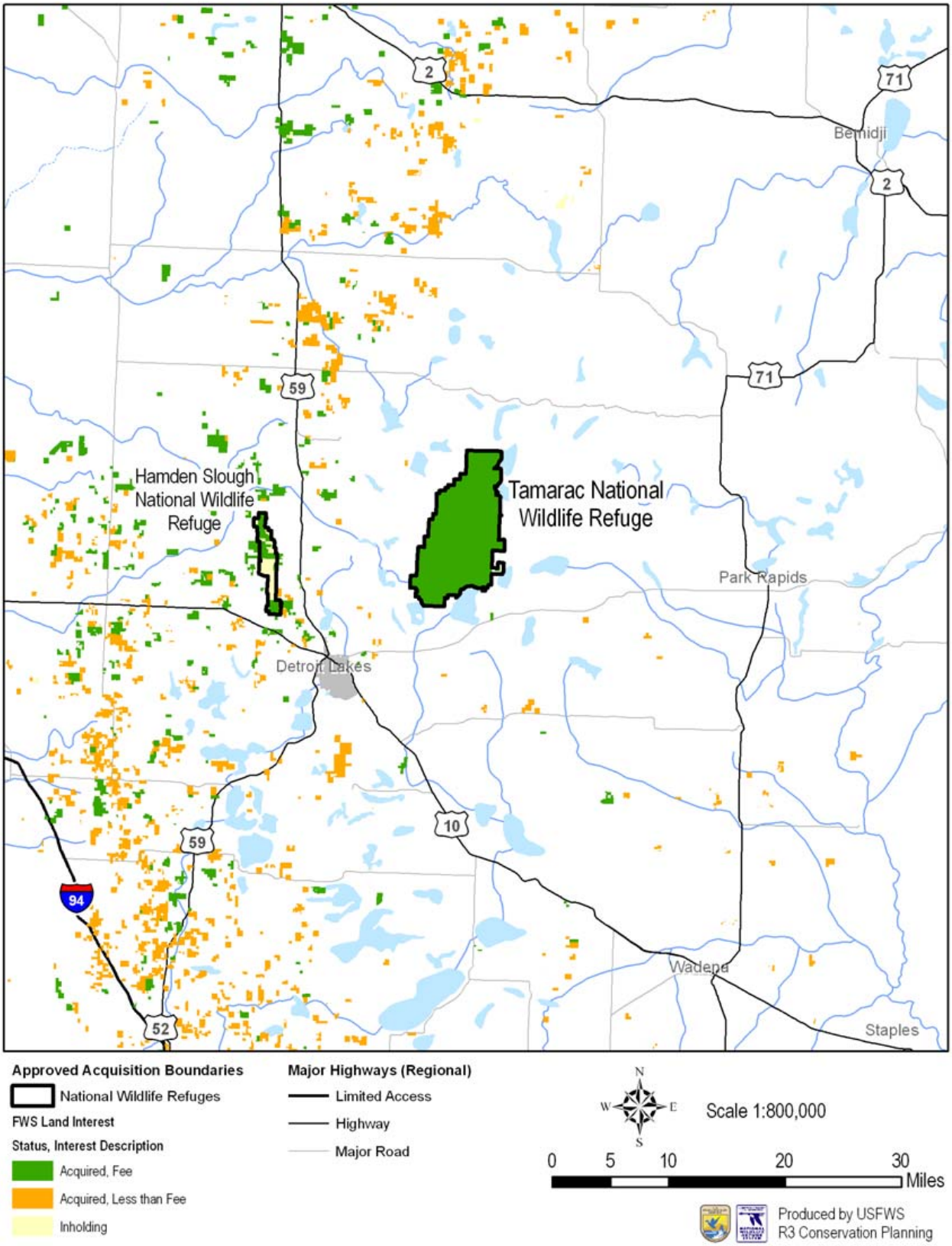
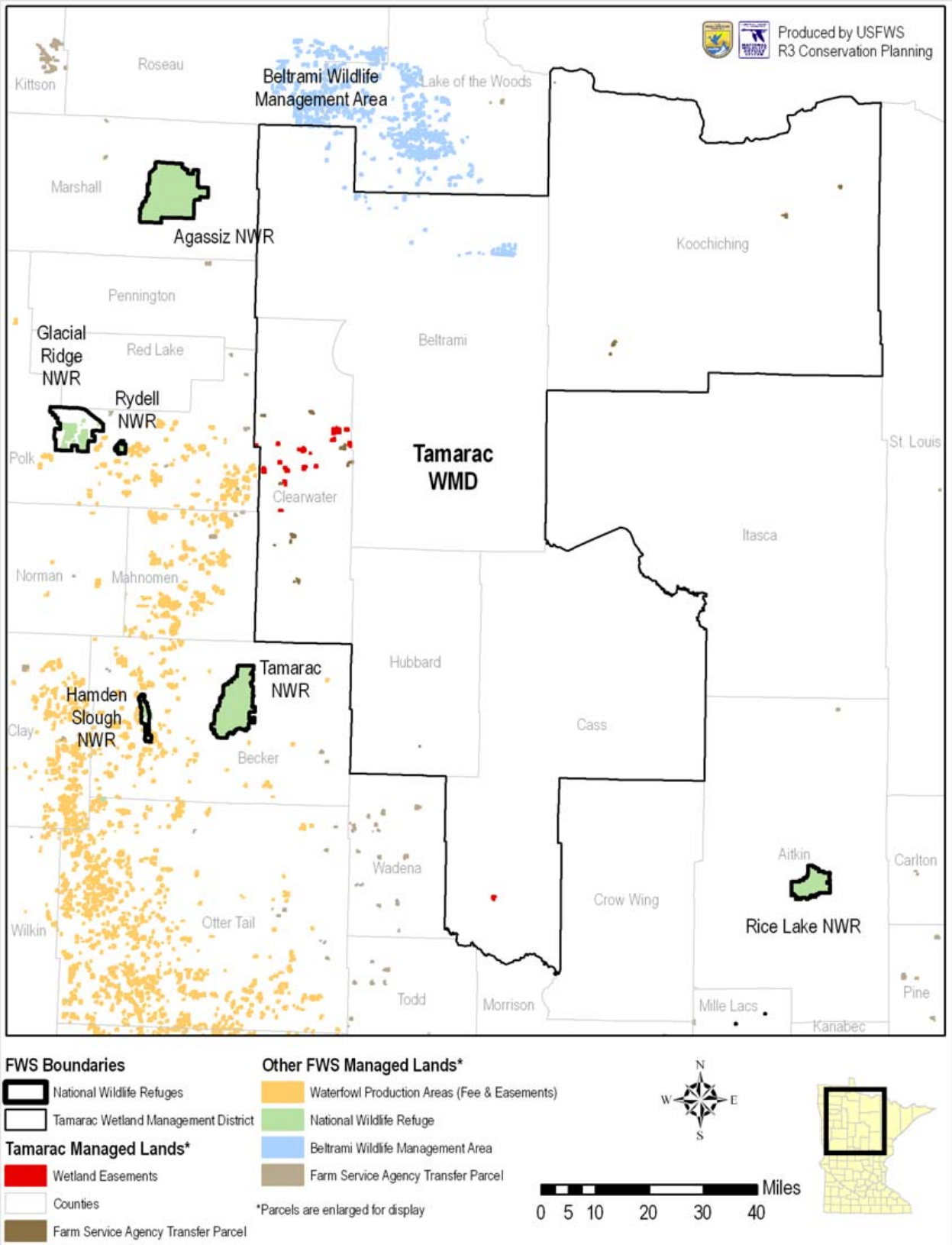


Figure 2: Location of Tamarac WMD



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

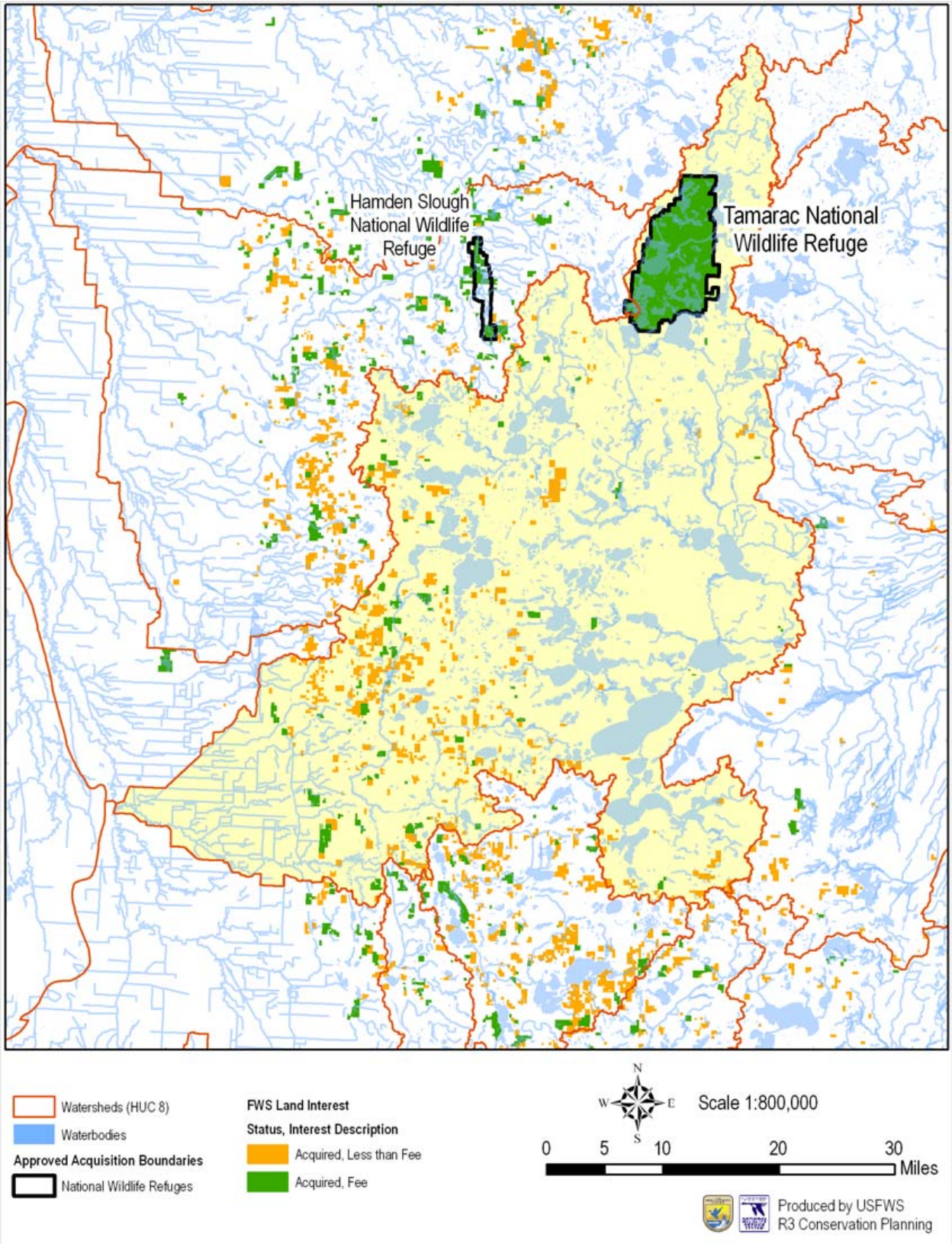
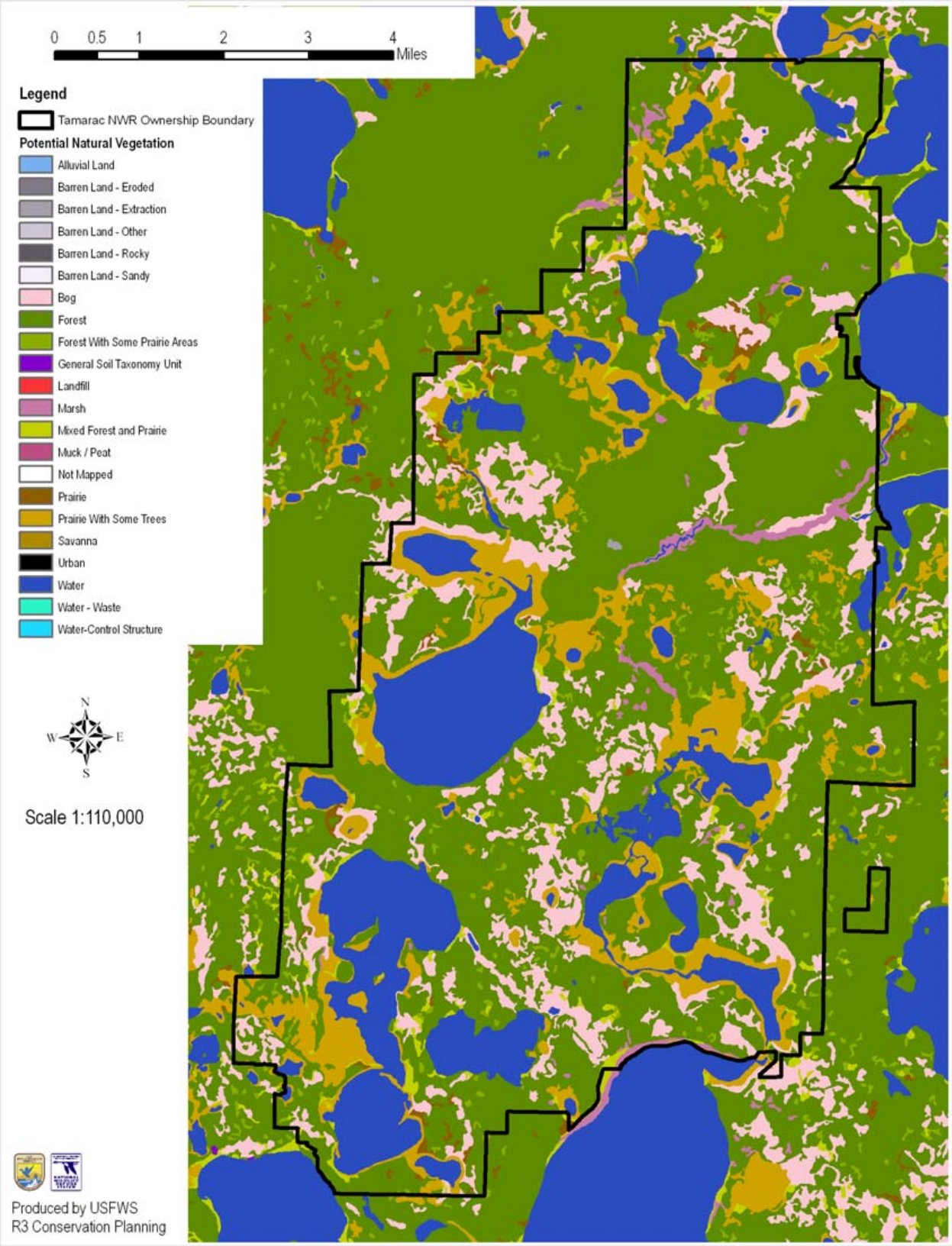


Figure 4: Potential Natural Vegetation, Tamarac NWR



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
- Wayne Brininger, Wildlife biologist

Regional Office Staff:

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

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.

Appendix B: Glossary

Alternative
A set of objectives and strategies needed to achieve refuge goals and the desired future condition.

Anthropogenic
Of, relating to, or resulting from the influence of human beings on nature.

Biological Diversity
The variety of life forms and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Compatible Use
A wildlife-dependent recreational use, or any other use on a refuge that will not materially interfere with or detract from the fulfillment of the mission of the Service or the purposes of the refuge.

Comprehensive Conservation Plan
A document that describes the desired future conditions of the refuge, and specifies management actions to achieve refuge goals and the mission of the National Wildlife Refuge System.

Cultural Resources
"Those parts of the physical environment -- natural and built -- that have cultural value to some kind of sociocultural group ... [and] those nonmaterial human social institutions...." Cultural resources include historic sites, archeological sites and associated artifacts, sacred sites, traditional cultural properties, cultural items (human remains, funerary objects, sacred objects, and objects of cultural patrimony), and buildings and structures.

Ecosystem
A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.

Ecosystem Approach
A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.

Ecosystem Management
Management of an ecosystem that includes all ecological, social and economic components that make up the whole of the system.

Endangered Species
Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.

Environmental Assessment
A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Extirpation
The local extinction of a species that is no longer found in a locality or country, but exists elsewhere in the world.

Goals
Descriptive statements of desired future conditions.

Interjurisdictional Fish
Fish that occur in waters under the jurisdiction of one or more states, for which there is an inter-

state fishery management plan or which migrates between the waters under the jurisdiction of two or more states bordering on the Great Lakes.

Issue

Any unsettled matter that requires a management decision. For example, a resource management problem, concern, a threat to natural resources, a conflict in uses, or in the presence of an undesirable resource condition.

National Wildlife Refuge System

All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife and plant resources.

Objectives

A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies.

Preferred Alternative

The Service's selected alternative identified in the Draft Comprehensive Conservation Plan.

Scoping

A process for determining the scope of issues to be addressed by a comprehensive conservation plan and for identifying the significant issues. Involved in the scoping process are federal, state and local agencies; private organizations; and individuals.

Seral

A phase in the sequential development of a climax vegetation community.

Species

A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Strategies

A general approach or specific actions to achieve objectives.

Threatened Species

Those plant or animal species likely to become endangered species throughout all of or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Undertaking:

"A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval...," i.e., all federal actions.

Vegetation

Plants in general, or the sum total of the plant life in an area.

Vegetation Type

A category of land based on potential or existing dominant plan species of a particular area.

Watershed

The entire land area that collects and drains water into a stream or stream system.

Wetland

Areas such as lakes, marshes, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and that do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.

Wildlife-dependent Recreational Use

A use of refuge that involves hunting, fishing, wildlife observation and photography, or environmental education and interpretation, as identified in the National Wildlife Refuge System Improvement Act of 1997.

Wildlife Diversity

A measure of the number of wildlife species in an area and their relative abundance.

Water Birds

This general category includes all birds that inhabit lakes, marshes, streams and other wetlands at some point during the year. The group includes all waterfowl, such as ducks, geese, and swans, and other birds such as loons, rails, cranes, herons, egrets, ibis, cormorants, pelicans, shorebirds and passerines that nest and rely on wetland vegetation.

Appendix C: Species Lists

Amphibian Species Occurring on Tamarac NWR 146
Bird Species Occurring on Tamarac NWR 147
Butterflies Occurring on Tamarac NWR..... 164
Fish Species Occurring on Tamarac NWR 165

Occurrence of Reptiles, Amphibians, Tamarac NWR

Common Name	Scientific Name	Family	Habitat	Abundance	Special Status
Mudpuppy	*Necturus maculosus*	Proteidae	Open water	Rare	
Blue-spotted Salamander	*Ambystoma laterale*	Ambystomatidae	Marsh/wetland, Upland deciduous forest	Occasional	
Tiger Salamander	*Ambystoma tigrinum*	Ambystomatidae	Marsh/wetland, Upland deciduous forest	Uncommon	
American Toad	*Bufo americanus*	Bufonidae	Marsh/wetland, Upland deciduous forest	Common	
Cope's Gray Treefrog	*Hyla chrysocelis*	Hylidae	Marsh/wetland, Upland deciduous forest	Occasional	
Gray Treefrog	*Hyla versicolor*	Hylidae	Marsh/wetland, Upland deciduous forest	Abundant	
Spring Peeper	*Pseudacris crucifer*	Hylidae	Marsh/wetland, Upland deciduous forest	Abundant	
Western Chorus Frog	*Pseudacris triseriata*	Hylidae	Marsh/wetland, Upland deciduous forest	Common	
Northern Leopard Frog	*Rana pipiens*	Ranidae	Marsh/wetland, Upland grass	Common	
Mink Frog	*Rana septentrionalis*	Ranidae	Open water, Marsh/wetland	Occasional	
Wood Frog	*Rana Sylvatica*	Ranidae	Marsh/wetland, Upland deciduous forest	Abundant	
Snapping Turtle	*Chelydra serpentina*	Chelydridae	Open water, Marsh/wetland	Common	Minnesota/ Special Concern
Painted Turtle	*Chrysemys picta*	Emydidae	Open water, Marsh/wetland	Abundant	
Prairie Skink	*Eumeces septentrionalis*	Scincidae	Upland grass	Occasional	
Red-bellied Snake	*Storeria occipitomaculata*	Colubridae	Upland deciduous and coniferous forest	Common	
Common Gartersnake	*Thamnophis sirtalis*	Colubridae	All habitats except open water	Abundant	

Bird Species Occurring on Tamarac NWR

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Common Loon	*Gavia immer*	Gaviidae	Open water, Marsh/ wetland	Widespread	**c**	**c**	**c**		✔		RCP
Pied-billed Grebe	*Podilymbus podiceps*	Podicipedidae	Open water, Marsh/ wetland	Widespread	**c**	**c**	**a**		✔		
Horned Grebe	*Podiceps auritus*	Podicipedidae	Open water, Marsh/ wetland	Isolated	**o**		**o**			Threatened	
Red-necked Grebe	*Podiceps grisegena*	Podicipedidae	Open water, Marsh/ wetland	Isolated	**u**	**u**	**u**		✔		
Eared Grebe	*Podiceps nigricollis*	Podicipedidae	Open water, Marsh/ wetland	Isolated	**r**		**r**				
Western Grebe	*Aechmophorus occidentalis*	Podicipedidae	Open water, Marsh/ wetland	Isolated	**r**	**r**	**r**				
American White Pelican	*Pelecanus erythrorhynchos*	Pelecanidae	Open water	Widespread	**u**	**c**	**u**			Special Concern	
Double-crested Cormorant	*Phalacrocorax penicillatus*	Phalacrocoracidae	Open water	Widespread	**c**	**u**	**u**				RCP
American Bittern	*Botaurus lentiginosus*	Ardeidae	Marsh/wetland	Isolated	**u**	**u**	**u**		✔		RCP
Least Bittern	*Ixobrychus exilis*	Ardeidae	Marsh/wetland	Isolated	**r**	**r**	**r**				RCP
Great Blue Heron	*Ardea herodias*	Ardeidae	Open water, Marsh/ wetland	Widespread	**a**	**a**	**a**		✔		
Great Egret	*Casmerodius albus*	Ardeidae	Open water, Marsh/ wetland	Isolated	**r**	**r**	**r**				
Cattle Egret	*Bubulcus ibis*	Ardeidae	Upland grass	Isolated	**r**	**r**	**r**				
Green Heron	*Butorides virescens*	Ardeidae	Open water, Marsh/ wetland	Isolated	**u**	**u**	**u**		✔		
Black-crowned Night Heron	*Nycticorax nycticorax*	Ardeidae	Marsh/wetland	Isolated	**r**	**r**	**r**				RCP
Turkey Vulture	*Cathartes aura*	Cathartidae	Development, Upland grass	Widespread	**u**	**u**	**u**				

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Greater White-fronted Goose	*Anser albifrons*	Anatidae	Open water,		**r**		**r**				
Snow Goose	*Chen caerulescens*	Anatidae	Open water		**o**		**o**				RCP
Canada Goose	*Branta canadennsis*	Anatidae	Open water, Marsh/ wetland, Upland grass	Widespread	**a**	**a**	**a**	**r**	✔		RCP
Trumpeter Swan	*Cygnus buccinator*	Anatidae	Open water, Marsh/ wetland	Widespread	**u**	**u**	**u**	**r**	✔	Threatened	RCP
Tundra Swan	*Cygnus columbianus*	Anatidae	Open water	Isolated	**u**		**u**				
Wood Duck	*Aix sponza*	Anatidae	Open water, Marsh/ wetland, Upland deciduous forest	Widespread	**a**	**c**	**a**		✔		RCP
Gadwall	*Anas strepera*	Anatidae	Open water, Marsh/ wetland	Isolated	**u**	**u**	**u**				
American Wigeon	*Anas americana*	Anatidae	Open water, Marsh/ wetland	Isolated	**u**	**u**	**u**				
American Black Duck	*Anas rubripes*	Anatidae	Open water, Marsh/ wetland	Isolated	**u**	**r**	**u**				
Mallard	*Anas platyrhynchos*	Anatidae	All Habitats	Widespread	**a**	**c**	**a**	**r**	✔		RCP
Blue-winged Teal	*Anas discors*	Anatidae	Open water, Marsh/ wetland, Upland grass	Widespread	**a**	**c**	**a**		✔		RCP
Northern Shoveler	*Anas clypeata*	Anatidae	Open water, Marsh/ wetland	Isolated	**u**	**r**	**u**				
Northern Pintail	*Anas acuta*	Anatidae	Open water, Marsh/ wetland	Isolated	**o**	**r**	**u**				RCP
Green-winged Teal	*Anas crecca*	Anatidae	Open water, Marsh/ wetland	Isolated	**u**	**o**	**u**		✔		
Canvasback	*Athya valisineria*	Anatidae	Open water, Marsh/ wetland	Isolated	**u**	**r**	**u**		✔		RCP
Redhead	*Athya americana*	Anatidae	Open water	Isolated	**u**	**r**	**u**				

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Ring-necked Duck	*Athya collaris*	Anatidae	Open water, Marsh/ wetland	Widespread	**a**	**c**	**a**		✔		
Greater Scaup	*Athya marila*	Anatidae	Open water	Isolated	**r**		**r**				
Lesser Scaup	*Athya affinis*	Anatidae	Open water	Isolated	**u**	**r**	**u**				RCP
Black Scoter	*Melanitta perspicillata*	Anatidae	Open water	Isolated			**r**				
Long-tailed Duck	*Clangula hyemalis*	Anatidae	Open water	Isolated			**r**				
Bufflehead	*Bucephala albeola*	Anatidae	Open water	Isolated	**u**	**r**	**u**		✔		
Common Goldeneye	*Bucephala clangula*	Anatidae	Open water, Upland deciduous forest	Isolated	**u**	**u**	**u**		✔		
Hooded Merganser	*Lophodytes cucullatus*	Anatidae	Open water, Marsh/ wetland, Upland deciduous forest	Widespread	**c**	**u**	**c**		✔		
Common Merganser	*Mergus merganser*	Anatidae	Open water	Isolated	**u**		**u**				
Red-breasted Merganser	*Mergus serrator*	Anatidae	Open water	Isolated	**u**		**u**				
Ruddy Duck	*Oxyura jamaicensis*	Anatidae	Open water	Isolated	**o**	**r**	**o**				
Osprey	*Pandion haliaetus*	Accipitridae	Open water, Marsh/ wetland	Isolated	**u**	**u**	**u**		✔		
Bald Eagle	*Haliaeetus leucocephalus*	Accipitridae	Open water, Upland coniferous and deciduous forest	Widespread	**c**	**c**	**c**	**r**	✔	Special Concern	Delisted, RCP,
Northern Harrier	*Circus cyaneus*	Accipitridae	Marsh/wetland, Upland grass, Upland shrub	Isolated	**u**	**u**	**u**		✔		RCP
Sharp-shinned Hawk	*Accipiter striatus*	Accipitridae	Upland deciduous forest	Widespread	**u**	**u**	**u**		✔		
Cooper's Hawk	*Accipiter cooperii*	Accipitridae	Upland deciduous forest	Widespread	**u**	**o**	**o**	**r**	✔		
Northern Goshawk	*Accipiter gentilis*	Accipitridae	Upland deciduous forest	Isolated	**r**	**r**	**r**	**r**			RCP

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Red-shouldered Hawk	*Buteo lineatus*	Accipitridae	Upland deciduous forest	Isolated	**u**	**u**	**o**		✔	Special Concern	
Broad-winged hawk	*Buteo platypterus*	Accipitridae	Upland deciduous forest	Widesrpead	**c**	**u**	**c**		✔		
Swainson's Hawk	*Buteo swainsoni*	Accipitridae	Marsh/wetland, Upland grass, Upland shrub	Isolated	**r**		**r**				RCP
Red-tailed Hawk	*Buteo jamaicensis*	Accipitridae	Upland grass, Upland shrub, Marsh/wetland	Widespread	**c**	**u**	**c**		✔		
Rough-legged Hawk	*Buteo lagopus*	Accipitridae	Upland grass, Marsh/wetland, Upland shrub	Isolated	**u**		**u**	**r**			
Golden Eagle	*Aquila chrysaetos*	Accipitridae	Upland grass, Marsh/wetland, Upland shrub	Isolated	**r**		**r**	**r**			
American Kestrel	*Falco sparverius*	Accipitridae	Upland grass, Marsh/wetland,Upland shrub	Widespread	**c**	**u**	**c**		✔		
Merlin	*Falco columbarius*	Accipitridae	Upland deciduous forest, Upland grass, Marsh/wetland	Isolated	**r**		**r**				
Peregrine Falcon	*Falco peregrinus*	Accipitridae	Open water, upland grass, Marsh/wetland, Upland shrub	Widespread	**o**		**o**			Threatened	RCP
Prairie Falcon	*Falco mexicanus*	Accipitridae	Upland grass, Marsh/wetland, Upland shrub	Isolated	**r**		**r**				
Gray Partridge	*Perdix perdix*	Phasianidae	Upland grass	Isolated	**r**	**r**	**r**	**r**			
Ring-necked Pheasant	*Phasianus colchicus*	Phasianidae	Upland grass, Marsh/wetland	Isolated	**r**	**r**	**o**	**r**			
Ruffed Grouse	*Bonasa umbellus*	Phasianidae	Upland deciduous forest	Widespread	**c**	**u**	**c**	**u**	✔		

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Wild Turkey	*Meleagris gallopavo*	Phasianidae	Upland deciduous forest, Upland grass	Widespread	**c**	**u**	**u**	**u**	✔		
Yellow Rail	*Coturnicops noveboracensis*	Rallidae	Marsh/wetland	Isolated	**o**	**o**	**o**			Special Concern	RCP
Virginia Rail	*Rallus limicola*	Rallidae	Marsh/wetland	Isolated	**u**	**u**	**u**		✔		
Sora	*Porzana carolina*	Rallidae	Marsh/wetland	Isolated	**u**	**u**	**u**		✔		
American Coot	*Fulica americana*	Rallidae	Open water, Marsh/wetland	Widespread	**c**	**o**	**a**		✔		
Sandhill Crane	*Grus canadensis*	Gruidae	Marsh/wetland, Upland grass	Isolated	**r**	**r**	**r**		✔		
Black-bellied Plover	*Pluvialis squatarola*	Charadriidae	Marsh/wetland, Upland grass	Isolated	**r**		**r**				
American Golden Plover	*Pluvialis dominica*	Charadriidae	Marsh/wetland, Upland grass	Isolated	**r**		**r**				
Semipalmated Plover	*Charadrius semipalmatus*	Charadriidae	Marsh/wetland	Isolated	**r**		**r**				
Killdeer	*Charadrius vociferus*	Charadriidae	Marsh/wetland, Upland grass	Widespread	**c**	**u**	**c**		✔		
Greater Yellowlegs	*Tringa melanoleuca*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				RCP
Lesser Yellowlegs	*Tringa flavipes*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				
Solitary Sandpiper	*Tringa solitaria*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				
Spotted Sandpiper	*Actitis macularius*	Scolopacidae	Marsh/wetland	Isolated	**o**	**o**	**o**				
Upland Sandpiper	*Bartramia longicauda*	Scolopacidae	Upland grass	Isolated	**r**		**r**				RCP
Hudsonian Godwit	*Limosa haemastica*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				RCP
Marbled Godwit	*Limosa fedoa*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**			Special Concern	RCP
Ruddy Turnstone	*Arenaria interpres*	Scolopacidae	Open Water	Isolated	**r**		**r**				
Semipalmated Sandpiper	*Calidris pusilla*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Least Sandpiper	*Calidris minutilla*	Scolopacidae	Marsh/wetland	Isolated	**o**	**r**	**o**				
Baird's Sandpiper	*Calidris bairdii*	Scolopacidae	Marsh/wetland, Upland grass	Isolated	**r**		**r**				
Pectoral Sandpiper	*Calidris melanotos*	Scolopacidae	Marsh/wetland, Upland grass	Isolated	**r**		**r**				
Dunlin	*Calidris alpina*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				
Stilt Sandpiper	*Calidris himantopus*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				RCP
Short-billed Dowitcher	*Limnodromus griseus*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				RCP
Long-billed Dowitcher	*Limnodromus scolopaceus*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				
Wilson's Snipe	*Gallinago delicata*	Scolopacidae	Marsh/wetland. Upland grass	Widespread	**c**	**u**	**u**		✔		
American Woodcock	*Scolopax minor*	Scolopacidae	Marsh/wetland, Lowland shrub, Upland grass, Upland shrub	Widespread	**c**	**u**	**c**		✔		RCP
Wilson's Phalarope	*Phalaropus tricolor*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**			Threatened	RCP
Red-necked Phalarope	*Phalaropus lobatus*	Scolopacidae	Marsh/wetland	Isolated	**r**		**r**				
Franklin's Gull	*Larus pipixcan*	Laridae	Open water	Widespread	**o**		**o**			Special Concern	
Bonaparte's Gull	*Larus philadelphia*	Laridae	Open water	Widespread	**o**		**o**				
Ring-billed Gull	*Larus delawarensis*	Laridae	Open water	Widespread	**c**	**c**	**c**				
Herring Gull	*Larus argentatus*	Laridae	Open water	Widespread	**u**	**o**	**u**				
Caspian Tern	*Sterna caspia*	Laridae	Open water	Isolated	**u**	**o**	**u**				
Common Tern	*Sterna hirundo*	Laridae	Open water	Isolated	**o**	**r**	**u**			Threatened	RCP
Forster's Tern	*Sterna forsteri*	Laridae	Open water	Isolated	**u**	**u**	**u**		✔	Special Concern,	RCP
Black Tern	*Chlidonias niger*	Laridae	Open water	Widespread	**c**	**c**	**c**		✔		RCP

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Mourning Dove	*Zenaida macroura*	Columbidae	Upland grass, Upland shrub	Widespread	**c**	**c**	**c**		✔		
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Cuculidae	Upland deciduous forest, Lowland shrub	Isolated	**u**	**u**	**o**		✔		RCP
Yellow-billed Cuckoo	*Coccyzus americanus*	Cuculidae	Upland deciduous forest, Lowland shrub	Isolated	**o**	**o**	**r**				
Eastern Screech-Owl	*Otus asio*	Strigidae	Upland deciduous forest	Isolated	**r**	**r**	**r**	**r**			
Great Horned Owl	*Bubo virginianus*	Strigidae	Upland deciduous and coniferous forest, Upland grass and shrub	Widespread	**u**	**u**	**u**	**u**	✔		
Snowy Owl	*Nyctea scandiaca*	Strigidae	Upland grass, Marsh/wetland	Isolated	**r**		**r**	**r**			
Barred Owl	*Strix varia*	Strigidae	Upland and lowland deciduous and coniferous forest	Widespread	**u**	**u**	**u**	**u**	✔		
Great Gray Owl	*Strix nebulosa*	Strigidae	Upland and lowland deciduous and coniferous forest	Isolated	**r**		**r**	**r**			
Long-eared Owl	*Asio otus*	Strigidae	Upland deciduous forest, Upland shrub, Marsh/wetland	Isolated	**r**	**r**	**r**				RCP
Short-eared Owl	*Asio flammeus*	Strigidae	Upland grass, Marsh/wetland	Isolated	**r**	**r**	**r**			Special Concern,	RCP
Northern Saw-whet Owl	*Aegolius acadicus*	Strigidae	Upland deciduous and coniferous forest	Isolated	**u**	**u**	**u**		✔		
Common Nighthawk	*Chordeiles minor*	Caprimulgidae	Upland grass and shrub, Marsh/wetland	Isolated	**u**	**u**	**u**				
Whip-poor-will	*Caprimulgus vociferus*	Caprimulgidae	Upland deciduous and coniferous forest	Isolated	**r**	**r**	**r**				RCP

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Chimney Swift	*Chaetura pelagica*	Apodidae	Open water during migration, Development	Isolated	**u**	**u**	**u**		✔		
Ruby-throated Hummingbird	*Archilochus colubris*	Trochilidae	Upland deciduous forest	Widespread	**c**	**c**	**c**		✔		
Belted Kingfisher	*Ceryle alcyon*	Alcedinidae	Open water, Marsh/ wetland	Widespread	**c**	**u**	**u**		✔		
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Picidae	Upland deciduous forest	Isolated	**o**	**o**	**o**	**r**			RCP
Red-bellied Woodpecker	*Melanerpes carolinus*	Picidae	Upland deciduous forest	Isolated	**u**	**u**	**u**	**u**			
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Picidae	Upland deciduous forest	Isolated	**c**	**u**	**u**		✔		
Downy Woodpecker	*Picoides pubescens*	Picidae	Upland deciduous forest	Widespread	**c**	**c**	**c**	**c**	✔		
Hairy Woodpecker	*Picoides villosus*	Picidae	Upland deciduous forest	Widespread	**u**	**u**	**u**	**u**	✔		
Three-toed Woodpecker	*Picoides tridactylus*	Picidae	Upland and lowland coniferous forest	Isolated	**r**			**r**			
Black-backed Woodpecker	*Picoides arcticus*	Picidae	Upland and lowland coniferous forest	Isolated	**r**			**r**			
Northern Flicker	*Colaptes auratus*	Picidae	Upland deciduous forest	Widespread	**a**	**c**	**a**	**r**	✔		RCP
Pileated Woodpecker	*Dryocopus pileatus*	Picidae	Upland deciduous forest	Widespread	**u**	**u**	**u**	**u**	✔		
Olive-sided Fylcatcher	*Contopus cooperi*	Tyrannidae	Upland and lowland coniferous forest	Isolated	**o**	**o**	**o**				RCP
Eastern Wood-Peweee	*Contopus virens*	Tyrannidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Tyrannidae	Lowland coniferous forest	Isolated	**r**		**r**				

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Alder Flycatcher	*Empidonax alnorum*	Tyrannidae	Lowland deciduous forest, Lowland shrub	Isolated	**u**	**u**	**r**		✔		
Willow Flycatcher	*Empidonax trailii*	Tyrannidae	Lowland shrub, Upland shrub	Isolated	**r**	**r**	**r**				
Least Flycatcher	*Empidonax minimus*	Tyrannidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		
Eastern Phoebe	*Sayornis phoebe*	Tyrannidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		
Great Crested Flycatcher	*Myiarchus crinitus*	Tyrannidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		
Western Kingbird	*Tyrannus verticalis*	Tyrannidae	Upland grass, Upland brush	Isolated	**r**	**r**	**r**				
Eastern Kingbird	*Tyrannus tyrannus*	Tyrannidae	Upland deciduous forest, Marsh/wetland	Widespread	**c**	**c**	**c**		✔		
Loggerhead Shrike	*Lanius ludovicianus*	Laniidae	Upland shrub, Upland grass	Isolated	**r**		**r**			Threatened	RCP
Northern Shrike	*Lanius excubitor*	Laniidae	Upland shrub, Upland grass	Isolated	**u**		**u**	**u**			
Yellow-throated Vireo	*Vireo flavifrons*	Vireonidae	Upland deciduous forest	Isolated	**u**	**u**	**u**		✔		
Blue-headed Vireo	*Vireo solitarius*	Vireonidae	Upland deciduous forest	Isolated	**u**		**u**				
Warbling Vireo	*Vireo gilvus*	Vireonidae	Upland deciduous forest	Isolated	**c**	**u**	**c**		✔		
Philadelphia Vireo	*Vireo philadelphicus*	Vireonidae	Upland deciduous forest	Isolated	**u**		**u**				
Red-eyed Vireo	*Vireo olivaceus*	Vireonidae	Upland deciduous forest	Isolated	**c**	**a**	**c**		✔		
Gray Jay	*Perisoreus canadensis*	Corvidae	Upland coniferous forest	Isolated	**r**		**r**	**r**			

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Blue Jay	*Cyanocitta cristata*	Corvidae	Upland deciduous forest	Widespread	**c**	**u**	**c**	**c**	✔		
Black-billed Magpie	*Pica hudsonia*	Corvidae	Upland deciduous forest, Upland shrub	Isolated	**o**		**o**	**o**			
American Crow	*Corvus brachyrhynchos*	Corvidae	Upland deciduous forest, shrub and grass	Widespread	**a**	**c**	**a**	**u**	✔		
Common Raven	*Corvus corax*	Corvidae	Upland deciduous and coniferous forest	Isolated	**r**		**r**	**u**			
Horned Lark	*Eremophila alpestris*	Alaudidae	Upland grass	Widespread	**u**	**o**	**u**	**r**			
Purple Martin	*Progne subis*	Hirundinidae	Upland grass, Upland shrub, Marsh/wetland	Isolated	**c**	**c**	**u**		✔		
Tree Swallow	*Tachycineta bicolor*	Hirundinidae	Upland grass, Upland shrub, Marsh/wetland, Open water	Widespread	**c**	**c**	**c**		✔		
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Hirundinidae	Upland grass, Marsh/wetland, Open water	Isolated	**u**	**u**	**u**		✔		
Bank Swallow	*Riparia riparia*	Hirundinidae	Upland grass, Marsh/wetland, Open water	Isolated	**u**	**u**	**u**				
Cliff Swallow	*Petrochelidon pyrrhonota*	Hirundinidae	Upland grass, Marsh/wetland, Open water	Isolated	**u**	**u**	**u**		✔		
Barn Swallow	*Hirundo rustica*	Hirundinidae	Upland grass, Marsh/wetland, Open water	Widespread	**c**	**c**	**c**		✔		
Black-capped Chickadee	*Poecile atricapilla*	Paridae	Upland deciduous and coniferous forest	Widespread	**c**	**c**	**c**	**a**	✔		
Boreal Chickadee	*Poecile hudsonica*	Paridae	Upland coniferous forest	Isolated	**r**		**r**	**r**			
Red-breasted Nuthatch	*Sitta canadensis*	Sittidae	Upland coniferous and deciduous forest	Isolated	**u**	**u**	**u**	**u**	✔		
White-breasted Nuthatch	*Sitta carolinensis*	Sittidae	Upland deciduous and coniferous forest	Widespread	**c**	**c**	**c**	**a**	✔		

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Brown Creeper	*Certhia americana*	Certhiidae	Upland and lowland deciduous and coniferous forest	Isolated	**u**	**u**	**u**	**u**			
House Wren	*Troglodytes aedon*	Tryglodytidae	Upland shrub	Isolated	**u**	**u**	**u**		✔		
Winter Wren	*Troglodytes troglodytes*	Tryglodytidae	Lowland deciduous forest, Lowland shrub	Isolated	**u**	**u**	**u**		✔		
Sedge Wren	*Cistothorus platensis*	Tryglodytidae	Marsh/wetland, Upland grass	Isolated	**c**	**c**	**c**		✔		RCP
Marsh Wren	*Cistothorus palustris*	Tryglodytidae	Marsh/wetland	Isolated	**c**	**c**	**c**		✔		
Golden-crowned Kinglet	*Regulus satrapa*	Regulidae	Upland coniferous forest	Isolated	**c**		**c**	**r**			
Ruby-crowned Kinglet	*Regulus calendula*	Regulidae	Upland coniferous and deciduous forest	Isolated	**c**		**c**				
Blue-gray Gnatcatcher	*Polioptila caerulea*	Sylviidae	Lowland deciduous forest	Isolated	**u**		**u**				
Eastern Bluebird	*Sialia sialis*	Turdidae	Upland grass, Upland shrub and deciduous forest	Widespread	**c**	**c**	**c**		✔		
Townsend's Solitaire	*Myadestes townsendi*	Turdidae	Upland coniferous forest	Isolated			**r**	**r**			
Veery	*Catharus fuscescens*	Turididae	Upland deciduous forest	Widespread	**c**	**c**	**c**		✔		
Gray-cheeked Thrush	*Catharus minimus*	Turididae	Upland coniferous forest	Isolated	**u**		**u**				
Swainson's Thrush	*Catharus ustulatus*	Turdidae	Upland deciduous forest	Isolated	**u**		**u**				
Hermit Thrush	*Catharus guttatus*	Turdidae	Upland coniferous and deciduous forest	Isolated	**u**	**u**	**u**		✔		
Wood Thrush	*Hylocichla mustelina*	Turdidae	Upland deciduous forest	Isolated	**u**	**u**	**u**		✔		RCP

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Varied Thrush	*Ixoreus naevius*	Turdidae	Upland deciduous and coniferous forest	Isolated				**r**			
American Robin	*Turdus migratorius*	Turdidae	Upland deciduous and coniferous forest, Upland grass	Widespread	**a**	**a**	**u**	**r**	✔		
Gray Catbird	*Drumetella carolinensis*	Mimidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		
Brown Thrasher	*Toxostoma rufum*	Mimidae	Upland deciduous forest, Upland shrub	Isolated	**u**	**u**	**u**		✔		
European Starling	*Sturnus vulgaris*	Sturnidae	Upland grass, Upland shrub, Development	Widespread	**o**	**o**	**o**	**o**			
American Pipit	*Anthus rubescens*	Motacillidae	Upland grass	Isolated	**o**		**u**				
Bohemian Waxwing	*Bombycilla garrulus*	Bombycillidae	Upland coniferous forest, Upland brush	Isolated	**u**		**o**	**o**			
Cedar Waxwing	*Bombycilla cedrorum*	Bombycillidae	Upland shrub, grass and deciduous forest	Isolated	**u**	**u**	**c**	**o**			
Blue-winged Warbler	*Vermivora pinus*	Parulidae	Upland shrub and deciduous forest	Isolated	**o**	**o**	**o**				
Golden-winged Warbler	*Vermivora chrysoptera*	Parulidae	Upland shrub and deciduous forest	Isolated	**u**	**u**	**u**		✔		RCP
Tennessee Warbler	*Vermivora peregrina*	Parulidae	Upland shrub and deciduous forest	Isolated	**c**	**r**	**c**				
Orange-crowned Warbler	*Vermivora celata*	Parulidae	Upland deciduous and coniferous forest	Isolated	**c**		**c**				
Nashville Warbler	*Vermivora ruficapilla*	Parulidae	Upland and lowland coniferous forest	Isolated	**c**	**u**	**c**		✔		
Northern Parula	*Parula americana*	Parulidae	Upland and lowland coniferous forest, Upland deciuous forest	Isolated	**u**	**o**	**u**		✔		

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Yellow Warbler	*Dendroica petechia*	Parulidae	Lowland shrub, Marsh/wetland	Widespread	**c**	**c**	**u**		✔		
Chestnut-sided Warbler	*Dendroica pensylvanica*	Parulidae	Upland deciduous forest	Widespread	**c**	**c**	**c**		✔		
Magnolia Warbler	*Dendroica magnolia*	Parulidae	Upland coniferous forest	Isolated	**u**		**u**				
Cape May Warbler	*Dendroica tigrina*	Parulidae	Upland coniferous forest	Isolated	**u**		**u**				
Black-throated Blue Warbler	*Dendroica caerulescens*	Parulidae	Upland deciduous and coniferous forest	Isolated	**r**		**r**				
Yellow-rumped Warbler	*Dendroica coronata*	Parulidae	Upland deciduous and coniferous forest	Widespread	**a**	**r**	**a**				
Black-throated Green Warbler	*Dendroica virens*	Parulidae	Upland coniferous and deciduous forest	Isolated	**u**	**u**	**u**		✔		
Blackburnian Warbler	*Dendroica fusca*	Parulidae	Upland coniferous and deciduous forest	Isolated	**u**	**o**	**u**		✔		
Pine Warbler	*Dendroica pinus*	Parulidae	Upland coniferous forest	Isolated	**c**	**u**	**c**		✔		
Palm Warbler	*Dendroica palmarum*	Parulidae	Lowland coniferous forest, Marsh/wetland, Upland grass	Isolated	**c**		**c**				
Bay-breasted Warbler	*Dendroica castanea*	Parulidae	Upland coniferous forest	Isolated	**u**		**u**				
Blackpoll Warbler	*Dendroica striata*	Parulidae	Upland coniferous forest	Isolated	**c**		**c**				
Cerulean Warbler	*Dendroica cerulea*	Parulidae	Upland and lowland deciduous forest	Isolated	**o**	**r**	**o**			Special Concern	
Black-and-white Warbler	*Mniotilta varia*	Parulidae	Upland deciduous forest	Isolated	**c**	**u**	**c**		✔		
American Redstart	*Setophaga ruticilla*	Parulidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Ovenbird	*Seiurus aurocapillus*	Parulidae	Upland deciduous forest	Isolated	**c**	**c**	**c**		✔		
Northern Waterthrush	*Seiurus noveboracensis*	Parulidae	Upland and lowland deciduous forest	Isolated	**u**		**u**				
Connecticut Warbler	*Oporornis agilis*	Parulidae	Upland and lowland deciduous forest	Isolated	**o**	**r**	**o**				RCP
Mourning Warbler	*Oporornis phiadelphia*	Parulidae	Upland and lowland deciduous forest, Lowland shrub	Isolated	**u**	**u**	**u**		✔		
Common Yellowthroat	*Geothlypis trichas*	Parulidae	Marsh/wetland, Lowland shrub, Upland grass	Widespread	**c**	**c**	**c**		✔		
Wilson's Warbler	*Wilsonia pusilla*	Parulidae	Lowland shrub, Lowland and upland deciduous forest	Isolated	**u**		**u**				
Canada Warbler	*Wilsonia canadensis*	Parulidae	Upland deciduous forest	Isolated	**u**	**r**	**u**				RCP
Scarlet Tanager	*Piranga olivacea*	Thraupidae	Upland deciduous forest	Isolated	**u**	**u**	**u**		✔		
Spotted Towhee	*Pipilo maculatus*	Emberizidae	Upland deciduous forest, Upland shrub	Isolated	**r**		**r**				
Eastern Towhee	*Pipilo erythrophthalmus*	Emberizidae	Upland deciduous forest, Upland shrub	Isolated	**u**	**u**	**u**		✔		
American Tree Sparrow	*Spizella arborea*	Emberizidae	Upland grass, Upland shrub	Isolated	**c**		**c**	**r**			
Chipping Sparrow	*Spizella passerina*	Emberizidae	Upland grass, Upland shrub	Widespread	**c**	**c**	**c**		✔		
Clay-colored Sparrow	*Spizella pallida*	Emberizidae	Upland grass, Upland shrub	Isolated	**c**	**c**	**c**		✔		
Field Sparrow	*Spizella pusilla*	Emberizidae	Upland grass, Upland shrub	Isolated	**u**	**u**	**u**		✔		RCP

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Vesper Sparrow	*Pooecetes gramineus*	Emberizidae	Upland grass, Upland shrub	Isolated	**u**	**u**	**u**		✔		
Lark Sparrow	*Chondestes grammacus*	Emberizidae	Upland grass, Upland shrub	Isolated	**u**	**o**	**o**		✔		
Savannah Sparrow	*Passerculus sandwichensis*	Emberizidae	Upland grass, Upland shrub, Marsh/wetland	Isolated	**u**	**u**	**u**				
Grasshopper Sparrow	*Ammodramus savannarum*	Emberizidae	Upland grass	Isolated	**u**	**u**	**r**				RCP
Henslow's Sparrow	*Ammodramus henslowii*	Emberizidae	Upland grass, Marsh/ wetland	Isolated	**r**	**r**	**r**			Endangered	RCP
Le Conte's Sparrow	*Ammodramus leconteii*	Emberizidae	Marsh/wetland	Isolated	**u**	**u**	**u**				RCP
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	Emberizidae	Marsh/wetland	Isolated	**r**		**r**			Special Concern	RCP
Fox Sparrow	*Passerella illiaca*	Emberizidae	Upland deciduous and coniferous forest	Isolated	**c**		**c**				
Song Sparrow	*Melospiza melodia*	Emberizidae	Upland shrub, Upland grass	Widespread	**a**	**a**	**c**		✔		
Lincoln's Sparrow	*Melospiza lincolnii*	Emberizidae	Upland shrub	Isolated	**u**		**u**				
Swamp Sparrow	*Melospiza georgiana*	Emberizidae	Marsh/wetland	Isolated	**c**	**c**	**u**		✔		
White-throated Sparrow	*Zonotrichia albicollis*	Emberizidae	Upland shrub, Upland deciduous forest	Isolated	**c**	**u**	**c**		✔		
Harris's Sparrow	*Zonotrichia querula*	Emberizidae	Upland coniferous and deciduous forest	Isolated	**u**		**u**				
White-crowned Sparrow	*Zonotrichia leucophrys*	Emberizidae	Upland shrub, Upland deciduous forest	Isolated	**u**		**u**				
Dark-eyed Junco	*Junco hyemalis*	Emberizidae	Upland coniferous and deciduous forest	Widespread	**c**		**c**	**u**			
Lapland Longspur	*Calcarius lapponicus*	Emberizidae	Upland grass	Isolated	**o**		**o**	**r**			

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Snow Bunting	*Plectrophenax nivalis*	Emberizidae	Upland grass	Isolated	**o**		**o**	**u**			
Northern Cardinal	*Cardinalis cardinalis*	Cardinalidae	Upland shrub, Upland deciduous forest	Isolated	**r**	**r**	**r**	**r**			
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Cardinalidae	Upland deciduous forest	Isolated	**u**	**u**	**u**		✔		
Indigo Bunting	*Passerina cyanea*	Cardinalidae	Upland shrub, Upland grass	Isolated	**c**	**c**	**u**		✔		
Bobolink	*Dolichonyx oryzivorus*	Icteridae	Upland grass	Isolated	**u**	**u**	**u**		✔		RCP
Red-winged Blackbird	*Agelaius phoeniceus*	Icteridae	Marsh/wetland, Upland grass, Upland shrub	Widespread	**a**	**a**	**a**	**r**	✔		
Eastern Meadowlark	*Sturnella magna*	Icteridae	Upland grass	Isolated	**r**	**r**	**r**				RCP
Western Meadowlark	*Sturnella neglecta*	Icteridae	Upland grass	Isolated	**u**	**o**	**u**				RCP
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Icteridae	Marsh/wetland, Upland grass	Isolated	**u**	**u**	**u**		✔		
Rusty Blackbird	*Euphagus carolinus*	Icteridae	Lowland coniferous forest, Lowland shrub	Isolated	**u**		**u**	**r**			
Brewer's Blackbird	*Euphagus cyanocephalus*	Icteridae	Upland shrub, Upland grass	Isolated	**u**	**o**	**u**		✔		
Common Grackle	*Quiscalus quiscula*	Icteridae	Upland coniferous and deciduous forest, upland grass	Isolated	**c**	**c**	**c**	**r**	✔		
Brown-headed Cowbird	*Molothrus ater*	Icteridae	Upland deciduous forest, Upland grass	Isolated	**c**	**c**	**c**		✔		
Orchard Oriole	*Icterus spurius*	Icteridae	Upland deciduous forest, Upland shrub	Isolated	**r**	**r**					RCP
Baltimore Oriole	*Icterus galbula*	Icteridae	Upland deciduous forest	Isolated	**c**	**u**	**u**		✔		

Bird Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance				Breeding Confirmed	Special Status	
					Sp	Su	Fa	Wi		State	Federal
Pine Grosbeak	*Pinicola enucleator*	Fringillidae	Upland coniferous forest	Isolated	**r**		**r**	**u**			
Purple Finch	*Carpodacus purpureus*	Fringilidae	Upland deciduous forest	Isolated	**c**	**u**	**c**	**u**	✔		
House Finch	*Carpodacus mexicanus*	Fringilidae	Upland deciduous forest, Upland shrub	Widespread	**c**	**u**	**c**	**u**	✔		
Red Crossbill	*Loxia curvirostra*	Fringilidae	Upland coniferous forest	Isolated	**o**		**r**	**u**			
White-winged Crossbill	*Loxia leucoptera*	Fringilidae	Upland coniferous forest	Isolated	**o**		**r**	**u**			
Common Redpoll	*Carduelis flammea*	Fringilidae	Upland and lowland shrub, Upland grass, Marsh/wetland	Isolated	**o**		**o**	**o**			
Hoary Redpoll	*Carduelis hornemanni*	Fringilidae	Upland and lowland shrub, Upland grass, Marsh/wetland	Isolated	**r**			**r**			
Pine Siskin	*Carduelis pinus*	Fringilidae	Upland coniferous and deciduous forest, Upland shrub	Isolated	**u**	**u**	**c**	**u**			
American Goldfinch	*Carduelis tristis*	Fringilidae	Upland shrub, Upland grass, Marsh/wetland	Widespread	**c**	**c**	**c**	**u**			
Evening Grosbeak	*Coccothraustes vespertinus*	Fringilidae	Upland deciduous forest	Isolated	**u**	**o**	**u**	**u**			
House Sparrow	*Passer domesticus*	Passeridae	Upland shrub, Upland grass	Widespread	**u**	**o**	**o**	**o**			

Occurrence of Butterfly Species, Tamarac NWR

Common Name	Scientific Name	Family	Habitat
Black Swallowtail	*Papilio polyxenes*	Papilionidae	Upland grass
Canadian Tiger Swallowtail	*Papilio canadensis*	Papilionidae	Upland deciduous and coniferous forest
Mustard White	*Pieris napi*	Pieridae	Upland and lowland deciduous and coniferous forest, Lowland shrub, Upland grass
Cabbage White	*Pieris rapae*	Pieridae	Upland grass
Clouded Sulphur	*Colias philodice*	Pieridae	Upland grass, Marsh/wetland
Orange Sulphur	*Colias eurytheme*	Pieridae	Upland grass
Bronze Copper	*Lycaena hyllus*	Lycaenidae	Marsh/wetland
Purplish Copper	*Lycaena helloides*	Lycaenidae	Upland grass, Marsh/wetland
Eastern Tailed-Blue	*Everes comynatas*	Lycaenidae	Upland grass
Spring Azure	*Celastrina ladon*	Lycaenidae	Upland grass, Marsh/wetland, Upland coniferous forest
Great Spangled Fritillary	*Speyeria cybele*	Nymphalidae	Upland grass
Meadow Fritillary	*Boloria bellona*	Nymphalidae	Upland grass, Marsh/wetland
Northern Crescent	*Phyciodes selenis*	Nymphalidae	Upland grass
Question Mark	*Polygonia interrogationis*	Nymphalidae	Upland deciduous forest, Marsh/wetland
Eastern Comma	*Polygonia comma*	Nymphalidae	Upland deciduous forest, Marsh/wetland
Gray Comma	*Polygonia progne*	Nymphalidae	Upland deciduous and coniferous forest, Marsh/wetland
Mourning Cloak	*Nymphalis antiopa*	Nymphalidae	Upland grass, Marsh/wetland
White Admiral	*Limenilis arthemis*	Nymphalidae	Upland deciduous forest, Upland grass
Common Wood-Nymph	*Cercyonis pegala*	Nymphalidae	Upland grass
Monarch	*Danaus plexippus*	Nymphalidae	Upland grass
Least Skipper	*Ancyloxypha numitor*	Hesperiidae	Marsh/wetland, Upland grass
Northern Broken-Dash	*Wallengrenia egeremet*	Hesperiidae	Upland Grass, Upland shrub
Delaware Skipper	*Anatrytone logan*	Hesperiidae	Upland deciduous forest, Upland grass, Marsh/wetland
Dion Skipper	*Euphyes dion*	Hesperiidae	Marsh/wetland
Dun Skipper	*Euphyes vestris*	Hesperiidae	Marsh/wetland, Upland grass

Fish Species Occurring on Tamarach NWR

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance	Special Status
Bowfin, Dogfish	*Amia calva*	Amiidae	Open water	Blackbird	Occasional	
Common Shiner	*Luxilus cornutus*	Cyprinidae	Open water	Buffalo, Egg, Ottertail River, Lost	Abundant	
Horneyhead Chub	*Nocomis biguttatus*	Cyprinidae	Open water	Ottertail River	Common	
Golden Shiner	*Notemigonus crysoleucas*	Cyprinidae	Open water	Egg River, Blackbird, Lost, Pine, Two Island	Common	
Bigmouth Shiner	*Notropis dorsalis*	Cyprinidae	Open water	Ottertail River	Occasional	
Blackchin Shiner	*Notropis hetarodon*	Cyprinidae	Open water	Egg, Ottertail River, Blackbird, Lost, Two Island	Common	
Blacknose Shiner	*Notropis heterolepis*	Cyprinidae	Open water	Egg, Ottertail River, Blackbird, Lost, Wauboose	Common	
Spottail Shiner	*Notropis hudsonius*	Cyprinidae	Open water	Cotton Lake Landing	Rare	
Sand Shiner	*Notropis stramineus*	Cyprinidae	Open water	Ottertail River	Rare	
Weed Shiner	*Notropis texanus*	Cyprinidae	Open water	Ottertail River	Rare	
Mimic Shiner	*Notropis volucellus*	Cyprinidae	Open water	Cotton Lake Landing	Rare	
Northern Redbelly Dace	*Phoxinus eos*	Cyprinidae	Open water	Buffalo, Ottertail River	Common	
Bluntnose Minnow	*Pimaphales notatus*	Cyprinidae	Open water	Egg River	Uncommon	
Flathead Minnow	*Pimaphales promelas*	Cyprinidae	Open water	Egg, Ottertail River, all fishing lakes except Two Island	Abundant	
Blacknose Dace	*Rhinichthys atratulus*	Cyprinidae	Open water	Egg, Ottertail River	Abundant	
Longnose Dace	*Rhinichthys cataractea*	Cyprinidae	Open Water	Ottertail River	Occasional	
Creek Chub	*Semotilus atromaculaus*	Cyprinidae	Open water	Ottertail River	Abundant	
White Sucker	*Catostromus commersoni*	Catostomidae	Open water	Egg, Ottertail River, all 6 fishing lakes	Common	
Black Bullhead	*Ameiurus melas*	Ictaluridae	Open water	Egg, Ottertail River, all 6 fishing lakes	Abundant	
Yellow Bullhead	*Ictalurus natalis*	Ictaluridae	Open water	Ottertail River, Blackbird, Lost, Tamarac, Wauboose	Uncommon	
Brown Bullhead	*Ameiurus nebulosus*	Ictaluridae	Open water	Ottertail River, all 6 fishing lakes	Common	
Tadpole Madtom	*Noturus gyrinus*	Ictaluridae	Open water	Egg, Ottertail River, Tamarac	Uncommon	
Northern Pike	*Esox lucius*	Esocidae	Open water	Egg, Ottertail River, all 6 fishing lakes	Abundant	
Central Mudminnow	*Umbra limi*	Umbridae	Open water	Buffalo, Egg, Ottertail River	Abundant	
Banded Kilifish	*Fundulus diaphanus*	Fundulidae	Open water	Egg River, Blackbird	Rare	

Fish Species Occurring on Tamarach NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance	Special Status
Brook Stickleback	*Culaea inconstans*	Gasterosteidae	Open water	Egg, Ottertail River, Blackbird, Lost	Abundant	
Rock Bass	*Ambloplites rupestris*	Centrarchidae	Open water	Ottertail River	Common	
Green Sunfish	*Lepomis cyanellus*	Centrarchidae	Open water	Egg, Ottertail River, Blackbird	Common	
Pumpkinseed	*Lepomis gibbosus*	Centrarchidae	Open water	Egg, Ottertail River, all fishing lakes except Two Island	Common	
Bluegill	*Lepomis macrochirus*	Centrarchidae	Open water	Egg,Ottertail River, Blackbird, Tamarac, Two Island, Wauboose	Abundant	
Hybrid Sunfish	*Lepomis sp X Lepomis sp*	Centrarchidae	Open water	Buffalo, Ottertail River, Blackbird, Lost	Common	
Largemouth Bass	*Micropterus salmoides*	Centrarchidae	Open water	Ottertail River, Blackbird, Tamarac	Common	
Black Crappie	*Pomoxis nigromaculatus*	Centrarchidae	Open water	Egg River, Lost, Tamarac, Wauboose	Common	
Iowa Darter	*Etheostoma exile*	Percidae	Open water	Egg, Ottertail River, Blackbird, Lost, Tamarac, Two Island, Wauboose	Abundant	
Johnny Darter	*Etheostoma nigrum*	Percidae	Open water	Egg, Ottertail River, Lost, Wauboose	Common	
Yellow Perch	*Perca flavescens*	Percidae	Open water	All Rivers, all 6 fishing lakes	Abundant	
Log Perch	*Percina caprodes*	Percidae	Open water	Cotton Lake Landing	Occasional	
Walleye	*Sander vitreus*	Percidae	Open water	Blackbird, Lost, Tamarac, Wauboose	Common	Fed-RCP

Mammal Species Occurring on Tamarac NWR

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance	Special Status
Bowfin, Dogfish	*Amia calva*	Amiidae	Open water	Blackbird	Occasional	
Common Shiner	*Luxilus cornutus*	Cyprinidae	Open water	Buffalo, Egg, Ottertail River, Lost	Abundant	
Horneyhead Chub	*Nocomis biguttatus*	Cyprinidae	Open water	Ottertail River	Common	
Golden Shiner	*Notemigonus crysoleucas*	Cyprinidae	Open water	Egg River, Blackbird, Lost, Pine, Two Island	Common	
Bigmouth Shiner	*Notropis dorsalis*	Cyprinidae	Open water	Ottertail River	Occasional	
Blackchin Shiner	*Notropis hetarodon*	Cyprinidae	Open water	Egg, Ottertail River, Blackbird, Lost, Two Island	Common	
Blacknose Shiner	*Notropis heterolepis*	Cyprinidae	Open water	Egg, Ottertail River, Blackbird, Lost, Wauboose	Common	
Spottail Shiner	*Notropis hudsonius*	Cyprinidae	Open water	Cotton Lake Landing	Rare	
Sand Shiner	*Notropis stramineus*	Cyprinidae	Open water	Ottertail River	Rare	
Weed Shiner	*Notropis texanus*	Cyprinidae	Open water	Ottertail River	Rare	
Mimic Shiner	*Notropis volucellus*	Cyprinidae	Open water	Cotton Lake Landing	Rare	
Northern Redbelly Dace	*Phoxinus eos*	Cyprinidae	Open water	Buffalo, Ottertail River	Common	
Bluntnose Minnow	*Pimaphales notatus*	Cyprinidae	Open water	Egg River	Uncommon	
Flathead Minnow	*Pimaphales promelas*	Cyprinidae	Open water	Egg, Ottertail River, all fishing lakes except Two Island	Abundant	
Blacknose Dace	*Rhinichthys atratulus*	Cyprinidae	Open water	Egg, Ottertail River	Abundant	
Longnose Dace	*Rhinichthys cataractea*	Cyprinidae	Open Water	Ottertail River	Occasional	
Creek Chub	*Semotilus atromaculaus*	Cyprinidae	Open water	Ottertail River	Abundant	
White Sucker	*Catostromus commersoni*	Catostomidae	Open water	Egg, Ottertail River, all 6 fishing lakes	Common	
Black Bullhead	*Ameiurus melas*	Ictaluridae	Open water	Egg, Ottertail River, all 6 fishing lakes	Abundant	
Yellow Bullhead	*Ictalurus natalis*	Ictaluridae	Open water	Ottertail River, Blackbird, Lost, Tamarac, Wauboose	Uncommon	
Brown Bullhead	*Ameiurus nebulosus*	Ictaluridae	Open water	Ottertail River, all 6 fishing lakes	Common	
Tadpole Madtom	*Noturus gyrinus*	Ictaluridae	Open water	Egg, Ottertail River, Tamarac	Uncommon	
Northern Pike	*Esox lucius*	Esocidae	Open water	Egg, Ottertail River, all 6 fishing lakes	Abundant	
Central Mudminnow	*Umbra limi*	Umbridae	Open water	Buffalo, Egg, Ottertail River	Abundant	
Banded Kilifish	*Fundulus diaphanus*	Fundulidae	Open water	Egg River, Blackbird	Rare	

Mammal Species Occurring on Tamarac NWR (Continued)

Common Name	Scientific Name	Family	Habitat	Distribution	Abundance	Special Status
Brook Stickleback	*Culaea inconstans*	Gasterosteidae	Open water	Egg, Ottertail River, Blackbird, Lost	Abundant	
Rock Bass	*Ambloplites rupestris*	Centrarchidae	Open water	Ottertail River	Common	
Green Sunfish	*Lepomis cyanellus*	Centrarchidae	Open water	Egg, Ottertail River, Blackbird	Common	
Pumpkinseed	*Lepomis gibbosus*	Centrarchidae	Open water	Egg, Ottertail River, all fishing lakes except Two Island	Common	
Bluegill	*Lepomis macrochirus*	Centrarchidae	Open water	Egg,Ottertail River, Blackbird, Tamarac, Two Island, Wauboose	Abundant	
Hybrid Sunfish	*Lepomis sp X Lepomis sp*	Centrarchidae	Open water	Buffalo, Ottertail River, Blackbird, Lost	Common	
Largemouth Bass	*Micropterus salmoides*	Centrarchidae	Open water	Ottertail River, Blackbird, Tamarac	Common	
Black Crappie	*Pomoxis nigromaculatus*	Centrarchidae	Open water	Egg River, Lost, Tamarac, Wauboose	Common	
Iowa Darter	*Etheostoma exile*	Percidae	Open water	Egg, Ottertail River, Blackbird, Lost, Tamarac, Two Island, Wauboose	Abundant	
Johnny Darter	*Etheostoma nigrum*	Percidae	Open water	Egg, Ottertail River, Lost, Wauboose	Common	
Yellow Perch	*Perca flavescens*	Percidae	Open water	All Rivers, all 6 fishing lakes	Abundant	
Log Perch	*Percina caprodes*	Percidae	Open water	Cotton Lake Landing	Occasional	
Walleye	*Sander vitreus*	Percidae	Open water	Blackbird, Lost, Tamarac, Wauboose	Common	Fed-RCP

Appendix D: Refuge Species of Concern

Refuge Species of Concern, Tamarac NWR

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Birds												
Canada Goose (resident)	✔					Lake						High populations; population control
Trumpter Swan	✔		✔			Lake		✔	T		✔	Minnesota threatened species, high breeding densities, original state reintroduction site
Wood Duck	✔					Forest		✔				
Mallard	✔					Wetlands		✔				
Blue-winged Teal	✔					Wetlands		✔				
Ring-necked Duck	✔					Wetlands						
Lesser Scaup			✔			Wetlands		✔			✔	Continental pop. declines, historical high fall use on Refuge
Common Loon	✔					Lake		✔			✔	BCR12[b] UMVGL Waterbird Plan stewardship species (moderate priority)
Red-necked Grebe	✔					Wetlands					✔	BCR12 UMVGL Waterbird Plan high priority
American Bittern	✔					Wetlands		✔			✔	BCR12 UMVGL Waterbird Plan high priority
Least Bittern	✔					Wetlands		✔			✔	BCR12 UMVGL Waterbird Plan moderate priority
Great Blue Heron	✔					Wetlands						3 nesting colonies on Refuge
Bald Eagle	✔					Open lands	T	✔		✔	✔	Minnesota special concern species
Red-shouldered Hawk	✔					Forest		✔		✔	✔	Minnesota Special Concern species

Refuge Species of Concern, Tamarac NWR (Continued)

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Broad-winged Hawk	✔					Forest						BCR12 PIF-Regional stewardship species
Yellow Rail	✔					Wetlands		✔		✔	✔	BCR12 UMVGL Waterbird Plan high priority
Virgina Rail	✔					Wetlands					✔	BCR12 UMVGL Waterbird Plan low priority
Sora Rail	✔					Wetlands						BCR12 UMVGL Waterbird Plan low priority
American Woodcock	✔					Shrubland/ Forest		✔			✔	BCR12 UMVGL Shorebird Plan high priority
Forster's Tern	✔					Wetlands		✔		✔	✔	Minnesota Special Concern species, BCR12 UMVGL Waterbird Moderate Priority
Black Tern	✔					Wetlands		✔			✔	BCR12 UMVGL Waterbird Plan high priority
Yellow-bellied Sapsucker	✔					Forest					✔	BCR12 PIF-Regional stewardship species, significant regional declines (NRRI)
Downy Woodpecker	✔					Forest						
Hairy Woodpecker	✔					Forest						
Northern Flicker	✔					Shurbland/ Forest		✔				BCR12 PIF-Regional concern species
Pileated Woodpecker	✔					Forest						
Eastern Wood-Pewee	✔					Forest					✔	Significant regional declines (NRRI)
Least Flycatcher	✔					Forest					✔	BCR12 PIF-Regional stewardship species

Refuge Species of Concern, Tamarac NWR (Continued)

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Great Crested Flycatcher	✔					Forest						
Red-eyed Vireo	✔					Forest						
American Crow	✔					Open lands						Nuisance species -nest predation
Sedge Wren	✔					Wetlands/ Grasslands		✔			✔	BCR12 PIF-Regional stewardship species
Veery	✔					Forest					✔	BCR12 PIF-Regional concern species & stewardship species
Wood Thrush	✔					Forest		✔			✔	BCR12 PIF-Continental & regional concern species
Blue-winged Warbler		✔				Shrublands /Forest					✔	Hybridization with Golden-winged warblers
Golden-winged Warbler	✔					Shrublands /Forest		✔			✔	BCR12 PIF-Continental concern species & regional stewardship species, 40 percent of global population in Minnesota
Black-throated Green Warbler	✔					Forest						BCR12 PIF-Continental & regional stewardship species
Blackburnian Warbler	✔					Forest						BCR12 PIF-Continental & regional stewardship species
Pine Warbler	✔					Forest						
Black & White Warbler	✔					Forest						
American Redstart	✔					Shrublands /Forest						
Ovenbird	✔					Forest					✔	Significant regional declines (NRRI), vulnerable forest interior habitat

Refuge Species of Concern, Tamarac NWR (Continued)

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Connecticut Warbler			✔			Tamarac		✔			✔	BCR12 PIF-Regional concern species
Mourning Warbler	✔					Shrublands /Forest						BCR12 PIF-Continental & regional stewardship species
Scarlet Tanager	✔					Forest						
Eastern Towhee	✔					Shrublands /Forest						
Swamp Sparrow	✔					Wetland					✔	BCR12 PIF-Continental stewardship species
Rose-breasted Grosbeak	✔					Forest					✔	BCR12 PIF-Regional stewardship species, significant regional declines (NRRI)
Indigo Bunting	✔					Shrublands /Forest						
Brown-headed Cowbird	✔					Open lands/ Forest						Nuisance species - nest parasitism
Purple Finch	✔					Forest						BCR12 PIF-Regional concern species
Mammals												
Gray Wolf	✔					Forest	T	✔			✔	Fed. Threatened species, Minnesota special concern species
Red Fox	✔					Open lands						Nuisance species -nest predation
Raccoon	✔					Forest						Nuisance species -nest predation
Fisher	✔					Forest						Inventory & monitoring need - furbearer trapping

Refuge Species of Concern, Tamarac NWR (Continued)

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Northern River Otter	✔					Lake						Inventory & monitoring need - furbearer trapping, nest predation
Striped Skunk	✔					Open lands						Nuisance species -nest predation
Canada Lynx				✔		Forest		✔			✔	Fed. Endangered species, Minnesota special concern species
Bobcat	✔					Forest						Inventory & monitoring need - furbearer trapping
White-tailed Deer	✔					Open lands/ Forest						High populations; population control needed for habitat management
Franklin's Ground Squirrel				✔		Grassland					✔	Stewardship species, stable pop. in Minnesota, declining in region, inventory need
Beaver	✔					Wetlands						Nuisance species - impacts on wild rice & water level management, inventory need
Porcupine	✔					Forest						Nuisance species - potential tree damage, unmanaged high pops.
Reptiles												
Snapping Turtle						Wetlands					✔	Minnesota Special concern species
Amphibians												
None listed at this time												

Refuge Species of Concern, Tamarac NWR (Continued)

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Fishes												
Fathead Minnow	✔					Wetlands					✔	Nuisance - competition with waterfowl for freshwater shrimp
Common Carp				✔		Lake						Nuisance – potential habitat degradation/destruction, present in Ottertail River (south of Refuge)
Walleye	✔					Lake		✔				DNR and tribal stocking programs
Lake Sturgeon				✔		Lake		✔				DNR/FWS/WEBD stocking adjacent Refuge, protection status needed for Refuge
Muskellunge				✔		Lake						DNR stocking adjacent Refuge
Spiders												
None listed at this time												
Insects												
Poweshiek Skipper										✔	✔	Minnesota Special Concern species
Mollusks												
None listed at this time												
Plants												
Wild Rice	✔											Important staple for waterfowl & Native Americans, contributes to Refuge purpose
Leafy Spurge	✔											Invasive species – control necessary

Refuge Species of Concern, Tamarac NWR (Continued)

Species	Presence on the Refuge					Habitat	Federal Status		State Status			Rationale for Listing
	Currently Breeding on Refuge	Transient Species	Migratory	Not Presently on Refuge	Unknown		Endangered (E) or Threatened (T)	Region 3 Conservation Priority Species	Endangered (E) or Threatened (T)	Special Concern	Species in Greatest Conservation Need[a]	
Spotted Knapweed	✔											Invasive species – control necessary
Purple Loosestrife	✔											Invasive species – control necessary
Goblin Fern					✔							Minnesota Special Concern species
Native Plant Communities												
Red and White Pine communities												
Jack Pine Communities												

a. Minnesota Comprehensive Wildlife Conservation Strategy Species in Greatest Conservation Need
b. BCR = NABCI Bird Conservation Region

Appendix E: Bibliography and References Cited

Albert, D. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. United States Forest Service, North Central Forest Experiment Station., St. Paul, MN.

Carson, T.L. 2002. the effects of sedment nutrient variation, water depth, and emergent aquatic perennials on wild rice (Zizania palustris) production at the Rice lake National Wildlife Refuge. Thesis, University of Minnesota, Minneapolis, USA.

Crozier, G.E. and G.J. Niemi. 2003. Using patch and landscape variables to model bird abundance in a naturally heterogeneous landscape. Canadian Journal of Zoology 81:441-452.

Dai, X., Boutton, T. W., Hailemichael, M., Ansley, R. J., Jessup, K. E. 2006. Soil Carbon and Nitrogen Storage in Response to Fire in a Temperate Mixed-Grass Savanna. J Environ Qual. 35: 1620-1628.

Devine, B. 1999. Clear-cut mission: communities unite to free native landscapes from the grip of invasive species. Nature Conservancy 49:12-17.

Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster Inc., New York.

Engstrom, F.B. and D.H. Mann. 1991. Fire ecology of red pine (*Pinus resinosa*) in northern Vermont, USA. Canadian Journal of Forest Research 21:882-889

Forman, R.T.T. 1995. Land mosaics: the ecology of landscapes and regions. Cambridge University Press, Cambridge, U.K.

Frehlich, L.E. and P.B. Reich. 1996. Old growth in the Great Lakes region. Pp. 144-160 in M.B. Davis, ed., Eastern old-growth forests: prospects for rediscovery and recovery. Island Press, Washington, D.C.

Frehlich, L.E. 2002. Forest dynamics and disturbance regimes. Cambridge University Press, Cambridge, UK.

Green. J., 1995. Birds and Forest, a Management and Conservation Guide. State of Minnesota,

Department of Natural Resources. St. Paul, Minnesota. 182 pages.

Holling, C.S. and G.K. Meffe. 1996. Command and control and the pathology of natural resource management. Conservation Biology 10:328-337.

Hunter, M. L., Jr. 1990. Wildlife, forests, and forestry. Prentice-Hall, Inc., Englewood Cliffs, NJ.

Iverson, L.R., A.M. Prasad, B.J. Hale and E.K. Sutherland. 1999. Atlas of current and potential future distributions of common trees of the eastern United States. U. S. Forest Service, Northeastern Research Station, General Technical Report NE-265.

Johnson, W.C., B.V. Millett, T. Gilmanov, R.A. Voldseth, G.R. Guntenspergen, D.E. Naugle 2005. Vulnerability of northern prairies wetlands to climate change. BioScience 55: 863-877.

Lambeck, R.J. 1997. Focal species: a multi-species umbrella for nature conservation. Conservation Biology 11:849-856.

Leopold, A. 1933. Game Management. University of Wisconsin Press, Charles Scribner's Sons, New York, NY.

Matteson, S., A. Paulios, G. Bartelt, G. Butcher, D. Sample, J. Fitzgerald, G. Niemi, J. Hanowski and R. Howe. *In Review*. Partner's in Flight Conservation Plan for the Boreal Hardwood Transition (Physiographic Area 20 and Bird Conservation Region 12, USA).

McAndrews, J.H. 1996. Postglacial history of prairie, savanna and forest in northwestern Minnesota. Torry Botanical Club, Memoir 23(2): 1-72.

Minnesota Pollution Control Agency. 2005. Sources of mercury pollution and methylmercury

Contamination of fish in Minnesota. Pollution prevention & sustainability fact sheet #4-06. 3 pp. On the Internet at http://www.pca.state.mn.us/publications/p-p2s4-06.pdf

Minnesota Department of Natural Resources, 2006. Tomorrow's Habitat for the Wild and Rare:

An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, Minnesota Department of Natural Resources.

Noss, R. F. and J. M. Scott. 1997. Ecosystem protection and restoration: the core of ecosystem management. Pages 239-264 in M. A. Boyce and A. W. Haney, eds. Ecosystem management: concepts and methods. Yale University Press, New Haven, CT.

Rich, T. D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S.Butcher, D.W. Demarest and E.H. Dunn. W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, and T.C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology. Ithaca, NY.

Root, T. L. and S. H. Schneider. 1995. Ecology and climate: research strategies and implications. Science 269:334-339.

Root, T.L., J.T. Price, K.R. Hall, S.H. Schneider, C. Rosenzweig and J.A. Pounds. 2003. Fingerprints of global warming on wild animals and plants. Nature 421:57-60.

Sallabanks, R. and E.B. Arnett. 2005. Accomodating birds in managed forests in North America: a review of bird-forestry relationships. USDA Forest Service PSW-GTR-191.

Sauer, J. R., J. E. Hines and J. Fallon. 2005. The North American Breeding Bird Survey, results and analysis 1966 - 2005. Version 6.2.2006. USGS Patuxent Wildlife Research Center, Laurel, MD.

Schroeder, Richard L., Wayne J. King, and John E. Cornely. 1998. Selecting habitat management strategies on refuges. Information and Technology Report, USGS/BRD/ITR – 1998-003. U.S. Geological Survey.

Seymour, R.S. and M.L. Hunter, Jr. 1999. Principles of Ecological Forestry. Ch. 2 (p. 22-61) In: Managing Biodiversity in Forest Ecosystems. M.L. Hunter, Jr., editor. Cambridge University Press, Cambridge.

Simberloff, D. 1997. Flagships, umbrellas, and keystones: is single species management passé in the landscape era. Biological Conservation 83:247-257.

Stevenson, I.R. and D.M. Bryant. 2000. Climate change and constraints on breeding. Nature 406:366-367.

Tester, J.R. 1995. Minnesota's Natural Heritage: An Ecological Perspective. University of Minnesota Press, Minneapolis. 332 pp.

U.S. Fish and Wildlife Service. 2006. Tamarac National Wildlife Refuge Visitor Services Review Report. U.S. Fish and Wildlife Service. 35 pages.

U.S. Fish and Wildlife Service. 1977. A Cultural Resources Reconnaissance of Tamarac National Wildlife Refuge, 1977, Phase 1. Prepared by Clifford W. Watson and Jerry W. Oothoudt, Terra Archaeological Services, Minneapolis, Minnesota.

United States Forest Service. 2003. Regional Forester Sensitive Animals.

U.S. Fish and Wildlife Service. 2007. Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. 2007. Division of Economics,U.S. Fish and Wildlife Service, Washington, DC.

United States Fish and Wildlife Service. 2002. Fish and Wildlife Resource Conservation Priorities: Region 3. Fort Snelling, MN.

United States Fish and Wildlife Service. 1999. Fulfilling the Promise: The National Wildlife Refuge System. Arlington, VA. 94 pages.

United States Census Bureau 2005. http://www.census.gov/popest/estimates.php

U. S. Department of Commerce. Bureau of Economic Analysis. Regional Economic Accounts. www.bea.doc.gov/bea/regional/data.htm. Washington, D.C. August 2007.

Appendix F: Compliance Requirements

Rivers and Harbor Act (1899) (33 U.S.C. 403)

Section 10 of this Act requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States.

Antiquities Act of 1906. 16 U.S.C. 431 et seq.

Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Migratory Bird Treaty Act, 16 U.S.C. 703 et seq.

Designates the protection of migratory birds as a federal responsibility. This Act enables the setting of seasons, and other regulations including the closing of areas, federal or non federal, to the hunting of migratory birds.

Migratory Bird Conservation Act, 16 U.S.C. 715 et seq.

Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq. (1934)

Requires that the Fish and Wildlife Service and state fish and wildlife agencies be consulted whenever water is to be impounded, diverted or modified under a federal permit or license. The Service and state agency recommend measures to prevent the loss of biological resources, or to mitigate or compensate for the damage. The project proponent must take biological resource values into account and adopt justifiable protection measures to obtain maximum overall project benefits. A 1958 amendment added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs. It also authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds.

Migratory Bird Hunting Stamp Act. Also known as the Duck Stamp Act, 16 U.S.C. 718 et seq. (1934)

Requires every waterfowl hunter 16 years of age or older to carry a stamp and earmarks proceeds of the Duck Stamps to buy or lease waterfowl habitat. A 1958 amendment authorizes the acquisition of small wetland and pothole areas to be designated as 'Waterfowl Production Areas,' which may be acquired without the limitations and requirements of the Migratory Bird Conservation Act.

Historic Sites, Buildings and Antiquities Act. Also known as the Historic Sites Act of 1935, 16 U.S.C. 461 et seq.

Declares it a national policy to preserve historic sites and objects of national significance, including those located on refuges. Provides procedures for designation, acquisition, administration, and protection of such sites.

Refuge Revenue Sharing Act,16 U.S.C. 715s (1935)

Requires revenue sharing provisions to all fee-title ownerships that are administered solely or primarily by the Secretary through the Service.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act, 16 U.S.C. 667b-667d (1948)

Provides that upon a determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred without reimbursement to the Secretary of Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.

Federal Records Act of 1950, 44 U.S.C. 31

Directs the preservation of evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Act of 1956, 16 U.S.C. 742a et seq.

Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Refuge Recreation Act, 16 U.S.C. 460k et seq. (1962)

Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Wilderness Act of 1964, 16 U.S.C. 1131 et seq.

Directed the Secretary of Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System.

Land and Water Conservation Fund Act of 1965, 16 U.S.C. 460 et seq.

Uses the receipts from the sale of surplus federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

National Wildlife Refuge System Administration Act of 1966, 16 U.S.C. 668dd, 668ee

Defines the National Wildlife Refuge System and authorizes the Secretary to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Historic Preservation Act, 16 U.S.C. 470 et seq. (1966)

Establishes as policy that the federal government is to provide leadership in the preservation of the nation's prehistoric and historic resources. Section 106 requires federal agencies to consider impacts their undertakings could have on historic properties; Section 110 requires federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; Section 101 requires federal agencies to consider Indian tribal values in historic preservation programs, and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

Architectural Barriers Act of 1968, 42 U.S.C. 4151 et seq.

Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

National Environmental Policy Act of 1969, 42 U.S.C. 4321 et seq.

Requires the disclosure of the environmental impacts of any major federal action significantly affecting the quality of the human environment.

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, 42 U.S.C. 4601 et seq.

Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Endangered Species Act of 1973, 16 U.S.C. 1531 et seq.

Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

Rehabilitation Act of 1973, 29 U.S.C. 701 et seq.

Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the federal government to ensure that anybody can participate in any program.

Archaeological and Historic Preservation Act 16 U.S.C.469-469c

Directs the preservation of historic and archaeological data in federal construction projects.

Clean Water Act of 1977, 33 U.S.C. 1251

Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 et seq.

Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Executive Order 11988 (1977)

Each federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 11990

Executive Order 11990 directs federal agencies to (1) minimize destruction, loss, or degradation of wetlands and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372 (Intergovernmental Review of Federal Programs)

Directs the Service to send copies of the Environmental Assessment to state planning agencies for review.

American Indian Religious Freedom Act, 42 U.S.C. 1996, 1996a (1976)

Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve American Indian religious cultural rights and practices.

Fish and Wildlife Improvement Act of 1978, 16 U.S.C. 742a

Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa et seq.

Protects materials of archaeological interest from unauthorized removal or destruction and requires federal managers to develop plans and schedules to locate archaeological resources.

Farmland Protection Policy Act, Public Law 97-98, 7 U.S.C. 4201 (1981)

Minimizes the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Emergency Wetlands Resources Act of 1986, 16 U.S.C. 3901 et seq.

Promotes the conservation of migratory waterfowl and offsets or prevents the serious loss of wetlands by the acquisition of wetlands and other essential habitats.

Federal Noxious Weed Act of 1974, 7 U.S.C. 2801 et seq.

Requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other federal and state agencies.

Native American Graves Protection and Repatriation Act, 25 U.S.C. 3001 et seq. (1990)

Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Americans with Disabilities Act of 1990, 42 U.S.C. 12101 et seq.

Prohibits discrimination in public accommodations and services.

Executive Order 12898 (1994)

Establishes environmental justice as a federal government priority and directs all federal agencies to make environmental justice part of their mission. Environmental justice calls for fair distribution of environmental hazards.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996)

Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

Executive Order 13007 Indian Sacred Sites (1996)

Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd

Considered the "Organic Act of the National Wildlife Refuge System. Defines the mission of the System, designates priority wildlife-dependent public uses, and calls for comprehensive refuge planning. Section 6 requires the Service to make a determination of compatibility of existing, new and changing uses of Refuge land; and Section 7 requires the Service to identify and describe the archaeological and cultural values of the refuge.

The Act also directs the administration of the Refuge System to ensure the biological integrity, diversity, and environmental health of the System. According to the U.S. FWS Service Manual (601 FW3) this refers to the maintenance of existing elements, and where appropriate the restoration of lost or severely degraded elements. Integrity pertains to biotic composition, structure, and function at genetic, organismal, and community levels. Diversity includes protection of the broad variety of living organisms, genetic distinctions, and community compositions. Environmental health recognizes the importance of both biotic and abiotic features and processes in the System. The standard of measure for each of these terms is defined using historic conditions, or conditions and processes present prior to substantial anthropogenic changes, as indicated by the best available science and sound professional judgment.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998, 16 U.S.C. 742a

Amends the Fish and Wildlife Act of 1956 to promote volunteer programs and community partnerships for the benefit of national wildlife refuges, and for other purposes.

National Trails System Act, 16 U.S.C. 1241 et seq. (1968)

Assigns responsibility to the Secretary of Interior and thus the Service to protect the historic and recreational values of congressionally designated National Historic Trail sites.

Treasury and General Government Appropriations Act, Pub. L. 106-554, §1(a)(3), Dec. 21, 2000, 114 Stat. 2763, 2763A–125

In December 2002, Congress required federal agencies to publish their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502). The amended language is included in Section 515(a). The Office of Budget and Management (OMB) directed agencies to develop their own guidelines to address the requirements of the law. The Department of the Interior instructed bureaus to prepare separate guidelines on how they would apply the Act. The U.S. Fish and Wildlife Service has developed "Information Quality Guidelines" to address the law.

Cultural Resources and Historic Preservation

The National Wildlife Refuge System Improvement Act of 1997, Section 6, requires the Service to make a determination of compatibility of existing, new and changing uses of Refuge land; and Section 7 requires the Service to identify and describe the archaeological and cultural values of the refuge.

The National Historic Preservation Act (NHPA), Section 106, requires federal agencies to consider impacts their undertakings could have on historic properties; Section 110 requires federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; Section 101 requires federal agencies consider Indian tribal values in historic preservation programs, and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

The Archaeological Resources Protection Act of 1979 (ARPA) prohibits unauthorized disturbance of archeological resources on federal and Indian land; and other matters. Section 10 requires establishing "a program to increase public awareness" of archeological resources. Section 14 requires plans to survey lands and a schedule for surveying lands with "the most scientifically valuable archaeological resources." This Act requires protection of all archeological sites more than 100 years old (not just sites meeting the criteria for the National Register) on federal land, and requires archeological investigations on federal land be performed in the public interest by qualified persons.

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) imposes serious delays on a project when human remains or other cultural items are encountered in the absence of a plan.

The American Indian Religious Freedom Act (AIRFA) iterates the right of Native Americans to free exercise of traditional religions and use of sacred places.

EO 13007, Indian Sacred Sites (1996), directs federal agencies to accommodate access to and ceremonial use, to avoid adverse effects and avoid blocking access, and to enter into early consultation.

Appendix G: Draft Compatibility Determinations for Tamarac NWR and WMD

Tamarac NWR

Archeological Investigations 188
Environmental Education, Interpretation and Outreach 190
Firewood Cutting and Timber Harvest (non-commercial) 193
Sport Fishing 196
Hunting 199
Mushroom, Nuts and Berry-picking 202
Research 204
Trapping of Furbearers 206
Wildlife Observation and Photography 209

Tamarac WMD

Foodplots 211
Grazing 213
Haying 216
Nest Structures 219
Right-of-way 221
Seeding 223
Timber 225

COMPATIBILITY DETERMINATION

Use: Archeological Investigations

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938…

"... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Permitted archeological investigations on Tamarac National Wildlife Refuge are those requested by archeologists who are not performing the investigation for Refuge management purposes (e.g., Section 106 of the National Historic Preservation Act). Rather, permitted archeologists are pursuing their own or institutional research or are working for other parties that will be conducting activities on FWS land, or as requested by the Governor of Minnesota or Chairwoman of White Earth Reservation, and similar third party activities on lands of the National Wildlife Refuge System.

Where is the use conducted? Permits can be for anyplace on FWS owned lands, but each permit is for specific lands; i.e., no general archeological permits are authorized.

When is the use conducted? Permitted investigations can occur at any time of the year although usually not during the winter. Investigations may be as short as a few hours or go on for months, depending on the research objective. These permitted investigations occur on the Refuge because this is where the resource is found or where the resource could be disrupted.

How is the use conducted? Archeologists request Archaeological Resources Protection Act (ARPA) permits or Antiquities Act permits to conduct "Surveys and limited testing and limited collections on lands identified" and "Excavation, collection and intensive study of specific sites described" on Refuge land. Permits are issued by the Regional Director to qualified archeologists. The ARPA permit, along with a detailed project description, are submitted to the Refuge Manager for issuance of a special use permit to archeologists prior to investigation. The special use permit will define allowable dates and times for the investigation, and other management controls.

Why is the use being proposed? Archeological investigations are not priority public uses on National Wildlife Refuge System Lands as identified in the National Wildlife Refuge Improvement Act of 1997. However, allowing access to the Refuge for this activity will serve to product vulnerable resources through identification of location and assessment of condition.

Availability of Resources:

The Refuge has resources available to administer this use. This activity will require the Refuge Manager to develop and issue a Special Use Permit and random inspections of the project area. ARPA/ Antiquities permits are received by the Regional Historic Preservation Officer and issued by the Regional Director as part of normal duties.

Anticipated Impacts of the Use:

Impacts from routine pedestrian surveys, soil coring, shovel tests, and land form analysis are limited to short-term disturbance to wildlife using the immediate area and disruption of vegetative cover for growing season on an extremely small area affected by shovel tests.

Impacts from a large scale excavation are potentially longer term (several growing seasons) with associated wildlife disturbance impacts affecting

animals in the immediate area and vegetation cover disruption severe enough to require site re-grading and reseeding of the area to desired native species.

Public Review and Comment:

This compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives, archeological investigations can only occur under the following stipulation:

1. Applicant must obtain a Special Use Permit issued by the District Manager. The Special Use Permit is to prescribe administrative or management restrictions required by the District Manager.
2. Permittee will shore up walls of test pits and trenches in accordance with OSHA standards; will flag, barricade, and sign testing areas as necessary to prevent injury to the public; will refill shovel tests as soon as excavated and data recorded including replacing the vegetative plug to restore original conditions; will backfill excavations as soon as data recording is completed and seed the surface with a grass or other vegetative mix approved by the District Manager.
3. Predetermined stipulations on ARPA/Antiquities permits and the requirements in 43 CFR Part 7, "Protection of Archaeological Resources: Uniform Regulations," contain protective measures to be accomplished by archeologists.

Justification:

This use has been determined compatible provided the above stipulations are implemented. It promotes public stewardship of natural resources and helps the Refuge meet its goals and objectives. It does not materially interfere with or detract from the Services ability to meet the mission of the National Wildlife Refuge System.

The activities follow all applicable laws, regulations and policies; including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Refuge goals and objectives. These activities are compliant with the purpose of the Refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the Refuge's ability to meet habitat goals and it helps support several of the primary objectives of the Refuge.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Environmental Education, Interpretation and Outreach

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938…

"... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Environmental education is a process designed to develop a citizenry that has the awareness, concern, knowledge, attitudes, skills, motivations and commitment to work toward solutions of current environmental problems and the prevention of new ones. Environmental education within the National Wildlife Refuge System incorporates on-site, off-site, and distance learning materials, activities, programs, and products that address the audience's course of study, the mission of the Refuge System and the management purposes of the field station. Environmental education integrates the station messages with the audience's program such as integration with school curriculum, with scout badge requirements or with Elder Hostel seminar requirements. Environmental education tends to be longer in duration, often times involving pre- and post-visit discussions and multiple station visits. Interpretation is a communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource (ie., more than information). Interpretation occurs in less formal activities with Refuge staff and volunteers or through exhibits, signs, brochures, elements of special events, and tours. Outreach is a two-way communication between the FWS and the public to establish mutual understanding, promote involvement, and influence attitudes and actions, with the goal of improving joint stewardship of our natural resources. Examples of outreach include news releases, newsletters, web sites, off-site displays, and participation in community partnerships.

Where is the use conducted? Environmental education and interpretation activities may occur off-site or on-site throughout the Refuge, but are most likely to occur in the vicinity of the headquarters, Visitor Center, wildlife drive, trails and roads. Visitors are greeted with a variety of interpretive displays and signs as they traverse the trails, wildlife drive, observation platforms or explore the Visitor Center. The Refuge also maintains a website that provides interpretive information. Environmental education and interpretive programs are given upon request to school and other groups visiting the Refuge. Back-country tours and interpretive programs are offered weekly during the spring and summer months and monthly during the winter. Special events are conducted throughout the year. Off-site activities consist of teacher workshops, participation in special events, and the sharing of wildlife education trunks.

University natural resource classes may conduct in-depth explorations of the Refuge habitats.

When is the use conducted? The Refuge's Visitor Center is open year-round Monday through Sunday from May 15th to October 15th and Monday through Friday the rest of the year and hosts 65,000 visitors annually. Interpretation occurs, throughout the year, whenever a visitor reads a sign, brochures or the Refuge's website. Environmental education activities typically occur when school is in session, concentrated in the spring and fall months, but our winter programming is growing. Most activities occur during daylight hours.

How is the use conducted? All environmental education and interpretation activities are conducted with the Refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Activities done under these restrictions allow the Refuge to accomplish its management goals and provide for the safety of visitors. All programs include a description of the U.S. Fish and Wildlife Service and the Refuge System. All of the interpretive programs address at least one of a number of wildlife conservation issues such as management, watershed, habitat, wildlife, endangered species, invasive species, etc. The environmental education programs not only addresses Refuge management goals but integrates audience needs such as school curriculum requirements.

Why is the use being proposed? Permitting this activity is consistent with the National Wildlife Refuge System Improvement Act, and helps accomplish Refuge goals and promotes understanding, appreciation, and support for its mission.

Availability of Resources:

Approximately $250,000 is required to properly administer this program. This includes a full time public use specialist, a visitor center manager / volunteer coordinator and seasonal Park Ranger. In addition, staff time is required for periodic maintenance and improvement of Refuge interpretive signs, trails, observation platforms and visitor center displays.

Trained volunteers and interns provide an integral part of the Refuge's environmental education and interpretation program. They staff the Visitor Center daily, host special events, lead or co-lead interpretive and environmental education programs, and assist Refuge staff with a variety of other needs. Interns and volunteers are trained annually to conduct programs with minimal staff oversight.

Every effort is made to meet each request for environmental education and interpretive programs. However staff and funding shortages have curtailed programs and the number of requests often exceeds our resources. Based on a review of the current Refuge budget, there is enough funding to administer this program, at its reduced level, and ensure compatibility with the purpose for which Tamarac NWR was established. Strategies to improve the environmental education and interpretive program have been identified in the CCP. A seasonal Park Ranger (0.5 FTE) may be added in the future if these strategies go forward.

The Refuge has identified a need to build a facility for environmental education purposes. The facility can also be used by conservation organizations, such as the North Country Trail Association, Izaak Walton League, or Boy Scouts for meeting space. Currently, the typical school field trip is 120 students (two half-day trips with 60 each). The Refuge Visitor Center does not have the capacity to accommodate a group of that size. Visiting schools do not have alternative facilities during inclement weather and must crowd into the visitor center. The Comprehensive Conservation Plans recommends some strategies to improve the environmental education program and increase visitor use. A construction project of $500,000-plus has been identified in the CCP for this purpose. Additionally, the Tamarac NWR will seek to add a Park Ranger (1.0 FTE) if visitation increases. The annual cost of this position is estimated at $80,000.

Anticipated Impacts of the Use:

Environmental education and interpretation are not expected to have measurable environmental impacts on the Refuge, its habitats, or wildlife. Disturbance to wildlife is limited to occasional incidents like flushing wildlife (e.g. deer, waterfowl). Restrictions on locations for environmental education and interpretation and the numbers of users will assure minimal disturbance to wildlife and other public use activities.

The activities follow all applicable laws, regulations and policies, including: Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Tamarac NWR goals and objectives. These activities comply with the purpose of the Refuge and the National Wildlife Refuge System Mission. Operating these activities does not alter the Refuge's ability to meet habitat goals and it helps support several of the primary objectives of the Refuge.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during the drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives, environmental education and interpretation can only occur under the following stipulation:

Environmental education and interpretation activities will only when and where the pose little or no threat to wildlife. The impacts of any activity that occurs outside of designated public use area will be evaluated for its impacts on wildlife and for alternative locations. All activities will occur under the guidance of a Refuge staff member, volunteer or trained teacher to assure minimal disturbance to wildlife, minimal vegetation damage, and minimal user conflict between other public uses.

Justification:

Environmental education and interpretation are priority public uses for the National Wildlife Refuge System as outlined in the Refuge Improvement Act of 1997. By facilitating these uses on the Refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the Refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the Refuge's purposes and the mission of the National Wildlife Refuge System.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Firewood Cutting (Non-commercial) / Timber Harvest (Commercial)

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938…

"... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The Refuge will allow the cutting and removal of trees (firewood cutting / tree harvest) from the Refuge by third parties for the purpose of improving forest diversity and health for wildlife benefits through thinning, creating openings, removal of invasive tree species, road/trail maintenance and public safety. This covers all wood removal activities regardless of the ultimate use of the wood (e.g. firewood, pulp, etc.). Harvest may include standing and fallen trees for personal-use firewood, and commercial timber harvest.

Where is the use conducted? The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Harvest sites will vary in size from a portion of an acre up to several hundred acres depending on the site and management objectives. Timber harvest will be conducted on any portion of the Refuge other than the Wilderness Area, Research Natural Areas, and the Old Growth Area (bounded by the Blackbird Auto tour Loop). Firewood cutting will generally occur along trails, roads and firebreaks and wherever there is a need to remove hazard trees.

When is the use conducted? Depending on the goals and objectives of the timber harvest, activities could occur during any season. For instance, if the objective is to promote red and white pine regeneration, scarification of the soil is required and this is best done during the growing season. On the other hand, lowland conifer sites have soils that are prone to rutting. Management activities in this forest type should only occur during the winter when the ground is frozen. In the end, management activities should occur when they meet silvicultural objectives, would not adversely impact other ecosystem processes (e.g., water and soil quality, etc.), would facilitate access and afford protection to underlying cultural resources, soils and vegetation.

Most often, wood removal activities for the purposes of firewood, occurs October through March when there is a personal need and when there the ground is frozen and access is easy.

How is the use conducted? Firewood cutters are issued a Special Use Permit on a "first come, first serve" basis. Commercial harvesting is awarded through a bidding process. Both processes are overseen by the Refuge Manager and his/her designee, usually the Refuge Forester or Refuge Biologist. The number of people participating in either activity varies from year to year depending on need, the funding constraints, and to some extent for commercial operations, the market interest. The number of permittees typically varies from zero to ten. The areas open to tree harvest and management strategies are specified in the Refuge Forest Management Plan (initial plan dates from 1955). Firewood cutting permits will be handled on a case-by-case basis.

Equipment used for harvest may range from chainsaws and axes, to traditional logging equipment such as feller-bunchers and log skidders. Access may be by horse teams, car and trailer, pick-up truck, farm tractor, or larger traditional logging equipment including semi tractor-trailer combina-

tions. Differences in scope and necessary equipment will occur depending on the amount and type of wood available for removal.

Why is the use being proposed? The management of Refuge forests using commercial and non-commercial mechanical means and other methods is administered in accordance with wildlife and ecosystem management principles and ongoing research and land management demonstrations. This activity will only occur where the Service has determined that a management need exists to remove wood. Wood removal may be done following storm events and where trees are encroaching on hiking trails, fire breaks and/or roads, open marshes, grassland areas, jack pine savanna restoration areas, or degrading earthen water impoundment structures. Wood cutting is not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, but rather serves as a management instrument for ensuring Refuge priority habitat goals are being addressed.

Availability of Resources:

Planning, issuing permits, and monitoring a wood product harvest program would require a commitment of staff hours. Periodic and small-scale harvest operations can be adequately administered with existing staff resources. Based on past activity, we estimate that administering a small timber harvest program will require from $1,000 to $2,000 in staff salary costs. Large-scale operations affecting many acres will require additional time for planning and permit administration and oversight required (bid process, bonding, permittee selection, inspection of field work, etc.) All harvest sites are marked with flagging tape or paint by Refuge staff. By permitting a wood products harvest, the manager has identified a management need and will have secured and prioritized the necessary station resources. In the past, the Refuge has issued approximately 5 to 10 permits annually for this activity, charging a $10 permit fee. Any permit fees or timber sale receipts will not off-set costs since these funds are deposited in general accounts and not returned to the Refuge. The Draft Comprehensive Conservation Plan identifies the long-term need for 1 FTE Forester.

Anticipated Impacts of the Use:

In permitting this type of activity, the potential exists to directly impact wildlife by displacement of animals from localized areas due to disturbance, or crushing of ground nests as a result of access for this activity. These impacts are easily avoided by timing of the activity in accordance with site specific characteristics.

Indirect impacts to wildlife and Refuge goals will occur as a result of removing woody vegetation. In nearly every instance, these impacts will be positive. The removal of woody vegetation facilitates native habitat restoration efforts on the Refuge and improves habitat for grouse, deer, gray wolves, eagles, and neotropical birds. In some cases, the removal of trees along roads, trails, and dikes is necessary because of the hazard to users from dead trees, blow down or ice damage.

Potential site disturbances could include decreased aesthetics, soil erosion/compaction, water temperature change along wooded streams, destruction of ground cover, creation of weed seed beds, introduction of invasive species, and increased sedimentation due to runoff in nearby wetlands. These impacts can be minimized by leaving buffer strips near streams, wetlands and roadways and by can be avoided by timing of the activity and requiring equipment be cleaned prior to entering the Refuge. As much as possible, existing roads or trails will be utilized to limit the amount of clearing required to access the desired location.

The no-action prescription for the Wilderness Area, Research Natural Areas, and Old Growth Area promote habitat sites for cavity nesters and forest interior wildlife. Minimal site disturbance results from this prescription since equipment for wildfire suppression is the only heavy equipment that would be used on these sites.

Public Review and Comment:

This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was announced in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives, firewood cutting / timber harvest can only occur under the following stipulation:

1. Each timber harvest requires compliance with a Special Use Permit (SUP). The SUP stipulates the applicable requirements for the Forest Management Plan.

2. An SUP will be issued to minimize or eliminate site specific impacts, to meet specific

habitat and related wildlife objectives and to contribute to the purposes of the Refuge.

3. All timber harvesting is monitored by the Refuge forester or equivalent Refuge specialist for compliance to the SUP.
4. No cutting operations will be permitted from April through July 15 if nesting birds are known to use the site.
5. Standing cavity trees which are actively being used by wildlife will be marked and protected.
6. Vehicle access for wood removal will be limited to existing trails or restricted to the frozen ground period when rutting and damage to growing vegetation would occur.
7. Commercial equipment must be cleaned prior to entering the Refuge.

Justification:

In accordance with the missions of the National Wildlife Refuge System and Tamarac NWR, the 1997 Refuge Improvement Act, and the Biological Integrity Policy, this use has been determined compatible provided the above stipulations are implemented. This use allow for the conservation, management, and restoration of the wildlife and plant resources and their habitats for the benefit of present and future generations of Americans by promoting ecological integrity and historic forest conditions that are now poorly represented.

The diverse forest community that existed prior to Refuge establishment has been adversely altered by forest clearing and settlement. The current forest is even aged, growing old, and in many cases not regenerating itself. Prescribed forest management practices, including harvest, are important elements of reversing this trend. Using third parties to accomplish harvest is efficient, and is one of a number of *potential* tools to conserve, restore, or rehabilitate forest stands. Harvest will only be done to meet specific forest health and wildlife objectives as outlined in the Forest Management Plan.

The removal of dead trees reduces fuel buildup and the severity of potential wildfires. Openings created by woodcutting allow light to penetrate and stimulate the understory growth which increases browse production, woodland diversity and offers protection to desirable conifer plantings. Any direct impacts on wildlife production (take, disturbance, etc.) can be largely avoided by timing the activity so that it is not coincident with the breeding/production season.

Impacts to the habitat as a result of access for wood removal purposes are potentially significant, but also easily avoided. Ground disturbance in some areas may actually be desirable due to an improved seedbed that may result. Access to and from these areas will need to be carefully controlled (via special use permit) to avoid impacts such as rutting and increased sedimentation in area wetlands due to run-off. If existing roads are not present, access can be restricted to periods of frozen ground to avoid or minimize impacts to underlying cultural resources, vegetation and soils.

Other indirect impacts are generally considered positive and thus do not materially interfere with or detract from the purpose of the Refuge or the System mission. The removal of trees at strategic locations will benefit habitat restoration. Individuals participating in the wood harvest program will be under special use permit and thus site specific stipulations will ensure resource protection and achievement of management goals. Control of woody species encroachment on wetland and grassland habitats is a necessary management activity and directly supports the mission of the National Wildlife Refuge System.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Sport Fishing

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938…

"... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Sport fishing as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act and the National Wildlife Refuge System.

Where is the use conducted? The Refuge allows fishing on North Tamarac, Wauboose, Two Island Lakes, Lost, Blackbird and Pine Lakes. Bank fishing on the Ottertail River is permitted 50 yards on either side of the Ottertail River bridges on County Roads 26 and 126.

When is the use conducted? Fishing on North Tamarac, Wauboose and Two Island Lakes is open year-round. Blackbird and Lost lakes are open from the spring opening day of the Minnesota state walleye/northern pike season (mid-May) through Labor Day. Pine Lake is open to fishing from December 1 to March 31. Bank fishing on the Ottertail River is open year-round.

How is the use conducted? Fishing is conducted in accordance with the state and Refuge-specific federal regulations. For that portion of the Refuge within the White Earth Reservation, tribal regulations as outlined in the White Earth Conservation Code apply.

Why is the use being proposed? Recreational fishing is identified as a priority public use identified in the National Wildlife Refuge Improvement Act of 1997 and it has traditionally occurred at Tamarac NWR without adverse impacts to the purpose for which the Refuge was established. The fishing program is administered to provide recreational opportunities to visitors while avoiding negative impacts to wildlife and their habitat. The activity will promote local tourism and economic trade and enhance Service initiatives in the surrounding local communities.

The Refuge was officially opened to sport fishing in 1938 and is conducted in accordance with the Refuge Fisheries Management Plan dated November 2, 1987 and an approved amendment dated December 6, 1991.

Availability of Resources: The cost of administering this program is approximately $20,000 annually. Seventy percent of this cost is for staff salary, primarily law enforcement patrols to insure compliance with regulations. Refuge law enforcement staff often times must adjust their work schedule to weekend details and holidays for complete Refuge patrol coverage. The remaining expense is incurred by providing and maintaining brochures, signs, facilities parking lot / portions of roads maintenance, including snow removal and lake landing ramps. Based on a review of the current Refuge budget, there is enough funding to ensure administration of this program is compatible with the purpose for which Tamarac NWR was established. The Draft Comprehensive Conservation Plan identifies the long-term need for a FTE Law Enforcement Officer.

Anticipated Impacts of the Use: Sport fishing has not caused any adverse impacts to the Refuge, its habitats, visitors or wildlife. Monitoring of fish populations, dissolved oxygen sampling, winter fish rescue, and walleye fingerling production are activities the Minnesota Department of Natural Resources

has conducted on the Refuge lakes for many years, in some cases dating back to 1923. Fish surveys have demonstrated no adverse impact to fish populations due to recreational fishing. Lakes experiencing fish losses due to reduced dissolved oxygen levels from severe winters are replenished by moderate stocking of native species.

Concerns over impacts to non-target wildlife through excessive disturbance are minimized through controlled access and seasonal restrictions. Abundant submergent and emergent vegetation along lake shorelines limit fishing activity in these areas. Sufficient escape cover for flightless waterfowl and broods is available should they be disturbed by fishing activities. Boat landings are single ramped, shallow, or primitive which deters large boat/motor use. Disturbance to sensitive wild rice beds is minimized by not allowing boat fishing on the Ottertail River. No motorized access if permitted for ice fishing which minimizes potential stress to winter wildlife residents. Use of lead tackle is an impact, but to what degree, is largely unknown. Education and mandatory use of non-toxic tackle will likely be phased in. In the short-term, Refuge will focus on the use of alternative tackle.

While no impacts have been observed to date, there is potential for infestation of aquatic invasive species transported by boats, live wells, and trailers. State regulations mandating boats, trailers, anchors, and live wells are free of invasive species, informational signs posted at all landings, and educational efforts will minimize this impact.

Other concerns, such as litter and fishing line entanglement are addressed through public education and regular patrols.

The fishing program follows all applicable laws, regulations and policies; including, 50 CFR, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Tamarac NWR goals and objectives. This activity is also compliant with the purpose of the Refuge and the National Wildlife Refuge System Mission. Conducting this program does not alter the Refuge's ability to meet habitat goals, provides for public safety and supports several primary objectives of the Refuge.

Public Review and Comment: this compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives the activity can only occur under the following stipulations:

1. Control access to fishing waters and seasonal restrictions
2. Monitor fish populations to ensure an adequate and diverse fishery.
3. State and/or Tribal fishing requirements apply on the Refuge.
4. The following Refuge-specific regulations and restrictions apply:
   - Fishing is restricted to those areas designated.
   - Bank fishing only along designated roadways
   - Fishing hours are between 5:00 a.m. to 10:00 p.m.
   - Vehicles are permitted only on designated roads and trails where gates are open. Motorized vehicle use on the ice, including snowmobiles and ATVs, is prohibited.
   - No personal possessions may be left overnight on the Refuge, including ice shelters and fish traps.
5. Annually review all fishing activities and operations to ensure compliance with all applicable laws, regulations and policies.

Justification: This use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not diminish the primary purposes of the Refuge. This use will meet the mission of the NWRS by providing renewable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

State fishing regulations allow the traditional taking of game fish species with rod and reel from shore or boat, through the ice, and by using trotlines and jugs. Removal of rough fish by spear, archery and dip net is allowed, as well as the taking of limited quantities of crayfish, frogs, minnows, leeches and turtles for personal use. Currently, the taking

of crayfish, frogs, minnow and turtles is minimal. Should this activity grow, the Refuge may need to monitor the use for impacts to fish, wildlife and habitats.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2023

COMPATIBILITY DETERMINATION

Use: Hunting

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938:

> "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)
>
> "... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Hunting of game as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act and the National Wildlife Refuge System. Hunting is currently allowed for small game (Ruffed Grouse, gray, red and fox squirrel, snowshoe hare and cottontail rabbit), furbearer (red fox, raccoon and striped skunk), big game (white-tailed deer), and migratory bird (ducks, geese, American woodcock, coot and common snipe) on Tamarac NWR.

Hunting is a traditional activity on Tamarac NWR and continues to be very popular. The Refuge experiences roughly 8000 visits per year with white tail deer hunting remaining the favorite activity. Actual hunter visits may vary year to year depending on a number of factors, such as weather conditions and animal population cycles. Most hunting for American woodcock is incidental to grouse hunting.

Where is the use conducted? The entire Refuge is open to small game, furbearer and deer only hunting except, roughly 1,800 acres, which surrounds the Refuge buildings and public use facilities is closed to hunting. Migratory bird hunting is restricted to two zones – the visitor use area south of County Road 26 except for approximately 1,100 acres surrounding Blackbird and South Chippewa Lakes and the area north of County Road 143 up to the northern shorelines of Big Egg, Lower Egg, Wauboose and Dry Lakes, including Two Island and Carmen Lakes.

When is the use conducted? The hunting season traditionally begins in mid-September on Tamarac NWR. All hunting activities are in accordance with state of Minnesota and White Earth Reservation seasons. Some of the more popular species and seasons hunted include the following: Small game – (Ruffed Grouse) mid-September to early January, (squirrels and rabbits) mid-September through February; furbearer (fox, raccoon and skunk) traditionally the last week of October through February. An annual youth waterfowl hunt occurs in September, prior to the general waterfowl season. Waterfowl season typically begins on the Saturday closest to October 1. The Canada Goose hunting has early, regular and late seasons, beginning as early as September 1 and ending as late as mid-December.

The Refuge deer hunting seasons are defined by method of take and are set by the Minnesota Department of Natural Resources with regular firearms as a 9-day season in mid-November; archery typically beginning mid-September through December and muzzle-loader hunting occurring after the firearm season, late November to mid-December.

To increase wildlife observation opportunities during the hunting season or to minimize conflict between user groups, a portion of the visitor use area south of County Road 26 and bounded by the auto-tour route is delayed for hunting until October 15. The Blackbird Auto Tour and Old Indian Hiking Trail are popular for wildlife photographers and nature enthusiasts who want to experience the spectacular fall colors of the area.

Tribal hunting seasons generally open two weeks prior to state seasons and may extend beyond the state seasons.

How is the use conducted? To ensure a quality hunt and visitor and staff safety, all hunting activities are in accordance with federal, state, and White Earth Reservation, subject to Refuge-specific regulations. Tribal regulations apply only to that portion of the Refuge within the White Earth Reservation. Hunting activities are intended to meet the National Wildlife Refuge System Improvement Act and some of the Refuge objectives and management goals without adversely affecting the primary objectives and mission of the Refuge. Completing this activity under a hunting plan allows the Refuge to accomplish its management goals and provide needed safety levels for citizens of the area without adversely affecting Refuge habitats and wildlife populations. Hunting activities can only occur in designated areas listed in the hunt management plan. A Refuge Hunting Regulations brochure is available to inform the public of hunting opportunities and Refuge regulations. state regulations are published in the Minnesota Hunting and Trapping Regulations Handbook. White Earth Reservation regulations can be found in their Conservation Code Handbooks.

Support facilities that are available for hunting include boat ramps, mowed secondary roads/trails for non-motorized access, and parking areas. Persons with disabilities may be granted special permits or exceptions to some hunting regulations.

Why is the use being proposed? Hunting is identified as a priority public use identified in the National Wildlife Refuge Improvement Act of 1997 and it has traditionally occurred at Tamarac NWR without adverse impacts to the purpose for which the Refuge was established. The hunt program is administered in accordance with sound wildlife management principles and the utmost concern for public safety.

Availability of Resources:

Approximately $30,000 is required annually to administer the hunting program. Staff support of this program cost $20,000. Refuge staff must adjust their work schedules to accommodate hunters early and late each day and on weekends. Additionally, law enforcement officers patrol to insure compliance with hunting regulations. Overhead expenses including signs, leaflets, parking lot /portions of roads maintenance (snow removal), trail mowing and equipment is estimated at $10,000. Based on a review of the current Refuge budget, additional funding of $21,500 will be required to ensure compatibility and to administer and manage the hunts. The Draft Comprehensive Conservation Plan identifies the long-term need for 1 FTE Law Enforcement Officer.

Anticipated Impacts of the Use:

This activity has shown no assessable environmental impact to the Refuge, its habitats or wildlife species, but the activity is monitored closely for any signs of change. Hunting does cause mortality and disturbance to those species hunted, but bag limits, season dates, and other regulations are set to protect the long-term health of populations. Repeated use of an area by boats equipped with "go-devils" can damage emergent and submergent vegetation beds. Concerns primarily center on the possibility of impacting sensitive non-target species through excessive disturbance. Visitor safety and law enforcement issues are also important. Providing restrictions that limit access to specific Refuge locations will minimize disturbance and unsafe vehicle access. Disturbance to wildlife is limited to occasional flushing of non-target species during the open hunting season. Nearly all migratory waterfowl have left the Refuge prior to the mid-November deer hunt. Law enforcement patrols are conducted regularly to ensure compliance with regulations. The hunting program follows all applicable laws, regulations and policies; including, 50 CFR, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Tamarac NWR goals and objectives. This activity is also compliant with the purpose of the Refuge and the National Wildlife Refuge System Mission. Conducting this program does not alter the Refuge's ability to meet habitat goals, provides for public safety and supports several primary objectives of the Refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives the activity can only occur under the following stipulations:

1. This use must be conducted in accordance with state, tribal and federal regulations, and special Refuge regulations published in the Refuge Hunting Regulations and Public Use Regulations brochures.

2. Hunting hours are determined by state regulations except as restricted by Refuge specific regulations.
3. Deer harvested must be registered at Minnesota DNR check stations in accordance with state regulations.
4. The following Refuge-specific regulations and restrictions apply:
   - Hunting hours are restricted to 5 a.m. to 10 p.m. daily.
   - Use of dogs to hunt furbearers is prohibited.
   - Snowmobiles and ATV's are prohibited on Refuge roads and trails.
   - Shotgun hunters may only use or possess non-toxic shot while hunting migratory birds and small game.
   - Parking, blocking, or in any manner restricting access to roads and gates is prohibited.
   - All personal property must be removed at the end of each hunt day.
5. Continue annual deer surveys and use of deer population modeling by Minnesota DNR to ensure population estimates are within target levels.
6. Annually evaluate/monitor hunting methods to ensure safety.
7. Annually review all hunting activities and operations to ensure compliance with all applicable laws, regulations and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not diminish the primary purposes of the Refuge. This use will meet the mission of the NWRS by providing renewable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

Without a hunting program specifically used as a management tool, the Refuge deer population may adversely affect plant communities, and hence alter ecological diversity and succession. This may result in significant negative impacts on both plant and other animal communities including some of special concern or of Service trust responsibility. This impact has been well documented and accepted through research over a period of many years. The white-tailed deer hunting plan objectives will ultimately result in a deer density of 13 to 18 deer / mi2. This deer density will maintain the Refuge deer population at the upper limit of a reasonable equilibrium with its environment as estimated for the Laurentian Mixed Forest region.

Migratory bird hunting seasons and bag limits are established by the states within a framework set nationally by the U.S. Fish and Wildlife Service. These restrictions ensure the continued well-being of overall populations of migratory birds. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. The system of Waterfowl Hunting Closed Areas on the Refuge provides feeding and resting areas for migratory birds during the hunting season. Specific Refuge regulations address equity and quality of opportunity for hunters.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Mushroom, Nuts and Berry Picking

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938:

> "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)
>
> "... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Non-commercial harvest of berries, nuts and mushrooms for human consumption, primarily chokecherries, high bush cranberries, raspberries, acorns, hazelnuts and morel mushrooms.

Where is the use conducted? These activities may occur throughout the 42,738 acres of Tamarac NWR. Approximately 50 people participate in this activity annually, and most access areas adjacent to existing roads and trails.

When is the use conducted? Mushroom, nut and berry picking are authorized year-round in the Visitor Use Area (that part of the Refuge south of County Road 26) and in the Sanctuary Area (that part of the Refuge north of County Road 26) September through February. However most of the activity is concentrated during the few weeks when that the fruits ripen.

How is the use conducted? This is an activity that is often done in conjunction with other activities that are wildlife dependent, such as wildlife observation and photography. Access to harvest sites is accomplished by walking from a designated parking area, public roadway or trail. All harvesting is done by hand.

Why is the use being proposed? Mushroom, nut and berry picking are traditional outdoor activities that bring families to the Refuge. It allows them to collect wholesome, healthy foods while enjoying the natural environment.

Availability of Resources: There is little or no cost to administer this program. It occurs in conjunction with other public uses and participation is low.

Anticipated Impacts of the Use: Historically, public participation in mushroom, nut and berry picking has been low and future participation is also expected to be low. Most activity occurs adjacent to existing roads and trails, therefore disturbance to wildlife will be minimal. The relatively few mushrooms, nuts and berries harvested will not significantly reduce the food source for wildlife.

Public Review and Comment: this compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: All users must comply with Refuge specific regulations.

Justification:

This use has little impact to wildlife or habitat since it is recreational in nature and few people participate. In addition, a relatively small portion of the Refuge is accessed by mushroom, nut and berry pickers, because most Refuge trails are not open to motorized vehicles. Ocular estimates of picked over areas reveal a very low percentage of total fruit

picked, so no appreciable effect on wildlife mast is anticipated. This activity provides hours of enjoyable recreation and promotes a positive image of the Refuge.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2018

COMPATIBILITY DETERMINATION

Use: Research

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938:

> "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)
>
> "... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is research projects conducted by Universities and other academic institutions; government agencies such as the Minnesota Department of Natural Resources, Tribal Department of Natural Resources and U. S. Geological Survey (USGS); consultants hired by the Service, private conservation organizations such as The Nature Conservancy and others. Research projects will focus on better understanding of Refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.

A Refuge research application, accompanied by a written project proposal, is required for review and approval before access will be allowed. If approved, access to Refuge lands and waters will be limited to the least invasive means required to accomplish the activities. A formal application and project proposal is not required in the case of contractors hired directly by the Service. Research will be carried out by professors, students, contractors, and Refuge staff and volunteers. Researchers will be required to provide written reports and make their data available to Refuge staff. Research results will be used to assist Refuge staff in making wise management decisions and to support adaptive management processes.

Where is the use conducted? Research activities will occur throughout the Tamarac NWRs 42,738 acres, occasionally on adjoining state lands (Hubbel Pond WMA) or on adjoining White Earth Band of the Chippewa Reservation under cooperative agreements with the White Earth Reservation Natural Resources Department.

When is the use conducted? Research may be conducted year-round but usually occur from April to November.

How is the use conducted? Research activities are managed through the Special Use Permit process and overseen by the Refuge Manager and his/her designee, usually the Refuge Biologist. All research activities will be conducted with the Refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Research may be conducted by foot, vehicle, canoe, kayak, boat, airboat, and aerial methods. Marking of nests and individual animals may be required. Every effort will be made to minimize the impacts of research activities on wildlife and their habitats and avoid conflicts with public use and management activities. A Special Use Permit will be issued for each research project that specifies what, when, where, and how research may occur on the Refuge.

Why is the use being proposed? Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife Refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Availability of Resources:

Much of the research and monitoring is funded by grants, other government agencies, universities, or conducted by students and volunteers. Refuge staff involvement includes reviewing research proposals, supervising or monitoring research activities, reviewing reports, providing some equipment and vehicles, and occasionally participating in field work. Staff time is required for development and/or review of research proposals/reports, administration of Special Use Permits, supervision of students and volunteers, coordination with researchers, maintenance of vehicles, specialized equipment and facilities (bunkhouse). Based on a review of the current Refuge budget, there is enough funding to ensure administration of this program is compatible with the purpose for which Tamarac NWR was established.

Anticipated Impacts of the Use:

Disturbance to wildlife and vegetation by researchers could occur through vegetation sampling, capture and handling of wildlife, observation activities, banding, and accessing the study area. It is possible that direct or indirect mortality could result as a byproduct of research activities. However, the overall impact of allowing well designed and properly reviewed research to be conducted by non-Service personnel is likely to have very little impact on Refuge wildlife populations. If the research project is conducted with professionalism and integrity, potential adverse impacts are likely to be outweighed by the knowledge gained about an entire species, habitat or public use.

Public Review and Comment:

This compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives the activity can only occur under the following stipulations:

1. Researchers will submit a study proposal and designate specific area(s) on the Refuge where activity is to occur.
2. Each research proposal is evaluated to insure the projects gives us a better understanding of Refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.
3. Each research proposal is evaluated to insure the least invasive techniques are used.
4. Researchers must follow their study proposal and comply with the provisions of their Special Use Permit.
5. Researchers must coordinate their activities with the biological staff and management staff.
6. A report must be submitted at the end of each field season and at the conclusion of the study.
7. Researchers must make any data collected while at the Refuge available for Refuge use.
8. Refuge research activities are evaluated annually to insure that their collective impacts do not compromise the goals or objectives of Tamarac NWR and to ensure compliance with all applicable laws, regulations and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Trapping of Furbearers

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938:

> "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)
>
> "... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The Refuge allows trapping of resident furbearers as a priority activity of the White Earth Band, Chippewa Tribe of Minnesota and by the public in accordance with state, Tribal, and Refuge-specific regulations. This compatibility determination does not apply to trapping activities where the Service awards a contract or permit for the removal of animals to facilitate management (ie predator control of ground-nesting birds or water control structures and roadways protection from flooding or dam blow-out). Trapping is not a priority public use, as defined by the Refuge Improvement Act of 1997, of the National Wildlife Refuge System.

Trapping and furbearer management activities have evolved since Refuge establishment. During 1938-1944, no trapping was permitted on the fee title Refuge land. The first season was held in 1945, and then was closed again in 1946. During 1947-1968, some trapping was done each year. At least through the mid-1960's, trapping was considered an economic Refuge activity. Between 1969 and 1975, the permits were awarded by lottery. Beginning in 1976, only enrolled members of the White Earth Band, Chippewa Tribe of Minnesota were able to obtain permits.

The matter of public demand for and opinion of trapping on Tamarac NWR was resolved in the early 1980s when several court decisions were finalized. The ruling made it clear that the White Earth Band had sovereign rights to harvest fish and wildlife within the reservation boundary pursuant to the Treaty of 1867. While the Fish and Wildlife Service controls access to Refuge lands, those sovereign rights are defended and prohibition of trapping on the reservation portion of the Refuge is a management alternative available only to the White Earth Reservation Tribal Council.

The southern, non-reservation portion of the Refuge is affected by the Collier Agreement of 1935. That document specifies that furbearer trapping is a priority privilege of the White Earth Band on the entire Refuge. The Fish and Wildlife Service can restrict trapping off the reservation for biological or public safety reasons. The letter of the Collier Agreement does not grant exclusive rights or privileges.

Where is the use conducted? The Refuge is divided into seven trapping units. Special use permits for trapping mink, muskrat and raccoon are issued through a bid system. Nuisance beaver trappers are selected by the Refuge Manager. The number of individuals that participate in the trapping program varies each year but is usually less than ten individuals.

How is the use conducted? The Trapping Plan of September 18, 1990, amended in September 5, 1991 provides guidance for issuing permits. The Refuge is divided into seven trapping zones. Annually, one permit is issued for each zone. The designated permittees are authorized to take beaver, mink, muskrat, raccoon, fox, coyote, and badger exclusively and only in that zone. The Trapping Plan was amended in 1994 to permit the take of otter.

Permits are issued following a random drawing conducted by the Refuge and White Earth Biological Department (WEBD) personnel at an agreed upon location. Drawing dates are determined annually by mutual agreement of Refuge personnel and

WEBD personnel. Only enrolled tribal members are eligible to apply. Non-tribal members may be offered trapping opportunities if the alternate list of tribal applicants is exhausted. Also, if the Refuge Manager determines that the tribal permittee in a zone is ineffective and there is a biological or damage control need to harvest a furbearer species, a non-tribal member may be selected to trap.

On those portions of the Refuge lying within the reservation boundary (all of zones 1 and 2, and portions of zones 3, 4, and 5), permittees are governed by seasons, bag limits, methods of take and license requirements established by the White Earth Reservation Tribal Council and Refuge coordination. On the remainder of the Refuge (zones 6 and 7, and portions of 3, 4, and 5), regulations of the Minnesota Department of Natural Resources are applicable.

Damage Control Trapping: Under provisions of 50 CFR 31.14, the Refuge Manager may conduct operations to take or destroy animals that are detrimental to the Refuge's management program or that are destroying federal property. Instances for exercise of this authority would include control of beaver damage to real property such as roads and water control structures and control of small rodents in and around Refuge buildings. Operations may be conducted by Refuge staff or contractor/permittees as directed by the Refuge Manager.

When would the use be conducted? The trapping seasons for various species of furbearers generally runs from September 1 through mid-May. Trapping for beaver, red fox and striped skunk occurs throughout the year, at times and problem sites throughout the Refuge, as directed by the Refuge Manager.

Availability of Resources:

Estimated administrative costs of the program are 10 staff days, or about $3,500 of salaries and fringe benefits. Approximately 70 percent of that time involves administration of the program, including permit drawings, reporting requirements, enforcement, and place of locks. The remainder consists of typing permits, answering trapping related questions via telephone, email or mail. Administrative costs for the nuisance beaver control activities are approximately $2,800 and include administration of special use permit, coordination with trapper and reporting.

Anticipated Impacts of the Use:

Control of predators that prey on nesting waterfowl and other ground nesting birds improves success of these birds. Direct impacts to the waterfowl production are negligible due to the temporal separation of trapping and nesting activity. Beaver trappers using the Refuge after early March, undoubtedly disturb individuals on occasion, and cause temporary displacement of waterfowl from specific and limited areas. These impacts would be occasional, temporary, and isolated to small geographic areas. Any habitat change as a result of the physical impacts of trapping activity (trampling, etc.) is undetectable and insignificant.

Although seasons open in September and extend into late spring, few permittees actually begin trapping when October waterfowl concentrations are present. Few trappers in this area are active before mid-November when furs "prime-up". That, coupled with the small number of permittees, results in little disturbance of waterfowl.

Indirect impacts to wildlife production do result from the removal of animals under a trapping program. In many instances, these impacts are positive. Mink and raccoon are predators on waterfowl at various stages in the production cycle. Controlling populations of predators on waterfowl has generally positive impacts on the Refuge purpose.

The Refuge is saturated with beaver colonies and pioneering individuals. At these population levels, an increasing number of individuals are interfering with water control activities by placing dams at the control structures and/or in the delivery ditches, hindering the movement of water between managed Refuge wetlands. These dams also cause damage to the Refuge infrastructure due to the resultant flooding at water control structures. The flooding undermines Refuge and county roadway integrity and increases the potential for these areas to washout. It is desirable and cost effective to allow a trapping program to reduce these populations, thereby reducing the Refuge's annual maintenance costs associated with the adverse impacts of beaver activity.

Managing beaver and muskrat populations, at reasonable levels, through a trapping program, results in positive impacts to waterfowl and other aquatic wildlife species by habitat enhancement. Muskrats build houses and dens using aquatic vegetation, thus creating openings available for fish, waterfowl and other migratory birds. Beaver dams create ponded habitat, and their lodges are also associated with openings in aquatic vegetation beds. These benefits minimize the need to commit Refuge resources to achieve these habitat conditions.

When considering impacts to Refuge purpose, impacts of the trapping program obviously include those to the furbearer populations themselves. Individual animals are harvested and removed, yet the Minnesota DNR indicates furbearer populations are stable to increasing. Harvest data derived from

trapper Fur Catch Reports indicate that trapper efficiency has remained fairly constant despite fewer total animals trapped. Harvest data best reflect the number of trappers, trapping conditions, and fur prices.

Public Review and Comment:

This Compatibility Determination was prepared concurrently with, and included in the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives, trapping of furbearers can only occur under the following stipulation:

1. This use must be conducted in accordance with state, tribal and federal regulations, and special Refuge regulations published in the Refuge Hunting Regulations and Public Use Regulations brochures.
2. Trappers must obtain a Special Use Permit to trap on the Refuge and comply with existing Refuge Trapping Regulations.
3. The following Refuge-specific regulations and restrictions apply:
   - Refuge is open from 5 a.m. to 10 p.m. daily
   - Snowmobiles and ATVs are prohibited on Refuge roads and trails.
   - Parking, blocking, or in any manner restricting access to roads and gates is prohibited.
   - The trapping program is monitored annually and trappers will continue to be required to report effort and catch.
   - Regulations can be altered or areas closed as needed to meet wildlife and habitat objectives.

Justification:

Trapping is not priority public uses on National Wildlife Refuge System Lands as identified in the National Wildlife Refuge Improvement Act of 1997. The damage to dike structures, forest and marsh habitat within the Refuge from an over-abundance of beaver requires control of these populations. A limited number of migratory waterfowl are present during the majority of the trapping activity and disturbance to resident wildlife is minimal and temporary.

With the decade long decline in the fur market and trapping participation, control of furbearer populations are being lost. Trapping assists in maintaining a healthy balance between furbearers and habitat, and safeguarding Refuge infrastructure. High populations of predator, such as the red fox, can decrease nest success of ground-nesting migratory birds, thus compromising a purpose of the Refuge. Other furbearers damage Refuge infrastructure such as beaver that plug water control structures. Costs of repair require the Refuge to divert resources away from other management activities that otherwise meet the purposes of the Refuge.

The trapping program, as managed and with stipulations previously described, does not materially interfere with or detract from the Service's ability to meet Refuge purposes or the mission of the National Wildlife Refuge System it does support our management objectives. Overall, managed furbearer trapping contributes to the purposes of the Refuge by maintaining vigor and health of furbearer populations and by safeguarding Refuge infrastructure critical to habitat for scores of fish and wildlife species.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Wildlife Observation and Photography (including means of access)

Refuge Name: Tamarac NWR

Establishing and Acquisition Authorities: Executive Order 7902 on May 31, 1938, Migratory Bird Conservation Act and the Migratory Bird Hunting Stamp Act.

Refuge Purpose(s):

Tamarac National Wildlife Refuge was established in 1938:

> "... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938
>
> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. ¤ 715d (Migratory Bird Conservation Act)
>
> "... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

National Wildlife System Mission: to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? General public access to observe and/or photograph wildlife and Refuge habitats including the means of access such as automobile, hiking, bicycling, canoeing, kayaking, snowshoeing and cross-country skiing. Under the National Wildlife Refuge Improvement Act, of 1997, wildlife observation and photography are priority public uses.

Where is the use conducted? These activities could take place anywhere on the Refuge but most often occur in the vicinity of roads and visitor use facilities. Within and around the Refuge there are approximately 50 miles of county and township roadways. Additionally, the Refuge contains nearly 50 miles of service roads and trails that are open to hiking, snowshoeing and cross-country skiing. The Refuge offers a 5-mile auto-tour drive, a 2.25-mile hiking trail, a short interpretive trail, 8 miles of groomed ski trails and two observation platforms with accessible spotting scopes. Non-motorized boating is allowed in Blackbird Lake.

When is the use conducted? The uses typically occur during the daylight hours throughout the year. The Refuge is open 5 a.m. to 10 p.m. The Refuge's Visitor Center is open year-round Monday through Sunday from May 15 to October 15 and Monday through Friday the rest of the year. The Sanctuary Area includes lands and trails north of County Road 26. This area is closed to the public from March 1 through August 31 to give wildlife a sanctuary during the breeding season. The Visitor Use Area south of County Road 26 is available for public use year-round.

How is the use conducted? All wildlife observation and photography activities will be conducted with the Refuge's goals, objectives and management plans as the guiding principles. Activities done under these restrictions allow the Refuge to accomplish its management goals and provide for the safety of visitors. Entry on all or portions of individual areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety. County and township roads do not have access restrictions.

Why is the use being proposed? Wildlife observation and photography are priority public uses on National Wildlife Refuge System Lands as identified in the National Wildlife Refuge Improvement Act of 1997. Allowing access to the Refuge for wildlife observation and photography is consistent with goals of the Refuge and the National Wildlife Refuge System.

Availability of Resources:

Approximately $50,000 is required to maintain the Refuge roads, trails and facilities used by the public engaged in wildlife observation and photography. Currently, with the assistance of the volunteers and the Tamarac Interpretive Association, there is enough staff and funding available to administer these activities.

Anticipated Impacts of the Use:

Wildlife observation and photography cause minor disturbance to wildlife. Wildlife quickly become accustomed to vehicles along the wildlife drive and non-motorized access is typically by along

established trails or roads. There is temporary disturbance to wildlife due to human activity on the land. The most likely impact to the Refuge purposes would be during the spring and early summer nesting and brood rearing, and during spring and fall migration. The Refuge has minimized this impact by providing a Sanctuary Area for wildlife during the critical use period. Winter activities pose no impacts to nesting waterfowl and little impact to vegetation. The winter disturbance to resident wildlife is temporary and minor. Overall, the disturbance is limited to a small portion of the entire Refuge. Blackbird Lake is designated non-motorized since it is along our auto-tour route which was developed for the purpose of wildlife observation. Abundant submergent and emergent vegetation along lake shorelines will limit boating activity in these areas. Sufficient escape cover for flightless waterfowl and broods is available should they be disturbed by canoeing/kayaking activities.

Wildlife observation and photography are priority public uses listed in the National Wildlife Refuge System Improvement Act. By facilitating these uses on the Refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the Refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the Refuge's purposes and the mission of the NWR System.

Public Review and Comment:

This compatibility determination was part of the Draft Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, which was in the Federal Register and available for public comment for 30 days.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac NWR goals and objectives, wildlife observation and photography can only occur under the following stipulation:

1. The Refuge is open from 5 a.m. to 10 p. m.
2. Motorized vehicles are restricted to designated roadways.
3. All Terrain Vehicles and snowmobiles are prohibited.
4. Camping, overnight use, and fires are prohibited.
5. No photo or viewing blinds may be left over night.
6. Harassment of wildlife or excessive damage to vegetation is prohibited.
7. Horseback riding and bicycling are restricted to the Blackbird Auto Tour Route, Bruce Boulevard, and county and township roads.

Justification:

This use has been determined compatible provided the above stipulations are implemented. It promotes public stewardship of natural resources and helps the Refuge meet its goals and objectives. It does not materially interfere with or detract from the Services ability to meet the mission of the National Wildlife Refuge System.

The activities follow all applicable laws, regulations and policies; including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Refuge goals and objectives. These activities are compliant with the purpose of the Refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the Refuge's ability to meet habitat goals and it helps support several of the primary objectives of the Refuge.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10 or 15 year Re-evaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Establishing Food Plots for Resident Wildlife

Station Name: Tamarac WMD

Establishing and Acquisition Authorities:

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties - Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations - "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? Allow the establishment of food plots on FmHA Conservation Easements to provide cover and food sources during harsh winter conditions. Particularly during severe winters, food plots are widely recognized as important to maintain populations of resident wildlife.

Where is the use conducted? The use can occur throughout the Tamarac Wetland Management District on specific areas identified as critical wintering areas for resident wildlife.

When is the use conducted? Food plots are small fields of agricultural crops with some or the entire crop left standing through the winter. Typically, these food plots are maintained for multiple years.

How is the use conducted? The food plots are maintained by private easement owners under a Special Use Permit issued by the Refuge Manager. The use must be carried out in accordance with the stipulations listed below. Typically, these food plots are maintained multiple years and sometimes rotated between locations on the easement for plant or insect pest resiliency. Following abandonment, food plot are replanted to perennial vegetation. The use of food plots also reinforces a shared conservation interest between the U.S. Fish and Wildlife Service and the conservation easement owners.

Food plots are not a priority public use as identified in the Refuge Improvement Act. Food plots are a non-essential but helpful tool to facilitate two priority uses (hunting and wildlife observation) since they help maintain high populations of species widely viewed as desirable to view and hunt.

Availability of Resources:

The cost of establishing and managing food plots is borne by private landowners, requiring minimal Service resources. There is a modest administrative cost associated with developing Special Use Permits and overseeing compliance. These costs typically involve a few hours of staff time lasting several years.

Anticipated Impacts of the Use:

Food plots are approximately 5 acres or less in size, generally located on land that has been abandoned from farming. The planting of agricultural crops for food essentially eliminates the land for use by ground nesting wildlife. The loss of a few acres of potential nesting cover would have minimal impact. Most grassland bird species generate far better production when nesting in large contiguous blocks of grassland. Careful site location of food plots in field corners or "out of the way", odd areas can avoid breaking up a large grassland block into smaller fragments. Some migratory birds actually benefit from the effect of adding more vegetative edges and encouraging some annual weed growth in and around a grassland block. However, these tend to be species whose populations are less imperiled than those requiring large grassland blocks. Impacts to waterfowl nesting can be reduced but not eliminated by siting the food plots strategically and confining their use to critical areas. Stipulations identified later in this document will prevent critical resources such as native prairie remnants or large, contiguous blocks of grassland or forest habitat from being degraded or destroyed by food plots.

Impacts from herbicide use to establish and maintain food plots will be greatly reduced by restricting products to zero or low toxicity chemicals. No insecticide use will be allowed on food plots. Runoff and erosion are minimized with proper food plot topographical location.

Food plots tend to be popular areas for hunting and the increased levels of hunting around food plots will cause mild increases in wildlife disturbance. These periodic disturbances should be mainly limited to autumn and early winter hunting seasons and produce no breeding season impacts and only minor disturbance impacts to waterfowl.

The cultivating, planting, and chemical application activities associated with food plots creates brief episodes of intrusion from agricultural equipment but this disturbance impact to wildlife is small.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about District operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge-Wetland Management District Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

1. Areas for food plots must be identified as critical wintering sites for resident wildlife.
2. Food plots will not have negative impacts on critical habitats such as wetlands, native prairie remnants, and continuity of forests.
3. Food plots will be located to avoid grassland and forest fragmentation.
4. Allowable species for planting in food plots will include: corn, soybeans, sunflowers, wheat, barley, oats, rye, buckwheat, millet, and sorghum.
5. Food plots will be no greater than five (5) acres and will occupy no more than 5 percent of the total acreage of the conservation easement.
6. No more than one food plot in any year will be authorized per easement tract.
7. Chemical use is restricted to the Region 3 Pesticide Approval list and all chemical label requirements and restrictions.
8. The permittee is required to re-seed the food plot to native vegetation if/when it is abandoned.

Justification:

Controlled use of food plots will not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System. Food plots can create significant interference with conservation easement purposes and are thus more stringently controlled to ensure that they remain compatible. Allowing the use of food plots can lead to higher and more stable resident wildlife populations by reducing catastrophic population crashes during severe winters. These higher populations facilitate two priority public uses, hunting and wildlife observation. The impacts to waterfowl and other migratory birds are modest based on limiting the size and location of food plots, and the stipulations in place.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Re-evaluation Date: 2020

COMPATIBILITY DETERMINATION

Use: Prescribed Grazing

Station Name: Tamarac WMD

Establishing and Acquisition Authorities:

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? Prescribed grazing is the controlled rotation of domestic livestock, normally cattle, between paddocks that improves grassland health, species diversity, and represses unwanted invasive plants on conservation easements. Grazing is a valuable tool where other grassland management methods, such as prescribed burning or haying, are implausible, or on easements where the landowner retains the rights to seasonally graze and a rotational grazing system is more desirable.

Where is the use conducted? Rotational grazing occurs within the boundaries of FmHA conservation easements that possess grassy fenced pastures and vary in size from 40 to more than 220 acres. Paddocks range from 10 to over 200 acres in size. razed grasslands consist of either tame grasses or seeded tall grass prairie and bear varying degrees of shrub encroachment.

When is the use conducted? Grazing activity can start in May, and ends around September 1. Grazing is confined to one paddock at a time, is of high intensity, but short duration, usually no longer than 8 to 10 days. Where private landowners maintain annual grazing rights on the easement, prescribed grazing may continue annually. On easements where the landowner does not have grazing rights, grazing to meet management objectives may occur every 3 to 6 years depending on the effectiveness of the treatment.

How is the use conducted? Grazing specialists with the USDA Natural Resources Conservation Service (NRCS) are consulted to develop prescribed grazing plans for selected easements. Livestock forage balance assessments are completed for sites that require treatment. Grazing agents are typically cattle, but can include domestic sheep, goats, and horses. The number and size of the livestock determines the desired stocking rate of the producer and their forage requirements. The forage capability of the site determines the sustainable stocking rate and allowable grazing duration. Livestock are moved from one paddock to the next when the stubble height of the forage is reduced to 4 inches. The grazing period runs 3 to 10 days depending on the stocking rate and the size of the paddock. All paddocks must experience a minimum resting period of 30 days. If the minimum residual stubble height cannot be maintained, for instance due to drought, the livestock are moved to a sacrificial site off easement for feeding until forage resumes growing. Landowners and/or renters are required to enroll in the NRCS Environmental Quality Incentive Program (EQIP) for a ten year period, binding them to the grazing plan in annual grazing situations.

Watering systems are occasionally needed in certain paddocks where natural water sources are not available. In this case temporary watering tanks are set up on grassland sites which only require periodic treatment. On easements bearing perpetual grazing rights, permanent tanks and pads are developed but located off the easement. On sites where annual grazing occurs, livestock sometimes erode soils and reduce water quality when watering from natural wetlands and streams. In these situations, armored watering ramps are constructed according to NRCS practice guidelines, to protect these riparian zones.

Fencing is a mandatory requirement to control grazing and will be the responsibility of the cooperating private party. On annually grazed easements,

permanent fencing is constructed for paddock formation. Where prescribed grazing is only a periodic treatment, temporary single strand electric fencing is employed to maintain paddocks and market rate grazing fees will be required. Grazing fees are charged according to market rates. Market rates will determined annually in consultation with USDA on prevailing local grazing rates.

Why is the use being proposed? Rotational grazing is used as a management treatment to stimulate the growth of desired grassland species, and repress unwanted weeds and the establishment or expansion of woody vegetation into the grassland community.

Grasslands are disturbance dependent communities and require the removal of excessive plant litter to maintain their health and vigor. Disturbance actions, such as grazing, also keep woody vegetation encroachment in check that would otherwise succeed the desired grassland ecosystem.

Grazing is not a priority public use as identified in the Refuge Improvement Act. As an economic use of Refuge System lands, a compatibility determination for grazing is mandatory.

Availability of Resources:

Grazing agreements are developed by NRCS and exhaust no Service resources. A minimal amount of Service staff time is required to prepare Special Use Permits associated with these agreements. Staff also invests a small amount of time monitoring compliance and evaluating the biological effects of grazing, however, this time is negligible since staff must monitor other easement compliance requirements anyway. All perimeter fences are in place on easements where the landowner retains annual grazing privileges. Fencing costs for permanent or temporary fencing, and the construction of watering ramps and tanks is cost shared between the cooperator and NRCS. In situations where prescribed grazing is being used as a periodic management tool, grazing fees are charged according to market rates, minus fencing expenses. These funds usually off-set the administrative costs invested to manage this activity.

Anticipated Impacts of the Use:

Prescribed grazing, due to its intensity, significantly reduces the height and density of grassland vegetation for a short period of time. Depending on the number of paddocks, some areas may be grazed multiple times during the season. The grassland structure will be greatly altered impacting grassland bird species that require tall vegetation for nesting and foraging. While some impacts to ground nesting species, such as waterfowl, due to displacement and trampling will be incurred, numerous nesting studies have revealed very good nesting success in grazed areas. Where disturbance grazing is only employed periodically, long-term gains of improved grassland density and diversity will outweigh any short-term losses. Where grazing is carried out annually, maximum benefits for grassland species will not be realized, but is a better alternative to season long over grazing that typically results in poor forage recovery, dominance of invasive non-native plant species, succession of woody cover types, and soil erosion.

Other impacts include the suppression of woody vegetation. This result is positive, however, since encroachment must be minimized in order to achieve grassland management goals.

Impacts of fence construction and watering facilities causes disturbance to wildlife and replace some habitat, but their requirement is mandatory and the effects are temporary and of very short in duration.

In some situations, grazing may not be the only technique employed, and rotating in other grassland management methods such as burning or haying could result in greater ecological benefits.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

1. Unless additional justification is provided, grazing will run from May 1 to September 1. On easements where the landowner does not reserve annually grazing rights, grazing will be restricted to a frequently of no more than once every 3 years. If factors beyond human control, such as drought, occur that prevent completion of the rotation, grazing may be considered the following year.
2. All fencing and watering facilities costs will be borne by the cooperator/landowner.

3. Forage stubble height may not drop below 4 inches. Livestock must be moved to the next paddock or removed from the conservation easement.
4. No supplemental or sacrificial feeding is permitted on the conservation easement.
5. No insecticides, including insecticidal dusting bags, will be used on WPAs or easements.
6. Control and confinement of the livestock will be the responsibility of the permittee.
7. If the landowner or cooperator fails to abide by the terms of grazing plan, the use will be terminated.

Justification:

Controlled grazing with domestic livestock will not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System. Livestock can be proxies for the historic ungulates who once roamed and maintained grasslands. Controlled grazing creates temporary disturbances and changes to the structure of grassland vegetation and reduces shrub and tree encroachment. While these short-term impacts result in less than ideal wildlife habitat conditions, the effects are temporal and are far exceeded by the long-term benefits and sustained objectives of maintaining a healthy and productive grassland ecosystem for migratory birds. Prescribed grazing is a feasible alternative or complementary technique to other grassland management tools. The grassland community and productivity of many migratory birds will not thrive or even perpetuate without periodic disturbance.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Reevaluation Date: 2020

COMPATIBILITY DETERMINATION

Use: Haying and Mowing

Station Name: Tamarac Wetland Management District

Establishing and Acquisition Authority(ies):

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? Haying or mowing is the cutting of noxious weeds for grassland restoration, or the cutting, baling, and removal of vegetation for purposes of reinvigorating established grassland habitat on FmHA conservation easements. Easement grassland communities fall into two general categories: stands dominated by non-native cool season species such as smooth brome, Kentucky bluegrass, and orchard grass; and seeded tall grass native prairie represented primarily by big bluestem, switch grass, and Indian grass. Both native and non-native forbs are present in both communities and include species of goldenrod, aster, sunflower, and yarrow. Haying is typically done through a Cooperative Farming Agreement or Special Use Permit issued by the Refuge Manager to an easement owner or contractor. Haying is also used to create fire breaks for prescribed fire operations.

Where is the use conducted? Haying/mowing occurs on grassland units within the boundaries of FmHA conservation easements. Grassland stands vary in size from 8 to 40 acres. Haying or cutting for firebreaks would involve very small acreages, generally 16 feet in width around the perimeter of these fields.

When is the use conducted? Mowing to control annual and perennial weed competition on new grassland seedings occurs anytime from late May through September. Weeds are generally clipped sometime between the flowering and seed formation stages of the principle competitors of concern. Frequency of weed clipping depends on seedling growth, but may occur several times during the growing year and annually up to three consecutive years. When haying is utilized as a tool to enhance established grasslands, cutting transpires after July 15 when most ground nests, particularly waterfowl have hatched and ends September 1 to allow sufficient time for some re-growth of winter cover. Frequency of treatment ranges from once every three to six years. Mowing for purposes of establishing fire breaks are generally conducted in the fall prior to spring burning activities.

How is the use conducted? Haying is often used as a strategy to help establish or maintain grassland habitat. In the case of grassland maintenance, cutting is carried out as low to the ground as possible, and when combined with racking, removes most of the old plant litter thereby stimulating new plant growth. For grassland restoration or enhancement, haying or clipping is conducted in two different ways. Haying is conducted to remove residual plant material, a necessity when restoration methods involve interseeding into the sod with a grass drill. Whether establishing native grass by drilling or broadcasting, follow up clipping is employed to repress weed growth that competes with the newly seeded vegetation. Competing non-native plants are clipped just above the tops of the emerging native grassland species to reduce shading and prevent reproduction of non-desirable plant species.

Haying and mowing is carried out with standard agricultural tractors and implements through Cooperative Farming Agreements, Special Use Permits, or station equipment and staff. When baling is desired, skid steers and hay trailers are used to load and remove the bales.

Why is the use being proposed? Haying or mowing is an effective, often crucial tool for grassland management and restoration. Construction of fire breaks is essential to controlling prescribed fire operations. Healthy grassland ecosystems require periodic disturbance to maintain species diversity and productivity. Haying is a viable alternative to rejuvenating and maintaining decadent grassland communities when treatments such as burning or grazing are infeasible or impractical. Intermittent cutting also prevents shrubs and trees from becoming established, thereby preserving the grassland ecosystem. In grassland restoration situations, mowing or clipping of weeds and non native grasses is often critical to establishment and minimizes herbicide applications.

Haying is not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, but rather serves as a management instrument for ensuring District priority habitat objectives are being addressed.

Availability of Resources:

No additional fiscal resources are needed to conduct this use. Needed management staff time is already committed and available. Most of the work needed to prepare for this use would be done during habitat management planning. The decision to use a cooperative farmer for haying would require some additional time to develop and oversee the needed Special Use Permit or Cooperative Farming Agreement, but would be relatively minor and within existing District resources. Some of these costs would be off-set by hay value paid back by the cooperator.

Anticipated Impacts of the Use:

Haying or mowing result in shortterm impacts, but longterm benefits to migratory birds and resident wildlife using conservation easements. Shortterm impacts include disturbance and temporary displacement caused by noisy heavy equipment. Restricting cutting activities to the mid to late summer period could potentially damage late nesting efforts by migratory birds, however most nesting studies have concluded nest densities during this timeframe are very low. Removal of standing grasses will also result in the seasonal loss of habitat for those species requiring tall vegetation to forage and perch. While some vegetation re-growth will occur during the fall, winter cover conditions will be less than ideal. This condition, however, would not occur on an annual basis, but rather on a 3-to 6-year treatment cycle. Longterm benefits far exceed any short duration impacts. Mowing and haying treatments stimulate the regrowth and vigor of all grassland species yielding higher quality habitat for nesting, foraging, and wintering. Additionally, cutting prevents encroachment of woody vegetation which will supplant desired grassland species and favor nest predator use. While cutting for purposes of controlling weeds likewise removes foraging and perch site habitat, mowing is carried out at a greater height and produces less impacts than haying. Long-term benefits of weed control outweigh temporary losses through the perpetuation of highly desirable native tall grass species and the control of invasive species that displace more beneficial native grassland species.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

1. Haying is only permitted between July 15 and September 1, and no more than once every three years on the same site.
2. Hay bales must be removed from the conservation easement within one week of baling.
3. Haying or mowing must fulfill specific habitat related management objectives of the conservation easement.
4. For purposes of controlling invasive plants, the cutting head of mowers will be set no lower than necessary to remove the majority of the target species seed heads.

Justification:

Haying or mowing will not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System if carried out under the required stipulations. Haying and mowing is a valuable management tool that provides greater long-term habitat benefits for reestablished and existing grasslands that otherwise would convert to a non-desired woody cover type or become dominated by exotic vegetation. The productivity and abundance of federal trust species such as waterfowl or grassland obligate species

would slowly decline in the absence of haying, mowing or similar treatments on these sites. Grasslands are a disturbance-dependent ecosystem that requires periodic renovation to maintain their vigor, diversity, and the structure necessary for migratory bird use. Haying is an effective alternative when other management methods are infeasible.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Reevaluation Date: 2025

COMPATIBILITY DETERMINATION

Use: Establishing and Maintaining Nesting Structures for Migratory Birds

Station Name: Tamarac Wetland Management District

Establishing and Acquisition Authorities:

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties - Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations - "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? This use pertains to the placement and maintenance of artificial nesting structures for migratory birds. Primary examples include bluebird boxes, wood duck boxes, and mallard hen houses, but could include nesting structures for other species.

Where is the use conducted? Nesting structures are typically erected over water or along the edges of wetlands in the case of waterfowl, or along open fields when attempting to attract bluebirds on FmHA conservation easement lands. Other types of nesting boxes may be located within interior forest areas for other migratory species.

When is the use conducted? The structures are normally installed in late winter or early spring. Bluebird boxes are cleaned out at the end of each nesting season. Nesting material for waterfowl structures is typically checked or added once a year during the late winter or early spring.

How is the use conducted? Occasional requests for this use originate from easement owners or conservation groups. Approval is granted by the Refuge Manager on a case by case basis through a Special Use Permit. Waterfowl nesting structures are preferably attached to poles to minimize predation, but occasionally affixed to trees. Bluebird boxes are mounted on posts, often in pairs to discourage tree swallow monopolization.

Why is the use being proposed? In all cases, the intent of the permittee is to enhance wildlife populations by providing safe nesting opportunities.

Placing artificial nesting structures on conservation easements is not a priority public use as defined in the Refuge Improvement Act. The use is a non-essential contributor to other priority uses such as wildlife observation, wildlife photography, and environmental education.

Availability of Resources:

Installation, monitoring, and maintenance of artificial nest structures on conservation easements are the full responsibility of the permit holder. There is a small administrative cost to the Service in terms of issuing Special Use Permits, but well within resource bounds. Should cooperators fail to adequately maintain the structures, there will be some cost associated with removing abandoned structures.

Anticipated Impacts on Refuge Purpose(s):

The installation and maintenance of artificial nesting structures offer little if any negative impact to wildlife or habitat. In fact, if placed properly and maintained, nesting structures can assist in enhancing migratory bird production by providing safer nesting sites or opportunities for nesting that otherwise don't exist. Examples include the placement of: wood duck boxes in areas where there are no natural trees cavities; mallard hen houses where there is limited nesting cover; and bluebird boxes where cavity producing snags and wooden posts have been removed. Studies have shown that nest success for many duck species is actually higher when utilizing artificial nest structures than nesting in grasslands where they are more susceptible to mammalian pre-

dation. There is a brief wildlife disturbance caused during placement and maintenance of the structures, but it is minor and temporary.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

1. Approval must be obtained from the Refuge Manager through a Special Use Permit prior to the activity.
2. The permittee will be required to remove all unmaintained nesting structures from the conservation easement.
3. The placement of artificial nesting structures must benefit Service trust species and compliment management objectives for the conservation easement.

Justification:

Artificial nesting structures do not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System. Appropriate use of nesting structures can actually contribute to migratory bird objectives by providing nesting opportunities that are naturally narrow and by reducing nest predation effects.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Re-evaluation Date: 2020

COMPATIBILITY DETERMINATION

Use: Temporal Upland Disturbance for Right of Way (ROW) Projects and Full Restoration.

Station Name: Tamarac Wetland Management District

Establishing and Acquisition Authorities:

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties - Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations - "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? Disturbances to FmHA conservation easement uplands for Right-of-Way (ROW) projects pertain to maintenance work carried out by road authorities and utility companies. Occasionally township, county, or utility officials request authority to temporarily work outside their ROW to repair or improve the road way or their utility related facility. This use can cause a disturbance to wildlife and damage to upland vegetation, but involves no expanded or new ROWs and full restoration of the original vegetative community and condition is required.

Where is the use conducted? The use occurs immediately adjacent to the road or utility ROW on the conservation easement, normally along its boundary.

When is the use conducted? ROW work can occur anytime from frost out in the spring through fall freeze up. The duration of the work ranges from less than a day to several months depending on the scale of the work.

How is the use conducted? In most situations, the use involves accessing, traveling, or turning around large mobile equipment on the conservation easement in close proximity to the ROW boundary. Project examples would include culvert installation or reshaping of the road ditch and slope. Utility type projects might also include tree limbing to facilitate power line maintenance.

Why is the use being proposed? Road improvement projects are conducted to improve transportation safety. Utility repair work maintains essential services to the local community.

ROW projects are not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, but rather represent, in most cases, a public safety undertaking, ensuring District priority habitat objectives are being addressed.

Availability of Resources:

There are negligible administrative costs relating to Special Use Permit issuance and monitoring that is well within station time and budget restraints. All habitat restoration requirements and costs are the responsibility of the permittee.

Anticipated Impacts on Refuge Purpose(s):

The impacts to the associated uplands of the ROW will be minimal and temporary. In most cases the impact will consist of the matting of vegetation by heavy equipment along the perimeter of the ROW. In situations where the sod is unavoidable destroyed or trees are removed or limbed, the permittee will replant the original vegetation. Approval to destroy vegetation will be limited to sites previously tilled or otherwise disrupted. No native prairie remnants, wetlands, or unique communities such as white pine, may be impacted.

Minor impacts from construction work may include disturbing and displacing a few migratory birds and individual wildlife residents, but will be confined tightly along easement/ROW boundaries. Roadway disturbances do not generate much greater turbulence than that created by the routine

passing of motor vehicles. There could be a slightly greater disturbance generated by work within utility ROWs that run into the interior of the easement.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

1. All work must be authorized by a Special Use Permit. Permit conditions, including full habitat restoration if applicable, must be met.
2. The use must, wherever possible, avoid or minimize damage to easement lands. No easement survey monuments may be disturbed.
3. No overnight parking of equipment or materials is permitted on the easement. All conservation easement signs must be reinstalled in good condition if removed for construction work.
4. No work or vehicle use will be permitted on wetlands, native prairie remnants, or areas possessing unique or declining communities.

Justification:

ROWs are present on nearly every FmHA conservation easement within the Tamarac WMD and were established prior to the federal government acquiring interest in the land. Impacts to easement wildlife and their habitats will be slight and temporary under the conditions outlined above. This use supports public safety and maintenance of essential services to the local community and will not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System the System if the stipulations above are followed.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Re-evaluation Date: 2020

COMPATIBILITY DETERMINATION

Use: Native Grassland Seeding and Weed Control

Station Name: Tamarac WMD

Establishing and Acquisition Authorities:

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? This use entails establishing or enhancing native grassland communities, through seeding and weed control activities, on FmHA conservation easements in the Tamarac WMD.

Where is the use conducted? Seeding and weed control occur on grassland units within the boundaries of FmHA conservation easements. Grassland stands vary in size from 8 to 40 acres.

How is the use conducted? Seeding of native grassland species is accomplished by broadcasting regional eco-type seed over the last winter's snow, or in spring immediately following a prescribed burn. Occasionally a grass drill is used to directly inter-seed into the sod of an existing stand of grass. Typically, seedbed preparation activities such as burning, grazing, or haying are conducted to remove litter and residue prior to drilling. Both methods can also be employed in mid to late fall when a dormant seeding is desired. District staff would normally carryout the seed bed preparations and seeding. Where normal preparation techniques are not feasible, cooperative farming is an excellent option to prepare a seedbed. Cooperative farming agreements are forged with easement owners or an area farmer and normally run three years. A multi-year agreement is needed to generate cooperator interest. Because of the extra investment in breaking the grassland sod, herbicide use, rock removal, and inevitable wildlife depredation losses, cooperators generally lose money the first year, break even the second, and gain a profit in the final year. At agreement expiration, the site is left unplowed in a clean small grain or soybean stubble and broadcast seeded the following spring. The great advantage to this method is farming practices control and even eradicate noxious weed competition; replenish soil nitrogen and other nutrient levels; and delivers good soil compaction for seed germination, all leading to faster and more successful native species establishment.

Whichever approach is taken, one application of glyphosate herbicide is employed after approximately two weeks of spring re-growth to suppress weeds while native species are developing their root systems. One or more clipping of emerging vegetation often follows to control annual weeds and biannual thistle species.

Why is the use being proposed? An almost complete domination of exotic and invasive species has emerged on most grassland sites since farming abandonment in the 1990s. The predomination of noxious weeds and introduced grasses yields minimal wildlife value, while displacing far more beneficial native vegetation. Plumeless and Canada thistle, spotted knapweed, quack grass, smooth brome grass and Kentucky bluegrass are the most common exotic species observed. Stands of non-native vegetation are low in diversity and bear light stem densities that provide fair to poor nesting and foraging cover for migratory birds.

Restored or enhanced native grasslands fulfill management objectives to benefit migratory bird production, particularly ground nesting waterfowl and grassland passerines.

Seeding and weed control is not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, but rather serves as a management instrument for ensuring District priority habitat objectives are being addressed.

Availability of Resources:

Staff time is required to prepare grassland sites for seeding, planting, and weed control. Seed is acquired from the Detroit Lakes Wetland Management District who harvests native prairie seed on an annual basis. In some years, the District makes a nominal contribution to assist with combine contracting costs. Total expenses may vary from $500 to $5000 depending on the size of the grassland site, but is within budget constraints with proper planning. Cooperative farming is a desirable option that off-sets project costs. Rent payments or in-kind contributions such as seeding and weed control are provided by the cooperator. There is a minor investment in terms of time preparing and overseeing farming agreements, however this is well within available resources.

Anticipated Impacts of the Use:

Grassland restoration activities generate both direct and indirect impacts to wildlife. Direct negative impacts include temporary displacement of nesting wildlife from grassland sites due to preparation, seeding, and weed control operations. Farming equipment may occasionally destroy a nest, however these instances are rare. Glyphosate is mostly non-toxic with no soil residual activity. Wildlife directly contacting this chemical could be impacted, but incidents are uncommon. Cooperative farming agreements would temporarily eliminate nesting and winter cover for several years. Negative indirect impacts would generally involve wildlife disturbance by machinery, but would be temporal. Long-term impacts are positive. Replacement of non-native vegetation or enhancement by establishing diverse stands of native grassland species will provide dense and structurally diverse habitat benefiting nesting and foraging conditions for wildlife.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac WMD goals and objectives, grassland restoration and weed control can only occur under the following stipulations:

1. Only locally adapted native prairie species will be seeded
2. Weed control will be limited to only the extent necessary to promote native seedling germination and bolting.
3. Herbicide applications must strictly adhere to label recommendations and restrictions.
4. Cooperator obligations outlined in a cooperative farming agreement will be stringently followed.

Justification:

Diverse, healthy, weed-free grasslands provide critical habitat for wildlife, particularly ground nesting migratory birds. Habitat use disruption for establishing or enhancing native grasslands is a significant, but temporary impact. The long-term benefits far outweigh short term losses by eradicating or reducing less beneficial exotic vegetation, creating more secure nesting cover, attracting a greater variety of migratory birds, and reducing long-term maintenance needs thereby eliminating additional wildlife disturbances.

This use is a critical habitat management tool and does not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System the System.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Reevaluation Date: 2020

COMPATIBILITY DETERMINATION

Use: Wood Cutting/Timber Harvest

Station Name: Tamarac Wetland Management District

Establishing and Acquisition Authorities:

"... conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. ¤ 668dd(a)(2) (National Wildlife Refuge System Administration Act)

FmHA (Farmers Home Administration) fee title transfer properties - Consolidated Farm and Rural Development Act 7 U.S.C. 2002.

Refuge Purpose(s):

FmHA Conservation Easement Reservations - "… purposes of this reservation are the preservation and maintenance of the wetland and floodplain areas existing....as well as protection and enhancement of plant and animal habitat and populations."

National Wildlife Refuge System Mission:

"...To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Description of Use:

What is the use? The removal of standing or fallen trees by private landowners or contractors for firewood salvage, forest management, or hazardous fuels reduction on FmHA conservation easements. This covers all wood removal activities regardless of the ultimate use of the wood (e.g. firewood, pulp, etc.).

Where is the use conducted? On FmHA Conservation Easements. The scope of the activity will be determined by the management objective for the area consistent with the easement management plan and by the quantity and quality of available wood. Harvest sites will vary in size from a fractional acre up to 200 acres depending on the site and management objectives. Firewood cutting will be limited to dead or downed trees and the stipulations listed below.

When is the use conducted? Wood removal activities may be authorized throughout the year. Most often, wood removal activities for the purpose of firewood salvage will occur September through December, while commercial harvest activities occur during the winter months when frozen ground will facilitate access and afford protection to underlying cultural resources, soils and vegetation.

How is the use conducted? Harvest equipment may range from chainsaws and axes, to traditional logging equipment such as feller-bunchers and log skidders. Sites may be accessed by any passenger vehicle, all-terrain-vehicles, snow machine, farm tractor, or larger logging transport equipment including semi tractor-trailers. Differences in scope and necessary equipment will occur depending on the amount and type of wood available for removal.

Special Use Permits for fire wood salvage are issued to easement owners. Commercial harvest contracts are awarded through a bidding process. The number of people participating in this use varies year to year depending on need and has ranged from zero to three fire wood permits and one commercial contract in any given year.

Why is the use being proposed? This activity will only occur where the Service has determined that a management need exists to remove wood. Wood removal may be authorized and desirable due to damaging storm events, disease outbreaks, excessive beaver kills, threats to earthen water impoundment structures, interference to non-easement agricultural operations and structures, or to improve forest habitat for migratory birds.

Wood cutting is not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, but rather serves as a management instrument for ensuring District priority habitat objectives are being addressed.

Availability of Resources:

Time required for planning, permit or contract issuance, and overseeing a wood product harvest program would require the dedication of some staff hours, very few in the case of firewood salvage, but significantly more when managing a commercial level activity. In permitting a wood products harvest, the manager has identified a management need and presumably has secured and prioritized station resources to that end. Based on past experience, we estimate that administering a small timber

harvest program will require from $1,000 to $5,000 in staff salary costs for commercial grade operations, considerably less for simple firewood permit management. Some of these costs will be offset by stumpage fees paid by commercial interests if timber is marketable.

Anticipated Impacts of the Use:

In permitting this type of activity, the potential exists to directly impact wildlife by displacing animals from localized areas due to disturbance, or unintentionally damaging ground nests as a result of motorized access. These impacts are avoided or minimized by timing the activity in accordance with site specific characteristics and the stipulations listed below. More significant impacts involve the temporary loss of habitat due to timber removal and damage to understory vegetation by heavy logging equipment. These impacts will, however, bear long-term benefits. Ultimately, the infrequent removal of woody vegetation is necessary for habitat restoration and management purposes. In some cases, the removal or limbing of a few trees along roads, trails, agricultural fields, buildings, and dikes is necessary to eliminate hazards for easement owners.

Access for the purpose of removing wood may impact habitat by rutting soils, destroying ground cover, creating weed seed beds, introducing invasive species, and increasing sedimentation due to runoff in nearby wetlands. These impacts can again be avoided by timing of the activity and requiring equipment be cleaned prior to entering the conservation easement. As much as possible, existing roads or trails will be utilized to limit the amount of clearing required to access the desired location.

Public Review and Comment:

Open houses were held and written comments were solicited from the public about Refuge operations during drafting of the Comprehensive Conservation Plan (CCP). This compatibility determination was prepared concurrently with, and included in the Tamarac National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. Public review and comment will be solicited during the CCP comment period.

Determination:

_____ Use is not compatible.

__X__ Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Tamarac WMD goals and objectives, firewood cutting / timber harvest can only occur under the following stipulations:

1. No cutting operations will be permitted from April 1 through July 15 if resource priority species are known to use the site.
2. Standing cavity trees which are actively used by wildlife will be marked and protected.
3. Vehicle access for wood removal will be limited to existing trails, designated ingress/egress routes that minimize damage to vegetation, or restricted to the frozen ground period when rutting and damage to growing vegetation would occur.
4. A Special Use Permit will be issued that requires special conditions to avoid or minimize wildlife impacts.
5. Wood cutting permits will be restricted to 5 cords per year, but may be less depending on the size of the site.
6. Commercial equipment must be cleaned prior to entering the conservation easement.
7. All wood harvest activities must comply with habitat objectives as identified in the easement management plan.

Justification:

The removal of dead trees for firewood reduces hazardous fuel buildup and the severity of potential wildfires. Timber removal creates openings in the forest canopy, increases light penetration, and stimulates restocking of desired tree species, browse production, and herbaceous growth. The type and extent of wood harvest and required stipulations are tailored to meet specific management objectives and minimal wildlife impacts. Direct impacts are short term and largely avoided by timing the activity so that it does not disrupt wildlife production.

Impacts to the habitat as a result of access for wood removal purposes are potentially significant, but also easily avoided. Access to and from these areas will be carefully controlled to avoid impacts such as rutting and increased sedimentation in area wetlands due to run-off. If existing roads or trails are not present, access can be restricted to designated access routes that minimize soil and vegetation damage or to periods of frozen ground to protect underlying cultural resources.

Wood removal for purposes of ecological restoration, controlling disease, elimination of fire hazards, and cooperating with adjacent land use needs contributes to management objectives and promotes easement owner cooperation. Individuals participating in wood harvest activities will operate under a Special Use Permit or contract that will possess stipulations ensuring resource protection, minimization of impacts to wildlife, and achievement of management objectives.

This use is a valuable habitat management activity and does not materially interfere with or detract from the purpose of FmHA conservation easements or the National Wildlife Refuge System the System.

Signature:

Refuge Manager:_____

Date

Concurrence:

Regional Chief :_____

Date

Mandatory 10-year Re-evaluation Date: 2020

Appendix H: Collier Agreement

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Collier Agreement

See pg. 3

June 4, 1939

Mr. John Collier, Commissioner,
Bureau of Indian Affairs,
Department of the Interior,
Washington, D. C.

Attention: Mr. Ward Shepard.

Dear Sir:

Subject: Cooperative solution of the conflict between the interests of the Indian Service and the Bureau of Biological Survey in the Egg Lake region of Becker County, Minnesota, with reference to their respective projects.

As agreed at the informal conference in Mr. Shepard's office between Mr. Shepard and Mr. Burns of the Indian Service and Mr. Salyer and Mr. Dieffenbach of the Biological Survey, I am presenting herewith the basis for a cooperative agreement to the interests of both parties in the development of their respective projects which overlap in one instance.

There is attached an outline map of Becker County upon which has been indicated in red the boundaries of the White Earth Indian Reservation. In green are shown the maximum boundaries of the area in which the Biological Survey is interested in developing as a migratory waterfowl sanctuary; the lands colored yellow are the lands in which the State Conservation Department of Minnesota is interested in maintaining as a State forest and which they prescribed to the Indian Service but relinquish to the Biological Survey inasmuch as the Survey has agreed to permit them to extend their reforestation operations onto these lands when they are acquired by the Biological Survey.

On this same map, the lands of J. N. Hamilton, which form the nucleus of our proposed project in the north, are outlined in blue. Mr. Hamilton has indicated that he will relinquish these lands to the survey only, because the Survey will continue the area as a wildlife refuge, which constitutes Mr. Hamilton's original interest in the property.

The area shaded pink on the same map shows the extent of the area already optioned by the Indian Service and on which the

COPY

Biological Survey wishes to secure a release from the Indian Service in order to develop the project to its greatest scientific capacity for migratory waterfowl which development, incidentally, will also be of the greatest benefit to the resident Indians of the vicinity.

From the standpoint of the Biological Survey, the proposed project forms a very definite link in the series of migratory waterfowl refuges being established by the Biological Survey throughout the great flight lane known as the Mississippi Flyway. Tracts suitable for such refuges are not readily found because of the need for adequate food and dependable water supply. No one, we believe, will question the outstanding value of the Egg Lake region from that standpoint.

In order to properly develop the lakes and establish ideal conditions suitable for migratory birds, it is necessary that the Biological Survey control the Egg Lake River Valley. It is planned to construct some small dams stabilizing the water in the many lakes of the area and thus insure better growing conditions, especially for the wild rice. The Indian Service is mainly interested in this same area in view of the excellent rice bed found on Little Rice Lake.

In the aforementioned conference, it was the thought of Mr. Shepard and Mr. Burns that the Indian Service could wellafford to release their options in this area to the Biological Survey, in return for the specific privileges to be granted to the Indians of this agency by the Biological Survey and herewith enumerated:

1. That the Indians be given priority in ricing privileges not only in the area where the interests of the two agencies overlap, but also on the much greater area which the Biological Survey is taking over in this region; namely, Flat Lake, Tamarac Lake, Pine Lake, Big Rice Lake, Height of Land Lake, Black Bird Lake, and smaller lakes too numerous to mention.

2. The Biological Survey further agrees to give the resident Indians of the agency priority in the matter of trapping rights in its entire project. The Biological Survey reserves the right at all times to preserve a minimum breeding stock of furbearing animals on the area. It is suggested that the Biological Survey set up a number of trapping units over these prolific furproducing waters, and that the Indian Service assign certain Indian families or groups the right to trap specific units.

3. The Biological Survey further agrees to train in rotation a series of young Indian men of high character along the most

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-3-

modern lines of game management. The Indian Service agrees to pay their salaries, and the Biological Survey will, through its resident biologists on the tract, give them specific practical training along modern game management lines. The philosophy is that these men will be transferred to other Indian projects as soon as they become proficient, and others will take their place.

4. The Biological Survey further agrees to use Indian CCC labor in the development of the project.

5. The Biological Survey further agrees to protect and guarantee to the Indian Service the ricing privileges on the Biological Survey's purchase unit in Aitkin County known as the Rice Lake Migratory Waterfowl Refuge unit. This lake produces annually from 90 to 100 tons of wild rice, and the granting of priority to the Indians for harvesting this will be decidedly to the advantage of this people. At this time, the Biological Survey is engaged in constructing two small dams to stabilize the water levels in this lake, with a view of perpetuating this great rice bed. It is feared that if another year goes by, with the attendant lowering of water levels before the rice matures, this great bed may be permanently and seriously injured.

At present, there exists an arbitrary agreement between the Indian Service and the Minnesota State Conservation Department adopting a boundary line between the two projects separating the eastern halves of the two townships, T142N, Range 39W, and T141N, Range 39W, from the original established civic township governments. The Sugar Bush Township is all but annihilated by the present Indian boundaries. The entrance of the Biological Survey into the picture would permit this area to be closed out entirely. This is most important in view of the fact that the County Boards of both Becker and Mahnomen Counties have made their delinquent tax abatement resolutions dependent upon the Government's buying all of Townships 141N and 142N.

Considered from all angles and the mutual interests of both parties to this agreement, it seems certain that the entrance of the Biological Survey into the picture and the consummation of the Survey migratory waterfowl project here will serve to round out the unfulfilled situations in the whole set-up, and that is is to the mutual advantage of both parties to enter into this agreement.

It is a recognized fact that the harvesting of wild rice by the Indian method does not destroy the annual yield of this plant; and the annual yield of this harvest to the Indians of the Egg Lake region will be greatly enhanced not only because all of the water area of the entire refuge unit will become available to

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-4-

the Indians for ricing purposes after it has been acquired by the Biological Survey, but also because the engineering development by the Survey will establish permanent water levels which are most beneficial to the natural production of wild rice. Properly-designed dams will also bring into rice production the present rather dry savanna type of meadow valley of the Egg and Otter Tail Rivers.

In the development of the area to its best condition, there will be a continuous demand for Indian labor, and the area will at the same time serve as a training school for Indian game managers. As stated before, the rich fur harvest of this region will be made available to the Indians.

Enclosure.

(Signed) W. C. Henderson
Acting Chief,
Bureau of Biological Survey.

(Signed) John Collier
John Collier, Commissioner,
Bureau of Indian Affairs.

Appendix I: Appropriate Use

Tamarac National Wildlife Refuge:

Archeological Investigations.....
Firewood Cutting/Timber Harvest.....
Mushroom, Nuts and Berry Picking.....
Research.....
Trapping of Furbearers.....

Tamarac Wetland Management District:

Establishing Food Plots for Resident Wildlife.....
Establishing and Maintaining Nesting Structures for Migratory Birds.....
Prescribed Grazing.....
Temporal Upland Disturbance for Right-of-Way Projects and Full Restoration.....
Wood Cutting/Timber Harvest.....
Grassland Seeding and Weed Control.....
Haying/Mowing .....

Refuge Appropriate Refuge Uses

The Service's Appropriate Use policy describes the initial decision process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must first find a use to be appropriate before undertaking a compatibility review of the use and outlining the stipulations of the use.

This policy clarifies and expands on the compatibility policy (603 FW 2.10D(1)), which describes when refuge managers should deny a proposed use without determining compatibility. If we find a proposed use is not appropriate, we will not allow the use and will not prepare a compatibility determination. By screening out proposed uses not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the Refuge System mission. Although a refuge use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use.

Background for this policy as it applies to Muscatatuck NWR is found in the following statutory authorities:

National Wildlife Refuge System Administration Act of 1966, as amended by the *National Wildlife Refuge System Improvement Act of 1997* (16 U.S.C. 668dd-668ee). This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The Administration Act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are compatible. The Improvement Act provides the Refuge System mission and includes specific directives and a clear hierarchy of public uses on the Refuge System.

Refuge Recreation Act of 1962, (16 U.S.C. 460k). This law authorizes the Secretary of the Interior to allow public recreation in areas of the Refuge System when the use is an "appropriate incidental or secondary use."

This policy does NOT apply to:

Situations Where Reserved Rights or Legal Mandates Provide We Must Allow Certain Uses.

Refuge Management Activities. Refuge management activities conducted by the Refuge System or a Refuge System-authorized agent are designed to conserve fish, wildlife, and plants and their habitats. These activities are used to fulfill a refuge purpose(s) or the Refuge System mission, and are based on sound professional judgment.

Uses that have been administratively determined to be appropriate are:

Six wildlife-dependent recreational uses. As defined by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

Take of fish and wildlife under State regulations. States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. We consider take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Refuge uses must meet at least one of the following four conditions to be deemed appropriate:

- It is a wildlife-dependent recreational use of a refuge as identified in the Improvement Act.
- It contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after the Improvement Act was signed into law.
- The use involves the take of fish and wildlife under state regulations.

The refuge manager has evaluated the use following the guidelines in this policy and found that it is appropriate. The criteria used by the manager to evaluate appropriateness can be found on each of the appropriate use forms included in this appendix. Also included under this condition are 'specialized uses,' or uses that require specific authorization from the Refuge System, often in the form of a special use permit, letter of authorization, or other permit document. These uses do not include uses already granted by a prior existing right. We make appropriateness findings for specialized uses on a case-by-case basis.

Refuge Name: Tamarac National Wildlife Refuge

Use: Archeological Investigations

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: _____

Date:

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: s/Barbara Boyle

Date: May 4, 2010

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac National Wildlife Refuge

Use: Firewood Cutting/Timber Harvest

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac National Wildlife Refuge

Use: Mushroom, Nuts and Berry Picking

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac National Wildlife Refuge

Use: Research

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac National Wildlife Refuge

Use: Mushroom, Nuts and Berry Picking

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac National Wildlife Refuge

Use: Trapping of Furbearers

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac National Wildlife Refuge

Use: Establishing Food Plots for Resident Wildlife

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac Wetland Management District

Use: Establishing and Maintaining Nesting Structures for Migratory Birds

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac Wetland Management District

Use: Prescribed Grazing

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac Wetland Management District

Use: Temporal Upland Disturbance for Right-of-Way Projects and Full Restoration

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac Wetland Management District

Use: Wood Cutting/Timber Harvest

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 4, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac Wetland Management District

Use: Grassland Seeding and Weed Control

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 3, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Refuge Name: Tamarac Wetland Management District

Use: Haying/Mowing

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the state, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

	Decision Criteria:	Yes	No
(a)	Do we have jurisdiction over the use?	✔	
(b)	Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	✔	
(c)	Is the use consistent with applicable Executive orders and Department and Service policies?	✔	
(d)	Is the use consistent with public safety?	✔	
(e)	Is the use consistent with goals and objectives in an approved management plan or other document?	✔	
(f)	Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✔	
(g)	Is the use manageable within available budget and staff?	✔	
(h)	Will this be manageable in the future within existing resources?	✔	
(i)	Does the use contribute to the public's understanding and appreciation of the Refuge natural or cultural resources, or is the use beneficial to the Refuge's natural or cultural resources?	✔	
(j)	Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	✔	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with state fish and wildlife agencies.

Yes _X_

No ____

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___

Appropriate _X_

Refuge Manager: s/Barbara Boyle

Date: May 3, 2010

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date:

A compatibility determination is required before the use may be allowed.

Appendix J: List of Preparers

Refuge Staff:

- Barbara Boyle, *Refuge Manager*
- Todd Luke, *Deputy Refuge Manager*
- Kelly Blackledge, *Park Ranger*
- Wayne Brininger, *Wildlife biologist*
- Lowell Deede, *Wildlife biologist*

Regional Office Staff:

- Gary Muehlenhardt, *Wildlife Biologist/Refuge Planner, Region 3, USFWS*
- Gabriel DeAlessio, *Biologist-GIS, Region 3, USFWS*
- Jane Hodgins, *Technical Writer/Editor, Region 3, USFWS*