DEPARTMENT OF NATURAL RESOURCES

DRAFT FOR REVIEW

Roseau River Wildlife Management Area Master Plan, 2025 - 2035

06/30/2025

DEPARTMENT OF NATURAL RESOURCES

Notice is hereby given that the Roseau River Wildlife Management Area Master Plan, 2025-2035 for the Minnesota Department of Natural Resources has been completed and is now adopted.

Sarah Strommen, Commissioner Date

Kelly Straka, Fish and Wildlife Division Director Date

Dave Trauba, Wildlife Section Manager Date

Executive Summary

Department of Natural Resources Mission Statement

The mission of the Minnesota Department of Natural Resources (DNR) is to work with Minnesotans to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.

Fish and Wildlife Division Vision and Purpose

The Fish and Wildlife Division (FAW) is responsible for managing fish and wildlife populations and providing related outdoor recreational opportunities in Minnesota. We conserve and enhance water and land habitats; regulate hunting, trapping, and fishing; foster environmental stewardship; and work with partners and the public to accomplish shared goals. Our work is informed by biological and social sciences, cultural and economic values, and our public trust obligation to manage fisheries and wildlife in perpetuity.

WMA System Description and Purpose

Wildlife Management Areas (WMAs) are part of Minnesota's outdoor recreation system and are established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. They are a key component of the DNR's wildlife management efforts and help ensure wildlife habitat for future generations by providing Minnesotans with opportunities for hunting, fishing, and wildlife watching, and by promoting important wildlife-based tourism in the state.

Roseau River WMA Vision Statement

Roseau River WMA will be managed to provide quality hunting, fishing, trapping, and wildlife viewing, as well as other outdoor recreational experiences compatible with the statutory purpose of WMAs. These opportunities will be provided in a way that emphasizes Roseau River WMA's ecological significance.

Roseau River WMA Master Plan Summary

This plan summarizes management activities for the Roseau River WMA, an approximately 75,000-acre WMA in northwestern Minnesota. The DNR completed the last master plan for Roseau River WMA in 1980, which was intended to cover a 10-year period. Significant changes in this current plan reflect: a greater emphasis on restoring and enhancing native plant communities and habitats to benefit the wildlife populations they support; increasing knowledge of the plants and wildlife of Roseau River WMA; new and evolving management techniques; changing trends of wildlife and public use of the area; and evolving challenges like invasive species and changing climate. This plan reaffirms the commitment to provide healthy terrestrial and aquatic systems that support biodiversity and outdoor recreation. Planned management actions will benefit a variety of wildlife species and support public use, as described below.

Roseau River WMA is rich in biodiversity and rare species and plant communities that range from specialists to those dependent upon a wide array of habitats. The active management, restoration, preservation and enhancement of Roseau River WMA's diverse habitats proposed in this plan will maintain, enhance and increase the area's biodiversity and rare features.

Management, restoration and enhancement of open water wetlands and impoundments will benefit waterfowl, waterfowl hunters, birdwatchers, aquatic furbearers and trappers. These habitats will support a wide range of goose, duck, shorebird and waterbird species, including Canada geese, mallards, blue- and green-winged teal, ring-necked ducks, wood ducks, trumpeter swans, eared grebes and black terns during the summer nesting and brood rearing seasons as well as spring and fall migration. Wetland management activities will also benefit aquatic furbearers, including muskrat, beaver and otter; reptiles and amphibians; and aquatic invertebrates. The DNR will manage all wetland types for a variety of open water and native emergent habitats favorable to a diversity and abundance of game and non-game species.

Management, protection and enhancement of lowland shrub and marsh communities will benefit sandhill cranes, moose and yellow rails. Management of these habitats will provide nesting habitat, food and cover through age class and species diversity.

Management, restoration, protection and enhancement of upland prairies/grasslands/shrublands will benefit a large suite of game and non-game species, upland bird hunters, big game hunters, and wildlife watchers. Management of these habitats will provide display sites, secure nesting habitat, cover, and food for wildlife including sharp-tailed grouse, white-tailed deer, black bear, waterfowl, bobolinks and meadowlarks through structural and vegetative diversity.

Management of upland forest communities will benefit numerous game and non-game species, hunters, trappers and wildlife watchers. Management of these habitats for cavity trees, early successional habitat, mast, and oak regeneration will support ruffed grouse, American woodcock, white-tailed deer, black bear, fisher, snowshoe hare, boreal songbirds, woodpeckers and cavity-nesting waterfowl.

Protection and management of coniferous wetland forest communities will maintain biodiversity and provide suitable habitat for great gray owls, northern hawk owls, pine marten, snowshoe hare and black-backed woodpeckers. Wetland deciduous forests will benefit pileated woodpeckers, cavity nesting waterfowl, American woodcock and ruffed grouse.

Protection and management of peatland communities will maintain biodiversity and support moose, yellow rails, short-eared owls and northern bog lemmings.

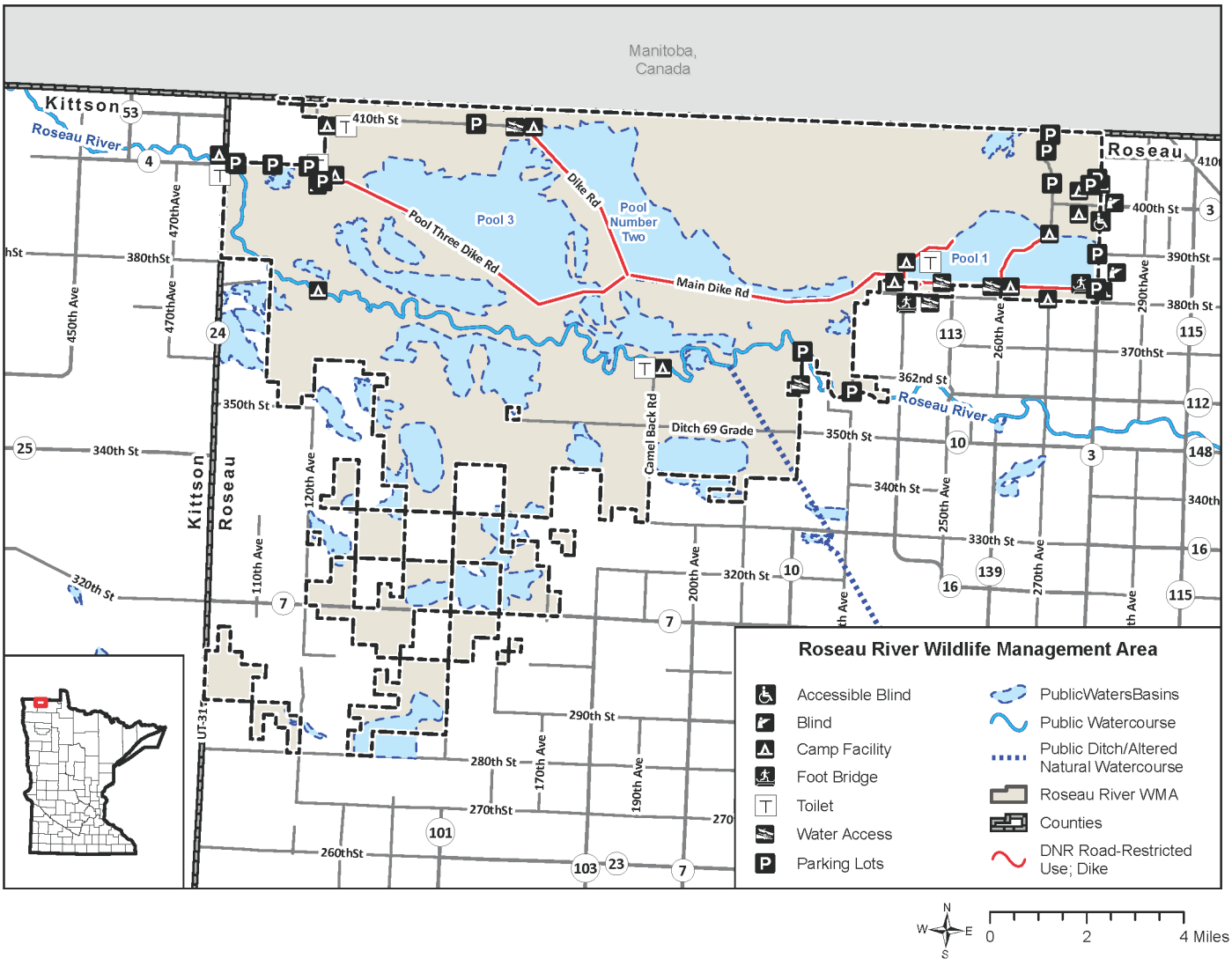
Protection and management of riverine and riparian habitats will support the Roseau River fishery and benefit anglers and water quality and quantity downstream.

Work in these habitats is critical to support abundant fish and wildlife populations and provide hunting, trapping and fishing opportunities on Roseau River WMA.

WMA users will also benefit from well-maintained roads, parking lots, facilities and clearly defined property boundaries that support public access to a rich diversity of wildlife and plant communities. The maintenance and addition of modern buildings and other facilities provide WMA staff the resources necessary to manage for quality habitats efficiently and safely.

This 10-year master plan spells out management goals and objectives as well as strategies needed to achieve them. Tools are presented for managing different habitat types, including prescribed fire; grazing; haying; mulching; shearing; wetland protection, enhancement and restoration; and woodland/forest habitat enhancement through thinning, timber harvests, and other common forestry practices; and invasive species management and prevention. Furthermore, the plan details priority areas for restoration and landscape-level restoration projects. The DNR is committed to restoring hydrology within Roseau River WMA, the Roseau River and vast wetland complexes that have been degraded by historic ditching and drainage efforts. An annual calendar of management activities is included, as is a discussion of current and potential research and monitoring efforts.

Figure 1. Roseau River WMA



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Introduction

Major Unit Definition

Minnesota currently has over 1,500 Wildlife Management Areas (WMAs) distributed across the state, totaling nearly 1.4 million acres. These WMAs are managed out of 37 local offices, and eight of them are classified as "major units" due to the large and generally connected acreages under management in that administrative area. Each of the major units manages a primary WMA and may also manage other nearby units. Major units are typically, although not always, distinguished by having resident staff (wildlife area supervisor and assistant wildlife area manager). They also typically have greater acreage that is more intensively managed than most WMAs; more fleet assets including heavy equipment such as bulldozers, tractors, and graders; larger staff complements; and more capital improvements.

Purpose of Plan

This master plan outlines the management of Roseau River WMA through 2035, in accordance with the Minnesota Outdoor Recreation Act of 1975. The plan's purpose is to provide management guidance, a basis for allocating staff and fiscal resources, direction for annual work planning, and metrics for measuring management accomplishments.

The previous management plan was prepared in 1980, and many environmental and social changes have occurred since then. Minnesota's population has grown, the climate has changed and continues to change, invasive species have proliferated, new state and federal policies have been enacted, recreation demands and preferences have changed, and many wildlife and plant populations have declined throughout the state. A revised management plan is needed to address and manage these changing conditions. The plan update process also provides an opportunity to engage with a wide variety of Minnesotans. This plan is one of seven comprehensive management plans the DNR is updating for the state's WMA major units. The plans are 10-year management plans, which will continue to be revised as new management practices develop, resource paradigms evolve, and new challenges are encountered.

Long-range Goals

For Roseau River WMA, the overarching long-range goals outlined in this plan are:

1. To maintain or enhance wildlife production, habitat and biodiversity.
2. To maintain or increase hunting, fishing, trapping and other compatible outdoor recreational uses.

Planning Process

The planning process began in July 2024, when an internal planning team was assembled of staff from multiple DNR divisions with diverse areas of expertise (Appendix A).

On Sept. 30, 2024, the DNR published an online questionnaire and requested feedback from the public via a DNR news release. Postcards containing a link to the online questionnaire were distributed in the local community

and handed out to individuals using Roseau River WMA. The online questionnaire was available in English, Spanish, and Hmong, and was open for public input from Sept. 30 to Nov. 15, 2024. The questionnaire received responses from 47 individuals. The planning team also hosted an online public meeting on Oct. 24, 2024, to provide an overview of Roseau River WMA and collect public input. Appendix B contains a summary of all input. The planning team reviewed the public comments and considered them while developing content for the plan.

The review process for the full draft of the Roseau River WMA plan started in the spring of 2025. The DNR received comments and incorporated them into multiple rounds of revisions. In January 2025, a complete draft of the plan was distributed for internal DNR staff review. A tribal review process took place from Feb. 14 to March 7, 2025.

The DNR held a second public comment period from March 17 to April 25, 2025 to provide the public an opportunity to review the draft Roseau River WMA plan. Comments were accepted via mail, email, an online survey, and two public meetings. The DNR hosted an in-person public meeting on April 9, 2025 and an online public meeting on April 8, 2025. A list of the comments received, and the responses provided to these comments, can be found in Appendix C.

Guiding Documents

Management at Roseau River WMA is guided by an array of statutes, rules, directives, and plans. A list of many of these documents is included in Table 1. The management objectives and strategies in this plan were developed within the context of these existing guidance documents. Due to the interdisciplinary nature of DNR's work, individual management decisions are often context-dependent and require consistent coordination beginning at the local level. When appropriate, the DNR aligns its work with plans developed by other agencies and organizations. This coordination helps ensure that all management decisions taken within Roseau River WMA will be made to benefit wildlife, wildlife habitats, and compatible outdoor recreation.

Select WMA Statutes and Rules

Minnesota Statues, Chapter 84 Department of Natural Resources, Section 84.942 Fish and Wildlife Resources Management Plan states that the commissioner shall prepare fish and wildlife management plans designed to accomplish the policy of section 84.941.

Minnesota Statutes, Chapter 86A Outdoor Recreation System, Section 86A.05 Classification and Purposes defines the purpose of WMAs as "to protect those lands and waters that have a high potential for wildlife production and to develop and manage those lands and waters for the production of wildlife, for public hunting, fishing, and trapping, and for other compatible outdoor recreation uses." It also directs WMAs be administered in a manner that will "perpetuate, and if necessary, reestablish quality wildlife habitat for maximum production of a variety of wildlife species." Finally, "public hunting, fishing, trapping, and other uses shall be consistent with the limitations of the resource, including the need to preserve an adequate brood stock and prevent long-term habitat injury or excessive wildlife population reduction or increase. Physical development may provide access to the area but will be developed to minimize intrusion on the natural environment."

Minnesota Statutes, Section 86A.09 Development and Establishment of Units describes the requirements that apply to the development of the master plan.

Minnesota Statutes, Section 97A.135 Acquisition of Wildlife Lands, Subdivision 1 Public Hunting and Wildlife Areas states that the commissioner may designate land acquired under this subdivision as a WMA for the purposes of the outdoor recreation system.

Minnesota Rules, Chapter 6230 Wildlife Management has additional rules that apply to WMAs.

Any portion of Roseau River WMA that was acquired with Wildlife Restoration grant funds must comply with federal regulation 50 CFR 80.134. These grant-acquired properties must continue to serve the purpose for which they were acquired, and grant acquired real property may not be sold without U.S. Fish and Wildlife Service (USFWS) approval. For these grant-acquired portions of the Roseau River WMA, management must first adhere to relevant federal laws and rules and then secondarily to relevant state statutes and rules.

Additional Documents

Table 1. Additional documents used to guide the development of the Roseau River WMA Master Plan. Acronyms used in this plan are listed in Appendix D.

Document Name	Plan Year	Plan Owner
Audubon Blueprint for Minnesota Bird Conservation	2014	Audubon Minnesota
Beaches Lake Area Fen Management Plan	2017	TRWD & DNR
Conservation Agenda	2015-2025	DNR
Deer Population Goal Setting	2022	DNR
Executive Order 11990, Protection of Wetlands	1977	Executive Order
FAW Directive No. 070605: Development Standards for WMA/AMAs	2010	DNR
Forest Resource Management Plan • Sustainable timber harvest analysis, decisions, and planning • Aspen Parklands Section Forest Resource Management Plan • 10-Year Stand Exam List (2021-2030)	Various	DNR
Long Range Duck Recovery Plan	2006	DNR
Long Range Plan for the Wild Turkey in Minnesota	2006	DNR
Managing Minnesota's Shallow Lakes for Waterfowl and Wildlife: Shallow Lakes Program Plan	2010	DNR
Minnesota Prairie Conservation Plan	2011	Minnesota Prairie Plan Working Group
Minnesota's Endangered Species Statute	2022	Minnesota Statute
Minnesota's White-tailed Deer Management Plan	2019-2028	
Minnesota's Wildlife Management Area Acquisition	2002	The Citizens' Advisory Committee

Document Name	Plan Year	Plan Owner
Minnesota's Wildlife Action Plan 2015-2025	2015-2025	DNR
Northern Forest Owl MOA	2020	DNR
One Watershed One Plan	Ongoing	BWSR
Pool 3 North Young Forest MOA	2021	DNR
Roseau River Watershed Restoration and Protection Strategy	2020	MPCA
Ruffed Grouse in Minnesota: A Long-Range Plan for Management	2012	DNR
Sundown-Boroos West Lowland Conifer Patch MOA	2021	DNR
Surveillance and Management Plan for Chronic Wasting Disease	2019	DNR
Wetland Conservation Act	1991	BWSR

1

2

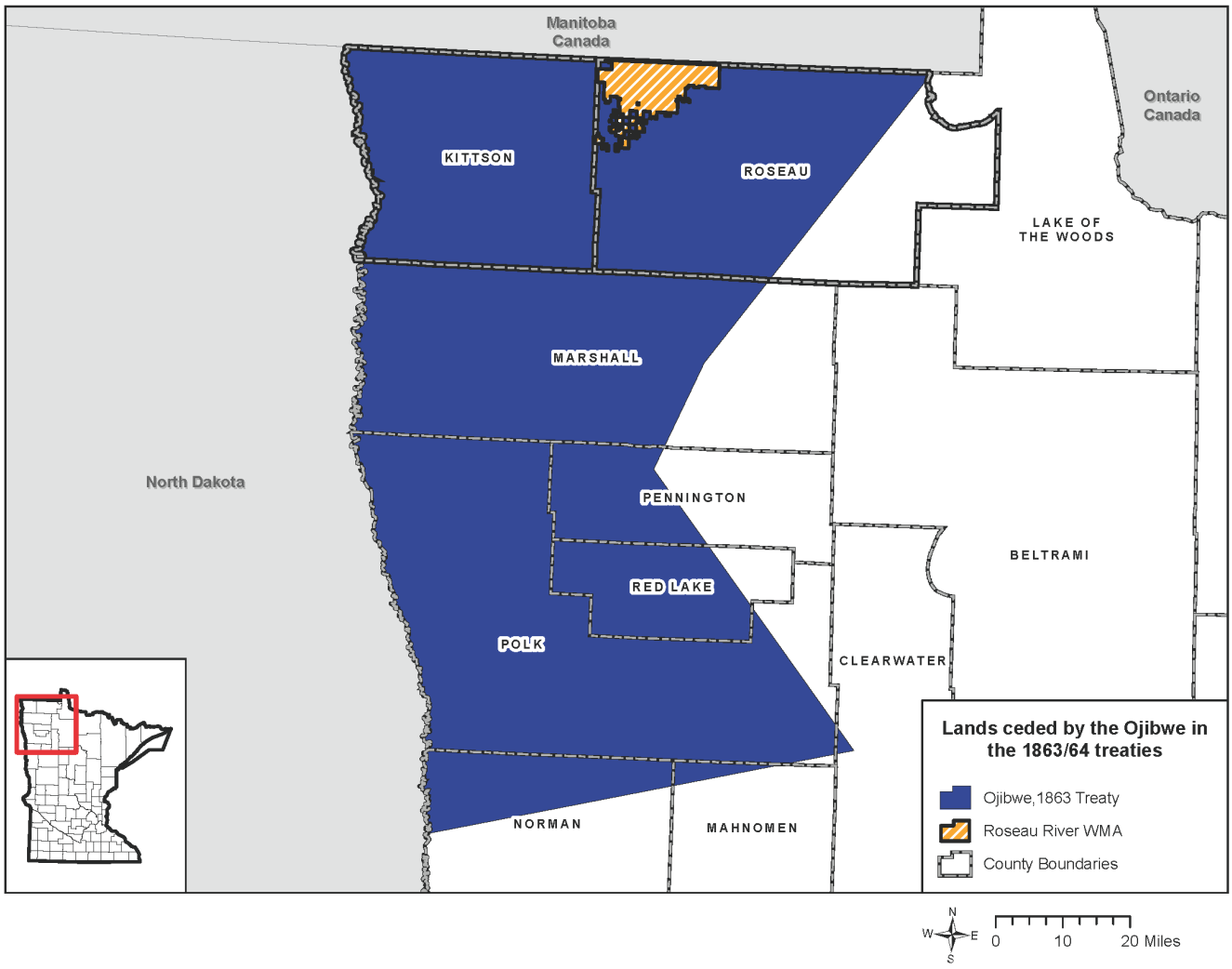
History

Area History

The Roseau River area (Figure 1) has long been known for its plentiful and rich natural resources; however, the area has undergone substantial human and ecological changes. Historical knowledge of the habitats, wildlife, and communities in the area is valuable for natural resource planning and management.

Native American tribes lived in what is now Roseau County for centuries before the first French explorers arrived around 1700. The region was occupied by the Dakota in the early 1600s. By the late 1600s, as the Ojibwe moved westward, fighting between the Dakota and the Ojibwe erupted and continued intermittently until about 1730. The gravel ridge extending between the Red River Valley and the Warroad River, which is the former shoreline of Glacial Lake Agassiz, became known as the “war road”. In the decades that followed, the Ojibwe at Red Lake fortified their ownership and expanded their control over the lands above Red Lake to Lake of the Woods and pushed further west into the region that now includes Roseau River WMA. By the middle of the 1800s, European settlers were beginning to pressure the Red Lake people to cede certain lands for European settlement. A treaty was attempted in 1851 that would have allowed for some settlement to occur, but it failed. Subsequently, in 1863, Minnesota Governor Alexander Ramsey, pressured by powerful land interests, brought the Red Lake and Pembina bands together for the negotiation of a treaty at the “Old Crossing” of the Red Lake River (Kappler, 1941). This treaty ceded over 11-million acres of land in present-day northwestern Minnesota and eastern North Dakota, including the land that is now Roseau County (Figure 2). Until the early 1900s, the Ojibwe, under chiefs Cobenais and Mickinock, maintained a series of camps along the Roseau River. The main village, Mickinock’s Village, was on the shores of Roseau Lake.

Figure 2. Present-day Minnesota lands ceded by the Ojibwe in the 1863/64 treaties



In 1848, the Hudson Bay Company established a trading post on the Roseau River in the vicinity of Roseau Lake. It was abandoned in 1851. In 1885 the first white settler, Seward A. Wood, built a cabin along the Roseau River near the present town of Roseau. Attracted by timber, game, hay and pasture, other settlers arrived, primarily from the Red River Valley and Dakotas, following the historic "war road", or Sandridge Trail. At the time, wetlands were thought to breed disease and inhibit travel and production (Dahl & Allord, 1997). Due to the extensive wetlands north of the gravel ridge, periodic flooding, and homesteading initiatives, management quickly escalated from drainage discussions to an era of ditching.

Flood Control and Drainage

Frequent flooding in the Roseau River basin has led to many attempts at drainage. Two floods in 1890 and 1896 isolated settlers for six to seven weeks and resulted in significant agricultural and property losses that led to proposals to drain low-lying land. At the request of the Board of County Commissioners, a civil engineer prepared a report "...for the purpose of determining the most practicable plan of drainage of the low-lying lands in your county, together with suggestions and estimates for the same..." (Ralph, 1897). This proposal included plans to drain nearly 120,000 acres through ditching and deepening portions of the river. Drainage programs

began in 1904 with the construction of the Badger Creek Ditch. The Roseau River was deepened and straightened in 1906 for several miles downstream from Roseau Lake. Between 1907 and 1920, an extensive system of ditches was constructed on both sides of the Roseau River, and the river was dredged from Roseau Lake to the Canadian border. The Roseau County Soil and Water Conservation District, formed in 1952, has undertaken the construction and improvement of about 75 miles of public drainage ditches and 110 miles of field ditches (Minnesota Department of Natural Resources, 1980).

Drainage assessments were levied against the landowners who would benefit. Drainage of the better soils was largely successful; however, most attempts to drain the peatlands failed to produce farmable ground. Landowners in these areas were unable to meet the drainage assessments, and the county assumed the debt. Ultimately, the debt burden became too great for the county and the Board of County Commissioners, as stipulated by state law (Minnesota Laws 1931, Chapter 407), proposed the state take over large swaths of wetland and peatland and assume the bonded indebtedness with it. The state took ownership of the land and debt in the early 1930s.

In 1964, local citizens requested further work on the Roseau River to increase flood control and drainage. In response to a congressional request, the U.S. Army Corps of Engineers (USACE) proposed new channel modifications (i.e., dredging and widening of the river west of the city of Roseau) on the Roseau River. The project was studied and modified slightly in 1971 to provide increased flood protection for the city of Roseau to mitigate possible fisheries and waterfowl habitat losses and to exclude lateral ditch improvements; however, the project was not completed. A major flood occurred in 2002 that intensified flood control discussions and demands. In 2009, an infrastructure project concept was developed consisting of dikes and diversion channels that would reroute high flows around the city of Roseau. The USACE completed the Roseau East Diversion Project in 2015. Around the same time, the Roseau River Watershed District (RRWD) constructed impoundments such as the Norland Impoundment on Hay Creek, which was completed in 2012. These impoundments were intended to capture early water in high flow events in order to reduce flood peaks and damages within the watershed.

Drainage efforts continue to present day. With advances in technology, increased investment in subsurface tiling has occurred since the 1990s. Since the 2000s, there has been a continued emphasis on drainage improvement, with increased maintenance investment and flood damage reduction projects. Recognition of environmental effects has grown, and management efforts have begun incorporating greater environmental sustainability. Since the Clean Water Land and Legacy Amendment passed in 2008, projects in partnership with the DNR have increasingly used natural systems approaches to meet natural resources and flood damage reduction goals on public lands.

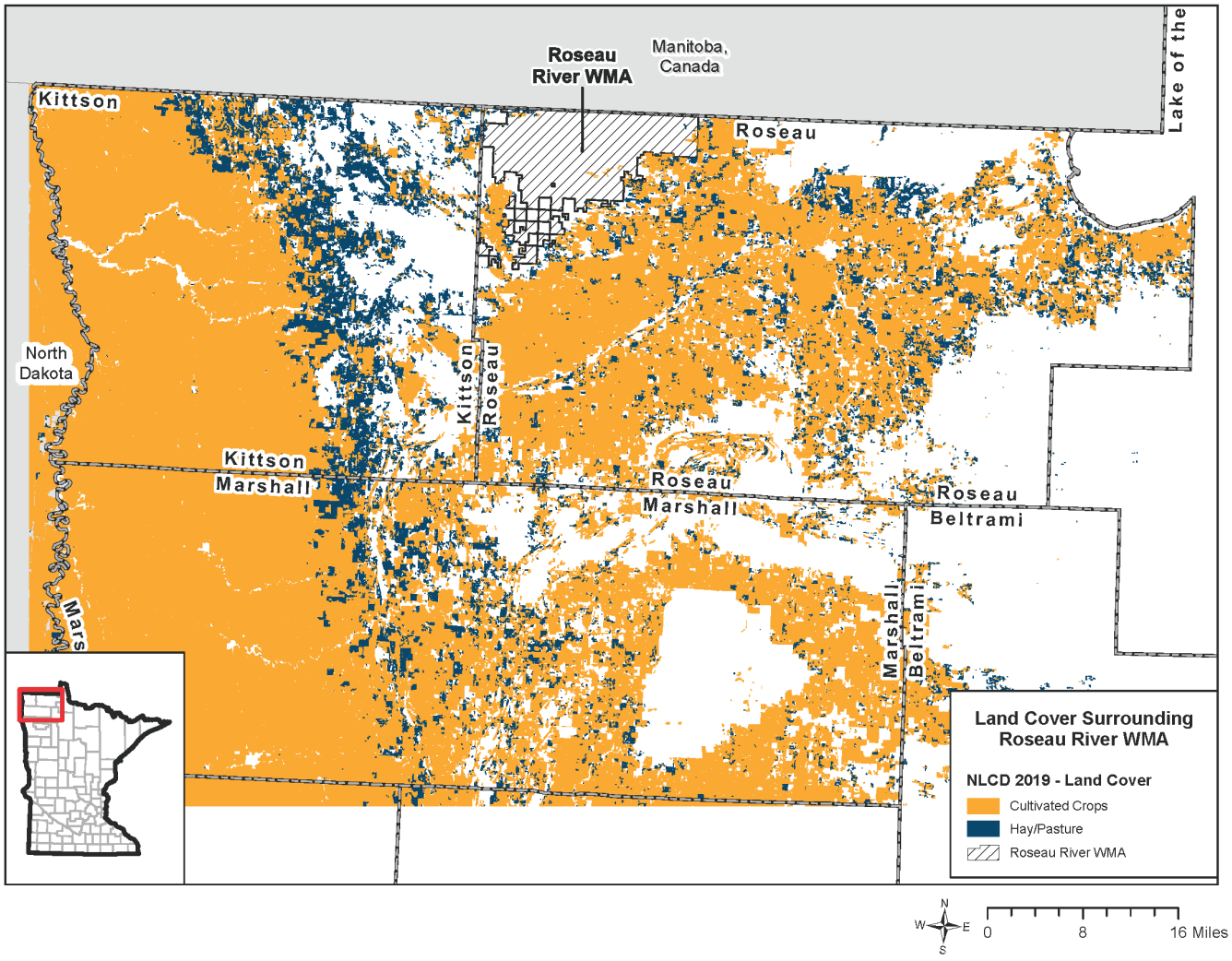
Agricultural Development

Agriculture in Roseau County was significantly influenced by the construction of the railroad, which reached Greenbush in 1904 and extended to Warroad in 1908. Prior to the drainage efforts and the railroad, the region's dense forests, peatlands, and wet soils largely restricted farming to the gravel ridges. In the early 20th century, small grains such as wheat, oats, barley and flax were the dominant crops in the area. Dairy farming and hay production became more prominent in the area by the 1960s. Grass seed production, including ryegrass and bluegrass, was also well-established. By the 1980s, demand from the turf and forage industries expanded grass seed production in the area.

In the 1990s, farmers began producing canola and sunflowers in Roseau County. Corn and soybean production increased in the 2000s due to genetic improvements and the growing biofuel market while dairy farming, which had already been under strain from market pressures, consolidated and declined. In 2005, bovine tuberculosis devastated both dairy and beef operations which, along with tight profit margins, caused many farmers to exit the industry and convert their pastureland to row crops.

By the 2020s, crops such as soybeans, wheat, oats, canola, flax, sunflowers, ryegrass, and bluegrass dominated agricultural production in Roseau County. Significant production of soybeans, wheat, oats, and grass seed occurs near the Roseau River WMA (Figure 3).

Figure 3. Land cover surrounding Roseau River WMA



Roseau River WMA History

In 1938, the idea of establishing a game refuge and public hunting area in Roseau County was created when state of Minnesota received its first allotment of funds from the Pittman-Robertson Wildlife Restoration Act (P-R). This act levied a federal excise tax on firearms, ammunition and archery equipment. By 1946, Minnesota's P-R apportionment had grown enough to support large projects, and several locals expressed interest and support

for the Roseau Project. The area and proposed project were described in a report by J. Donald Smith on Dec. 12, 1946. In April of 1948, the Minnesota Division of Game and Fish submitted a proposal to USFWS to use P-R funds to acquire and develop land for the Roseau River WMA. The proposal was approved, and acquisition began in 1949.

The construction of the Roseau River "pools", or impoundments, is one of the largest wildlife development projects completed by the DNR. Twenty-four miles of dikes were constructed in 1952 and 1953, forming three impoundments with a total area of approximately 10,600 acres. The impoundments are supplied with water from Canada through natural hydrologic movement through the watershed. The seven-mile-long Pine Creek diversion ditch was constructed in 1952 from Pine Creek in Manitoba, Canada to supply additional water for the impoundments as well as reduce flood damages. This project was financed by the state of Minnesota, although construction work in Canada was completed by the Province of Manitoba. It was estimated that the Pine Creek diversion ditch would result in a reduction of up to 4% to 5% in flood peaks at the town of Caribou (International Roseau River Engineering Board, 1975). Dike and structure repairs were frequently required between 1954 and 1980. Over the next 7 years, the entire dike received a 1-foot lift and was reinforced. In addition, eight water control structures were added to address initial inadequacies and improve water level management. The Pool 1 Subdivision dike, which divides Pool 1 into Pool 1 East and Pool 1 West, was built in 1974 to provide greater flexibility in water management. This new dike brought the total dike infrastructure maintained by Roseau River WMA to 27 miles.

In 2009, six moist soil units (MSUs) were completed north of Pool 1 East within the sanctuary, and two MSUs were developed south of the Pool 1 impoundments in 2012 and 2014. In 2024, a water control structure was added to a shallow backwater wetland on the Kittson County line.

Figure 4. Photo of the parking lot at the northeast corner of Pool 1 on the opening day of waterfowl season, Oct. 7, 1959

The DNR has continued management of the Roseau River WMA since the first WMA master plan in 1980. Full-time staff continue the operation, maintenance and enhancement of Roseau River WMA for wildlife populations, hunters, recreationists and visitors. Roseau River WMA still directs resources and sets management

goals largely based around game species and populations, with the knowledge that habitat management benefits all wildlife. A current assessment of Roseau River WMA operational goals and plans are detailed in later sections (see Implementation Process and Desired Conditions sections).

Archaeological and Historic Aspects

No archaeological sites are recorded for the Roseau River WMA, although several sites have been found along the Roseau River elsewhere in the county. During construction, the State Archaeologist felt that the chances of finding archaeological surface sites in the large bog areas of Roseau River WMA were very slim, but that buried bison kill sites in the peat were probable. They recommended that personnel involved in ditching or diking be advised of the possibility of buried sites and asked to stop work if any are found and notify the State Archaeologist or the Minnesota Historical Society (Johnson, 1977).

In a 1973 assessment of the archaeological sites of the area for the USACE, Bares et al. (1973) reported that residents near the Roseau River had observed burial mounds scattered along the riverbanks. The report implied that the project area should be surveyed, and prehistoric sites should be inventoried before construction.

In early June of 1973, the University of North Dakota Archaeological Survey Team conducted a survey along the Roseau River from the Village of Roseau to the Canadian border (Reid, et al., 1974). A half-mile-wide corridor, centered on the river, was surveyed to assess the effect of the proposed USACE flood control project. An area 1 to 15 miles long in the Roseau River WMA was impossible to survey on foot and was instead spot-checked by boat. The survey team examined seven "occupation sites" and two probable burial sites, but none of these were located on the WMA. Most of the land along the Roseau River within the WMA is low, marshy peatland (McMiller, et al., 1942), so the occurrence of archaeological sites is unlikely.

The Minnesota State Historical Society and the Roseau County Historical Society were consulted for updates to cultural resources and historic sites on the area. As of 2024, there are no known cultural resources or historical sites and no need for special management consideration.

Existing Conditions

Land Ownership

Introduction

Land ownership and associated policies strongly influence natural resource management on state managed lands. Management goals and designation type are affected by acquisition history, present land ownership patterns, sources of acquisition funds, and state and county policies. Multiple land type designations make up Roseau River WMA, each carrying different implications.

Acquisition of Wildlife Lands

The commissioner of natural resources, or their designee, such as the FAW director, is authorized to acquire lands for wildlife management purposes. A regional Strategic Land Asset Management team meets twice a year

to prioritize existing and new proposed acquisition projects. After approval through this regional process, FAW may attempt to acquire lands from willing sellers. FAW must also obtain approval from the appropriate county board before land can be purchased for a WMA. Newly acquired WMAs are designated by the commissioner and the public is notified through the State Register.

The DNR uses multiple funding sources for wildlife land acquisition, including the Game and Fish Fund (GFF), which is funded by proceeds of hunting and fishing licenses, and federal matching funds from P-R. In addition, wildlife land acquisition has been supported through state bonding funds, and through the Environment and Natural Resources Trust Fund as recommended by an administrative committee, the Legislative-Citizen Commission on Minnesota Resources (LCCMR). Legislative appropriations through the Clean Water, Land and Legacy Amendment's Outdoor Heritage Fund (OHF) became available for wildlife land acquisitions starting in 2009 through its administrative body, the Lessard-Sams Outdoor Heritage Council.

Lands purchased with federal dollars and most purchased with state dollars have use restrictions. The land must be bought and continue to be used for wildlife conservation purposes. Examples of such programs include the federal P-R Fund (50CFR Part 80.134), the OHF, and the state GFF. Generally, approved wildlife conservation activities in Roseau River WMA include the maintenance, restoration, and enhancement of wildlife habitats and the operation of public hunting grounds.

Acquisition of the Present WMA

Land acquisition for the Roseau River WMA began in 1949, and by 1952, 51,660 acres had been acquired. Additional tracts of state and private land were purchased between 1958 and 1969, increasing Roseau River WMA to 61,333 acres by 1980. In the following decades, intermittent subsequent acquisitions increased Roseau River WMA to an acquired land base of 62,598 acres, of which 61,633 acres were acquired through the P-R grant program. An additional 12,435 acres of School Trust Land adjacent to Roseau River WMA were added to the area's administration through an internal Transfer of Custodial Control in 1986. School Trust Lands are tracts of public land throughout Minnesota, managed by the DNR to maximize long-term economic return for the Permanent School Fund while maintaining sound natural resource conservation and management principles. In total, the main work area with the addition of these lands and others since then for the Roseau River WMA is approximately 75,163 acres (Table 2; Figure 5).

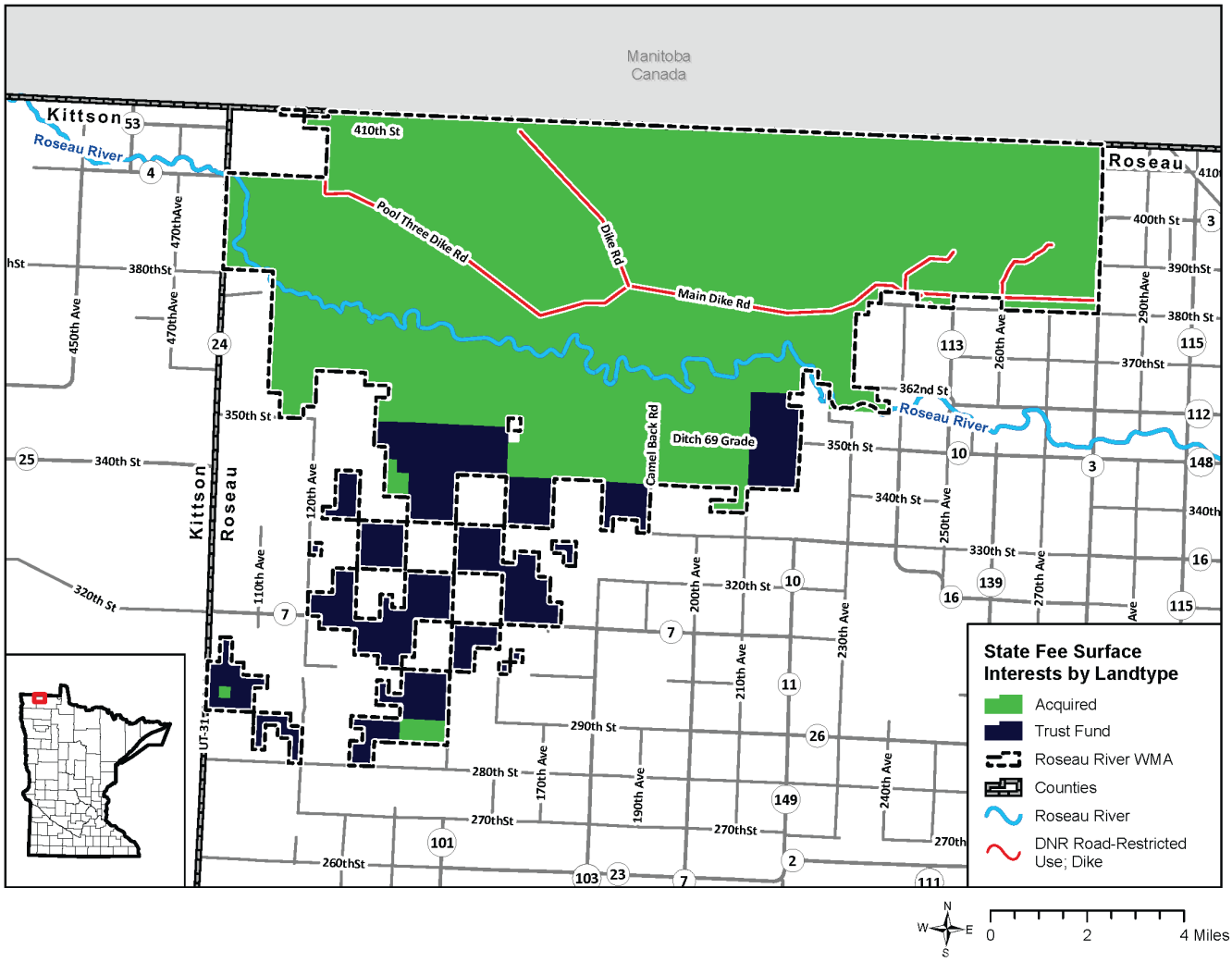
Over 87% of the acquired land was previously in state ownership, including about 3,000 acres of Consolidated Conservation Area land and over 50,000 acres of Trust Fund land. About 7,600 acres of private land and some land previously owned by the federal government was also acquired.

Nearly $383,000 was invested in land acquisition by 1980. Ninety-five percent of the acquired land was purchased through P-R projects. Minnesota paid 25% of the federal aid acquisition project costs; over 99% of the matching funds were from the GFF. The remainder of the matching funds were provided from cigarette tax monies by the Legislative Minnesota Resources Commission (now the LCCMR). Consolidated Conservation Area land was dedicated to Roseau River WMA at no cost.

Table 2. Acreage and percentage of land ownership types at Roseau River WMA

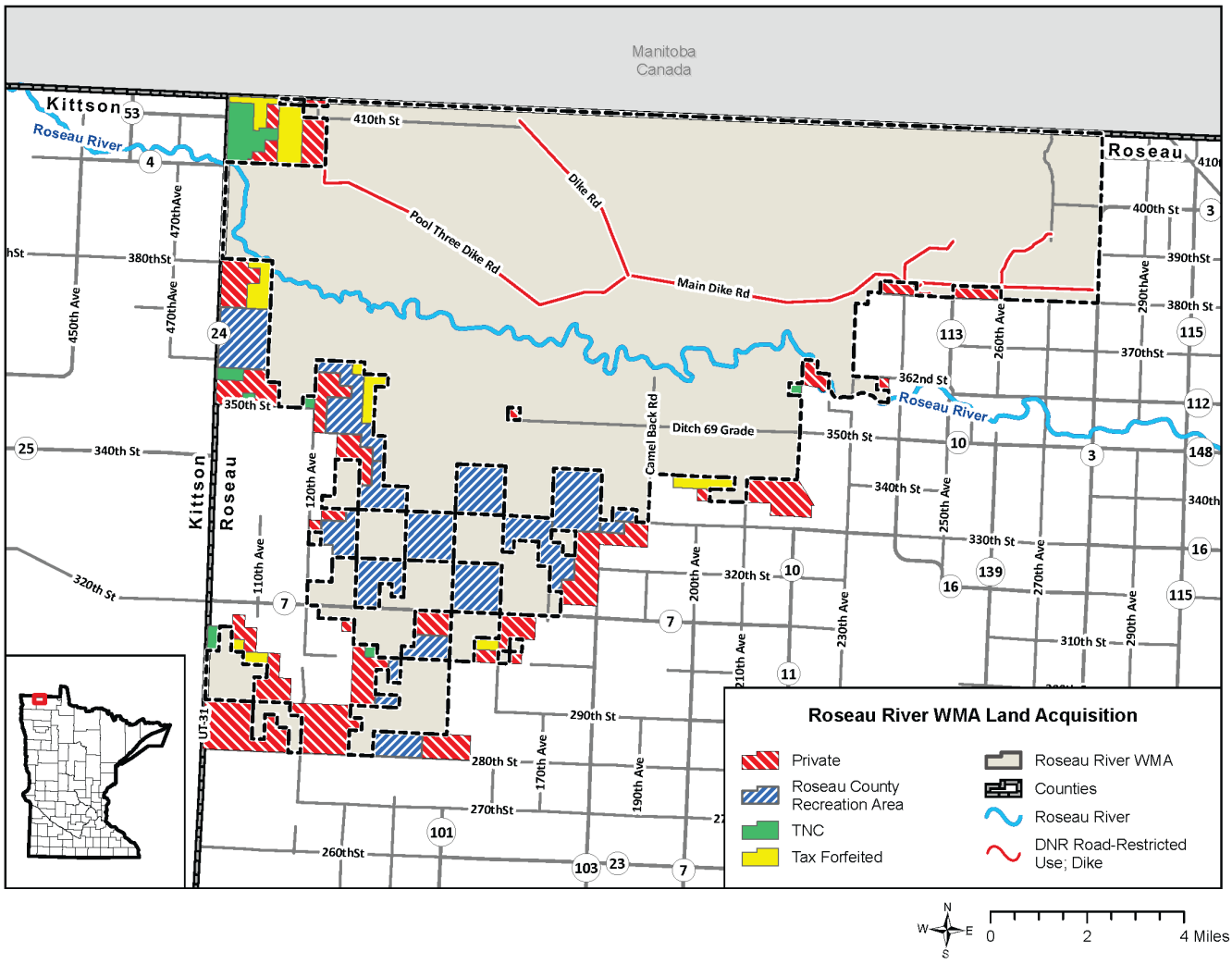
Land Type	Acreage	Percent
Acquired Land	62,598	83%
School Trust Land	12,434	17%

Figure 5. Land ownership classification at Roseau River WMA



An acquisition plan is critical to Roseau River WMA operations as it outlines DNR priorities and serves to guide staff on acquisition in the work area. Since 1980, three supplements have been approved to the Roseau River WMA acquisition plan: the Juneberry, Northwest, and Southeast supplements (Figure 6). The acquisition plan identifies inholdings and county, partner and private lands that would either facilitate area management operations, improve WMA access or protect adjoining high-quality habitat.

Figure 6. Priority areas for future acquisitions for Roseau River WMA



Area Description

Landscape Context

The 75,163-acre Roseau River WMA is in northwestern Minnesota near the city of Roseau. The unit lies within a flat, poorly drained, agriculturally developed region in a basin known as Glacial Lake Agassiz. Much of the surrounding land where drainage is possible is used for cash crops, although cattle and grazing were much more common prior to the 2000s (see Area History section for more information). Poorly drained sites are extensive and scattered throughout the area. They are commonly composed of brush and forest.

Roseau River WMA is entirely within Roseau County. The nearest communities in the U.S. are Roseau (13 miles), Lake Bronson (16 miles), Greenbush (nine miles), and Badger (10 miles), although access points into Roseau River WMA from these communities are farther away.

The unit is low and flat, and the vegetation is dominated by sedge meadows and lowland brush. Aerial photos from 1940, prior to the establishment of Roseau River WMA, show patchy forest and brushland, which have

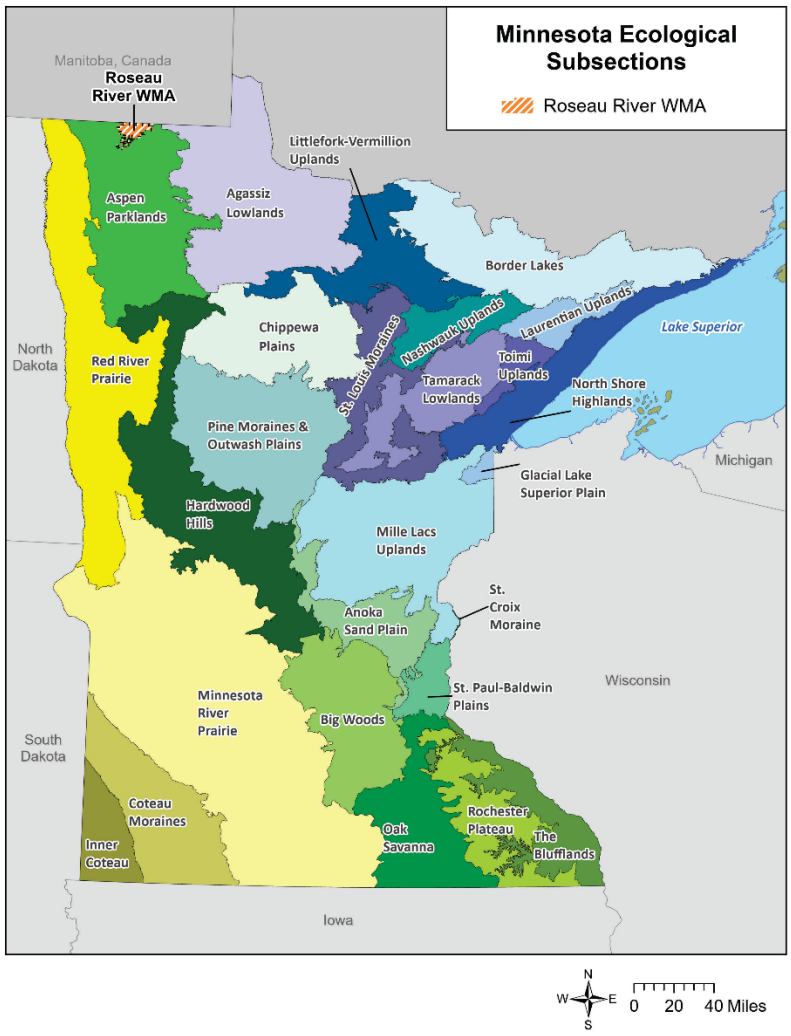
since expanded significantly across Roseau River WMA. Aspen was sporadic and young with few mature stands of any acreage, and oak and jack pine ridges were predominantly open woodlands. Brushlands are harder to distinguish in the photos but were likely less contiguous than present. Brush establishment is particularly pronounced downstream of hydrologic barriers or disruptors, such as the dike system.

The extensive drainage efforts in Roseau County have significantly altered the hydrology of the river and its connectivity to its floodplain within Roseau River WMA. The Roseau River flows west for 17 miles through the unit. It enters Roseau River WMA 99 miles downstream of its headwaters and exits Roseau River WMA 97 miles upstream of its confluence with the Red River of the North in Manitoba. Dredging of the river in the early 1900s cut off approximately 14 miles of river that function as oxbows today.

Several projects are currently in development to restore hydrology and riverine and floodplain habitat within and near the WMA. The Roseau River Restoration Project seeks to reroute the river back through its historic channel, returning primary flows to all 14 miles of oxbow. Concurrently, the Juneberry Project intends to abandon the lateral ditch network and fill or plug up to 25 miles of ditch, restoring hydrology through much of the "Big Swamp" wetland complex south of the Roseau River. More information on these projects is available in the Desired Conditions section. Upstream, the Roseau Lake Rehabilitation Project is under construction and will restore 3,000 acres of wetland habitat while providing downstream flood damage reduction benefits and meter discharge to the river. The low head dam in Roseau was replaced with a rock-arch rapids and another near Malung was removed for fisheries and aquatic ecology benefits. Discussions are underway with Canadian partners regarding an additional fish passage project at a derelict dam in Dominion City, Manitoba.

Roseau River WMA is located within the Tallgrass Aspen Parklands (TAP) Province of the Ecological Classification System (ECS; Figure 7). Within the TAP there is only one ECS Section, the Lake Agassiz Aspen Parklands (LAP) Section, and only one ECS Subsection, the Aspen Parklands Subsection. The TAP Province in Minnesota comprises less than 7% of a larger, ecologically important habitat system that spans from Minnesota to Alberta (TNC Canada, 2019). The TAP Province contains unique flora and fauna that contribute to the biodiversity of Minnesota. This fire-dependent system continues to support wide-ranging megafauna in Minnesota, including moose, elk, white-tailed deer, wolf, black bear, lynx and the occasional mule deer. The landscape formerly hosted caribou, bison and, most likely, nesting whooping cranes and long-billed curlews.

Figure 7. Ecological subsections of Minnesota

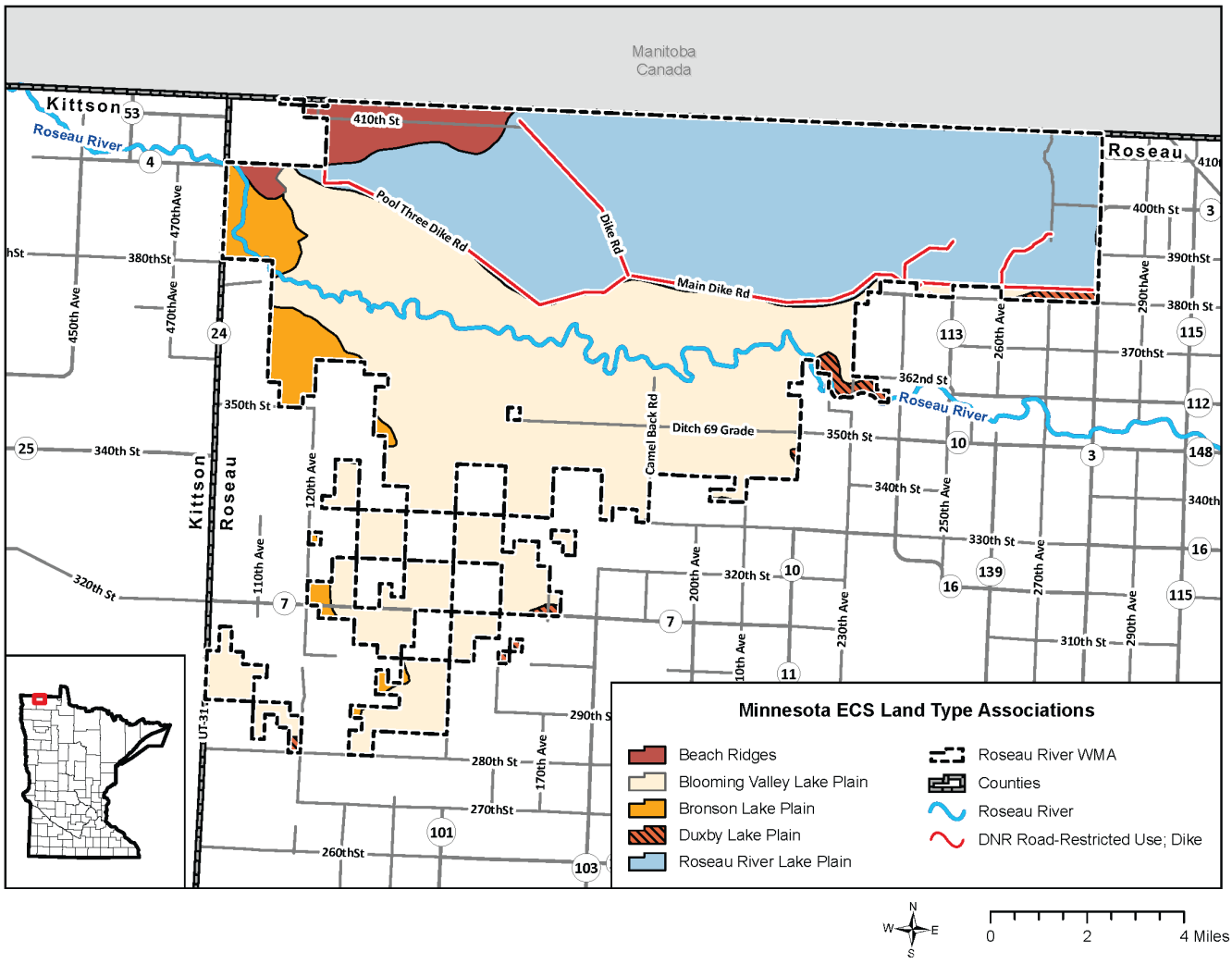


The eastern boundary of Roseau River WMA is four miles west of the westernmost part of the Laurentian Mixed Forest (LMF) Province and Northern Minnesota and Ontario Peatlands Section. About 60% of the LAP consists of sandy deposits from the shallow areas of Glacial Lake Agassiz. About 30% of the LAP consists of loamy till glacial deposits that were inundated and reworked by wave action. Clay and silt deposited in deeper portions of Glacial Lake Agassiz make up the remaining 10% of the Section.

Due to the proximity of the two ecological Provinces and Sections, some native plant communities present on Roseau River WMA are more representative of the LMF instead of the TAP. Upland Prairie and Wet Prairie plant communities cover 40% of the LAP, but these communities are largely absent from Roseau River WMA. The Wet Meadow/Carr and Marsh systems, which are very common on Roseau River WMA, are relatively uncommon in the LAP, making up 14% and 7% of the vegetation community systems, respectively. More information on native plant communities is provided in the Habitat and Native Plant Community section.

Within the boundary of Roseau River WMA there are five Land Type Associations represented (Figure 8): Blooming Valley Lake Plain (36,624 acres), Roseau River Lake Plain (31,430 acres), Bronson Lake Plain (3,450 acres), Beach Ridges (2,700 acres), and Duxby Lake Plain (946 acres).

Figure 8. Land Type Associations on Roseau River WMA



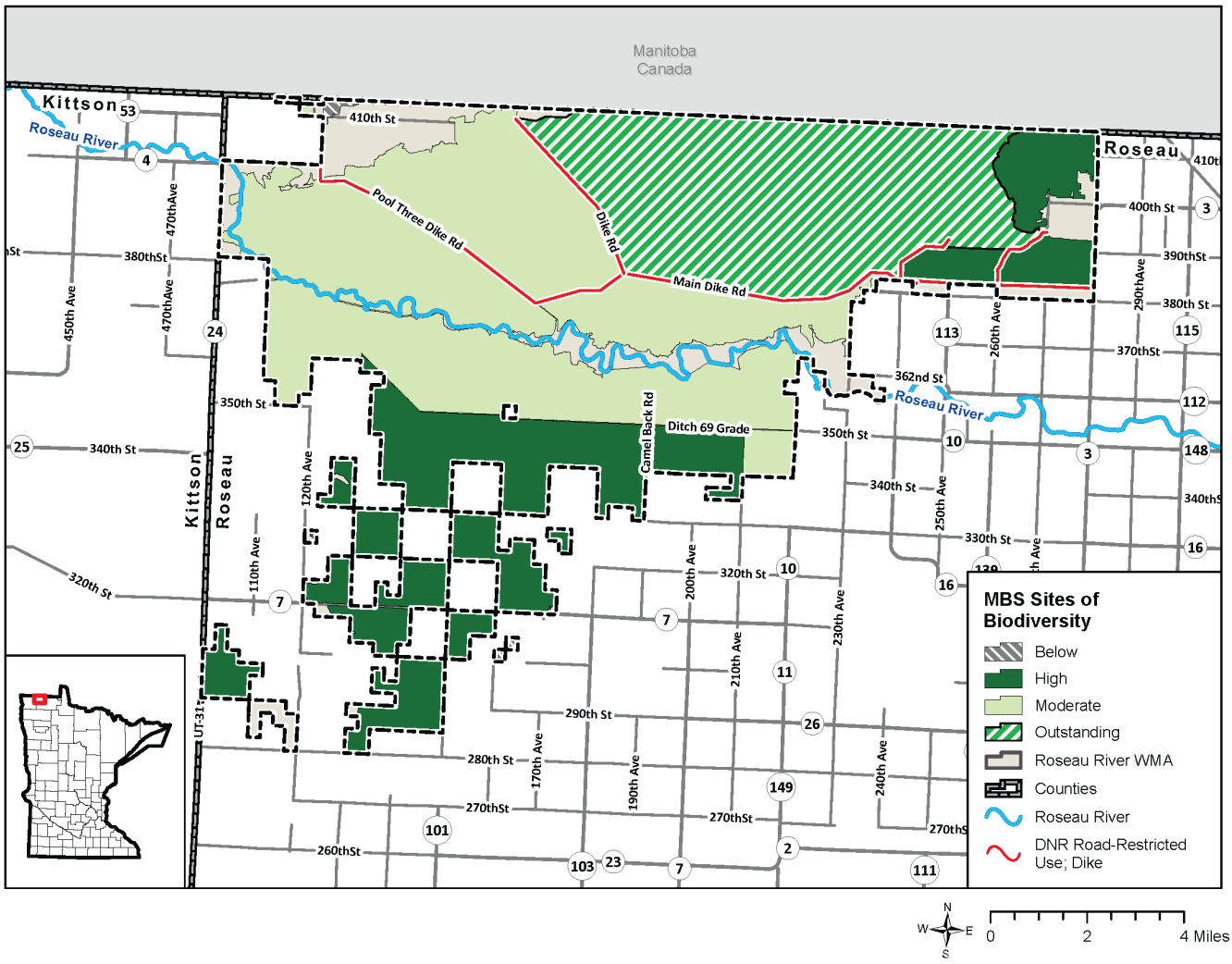
Roseau River WMA abuts a sparsely populated region of Canada known as the Sandilands. It is part of the Boreal Shield EcoZone, and the Lake-of-the-Woods EcoProvince and Ecoregion, Piney EcoDistrict (Statistics Canada, 2018). Because it is a largely natural area, large mammals have mostly unhindered access to Roseau River WMA through Canada (see Wildlife section for more information on mammals present on Roseau River WMA).

The unit lies within the Roseau River and Two Rivers Watershed districts. Most of the unit lies between 1,013 to 1,040 feet of elevation; the maximum elevation of the unit is 1,084 ft. Much of the unit is classified as wetland by the National Wetlands Inventory. The nearest major lakes are Lake Bronson (12 miles southwest), Thief Lake (27 miles south-southeast) and Lake of the Woods (31 miles east).

Numerous rare plants and animals are present on Roseau River WMA, mostly within areas recognized as areas of biodiversity significance by the Minnesota Biological Survey (MBS; Figure 9). MBS completed the initial survey in 1994 and has since made efforts to update and expand the record; currently, MBS has evaluated most of the unit for MBS Biodiversity Significance. Approximately 18,428 acres are classified as Outstanding, 24,992 acres (includes some areas not under state management) are classified as High, and 32,986 acres (includes some areas not under state management) are classified as Moderate quality. The biodiversity of the unit has been

recognized in the Minnesota Prairie Conservation Plan, which identified most of the unit as a Core Area, and in Minnesota's Wildlife Action Plan (MNWAP), which designated the entire unit as medium-high to high in the Wildlife Action Network. In addition, Minnesota Audubon designated the entire unit as an Important Bird Area.

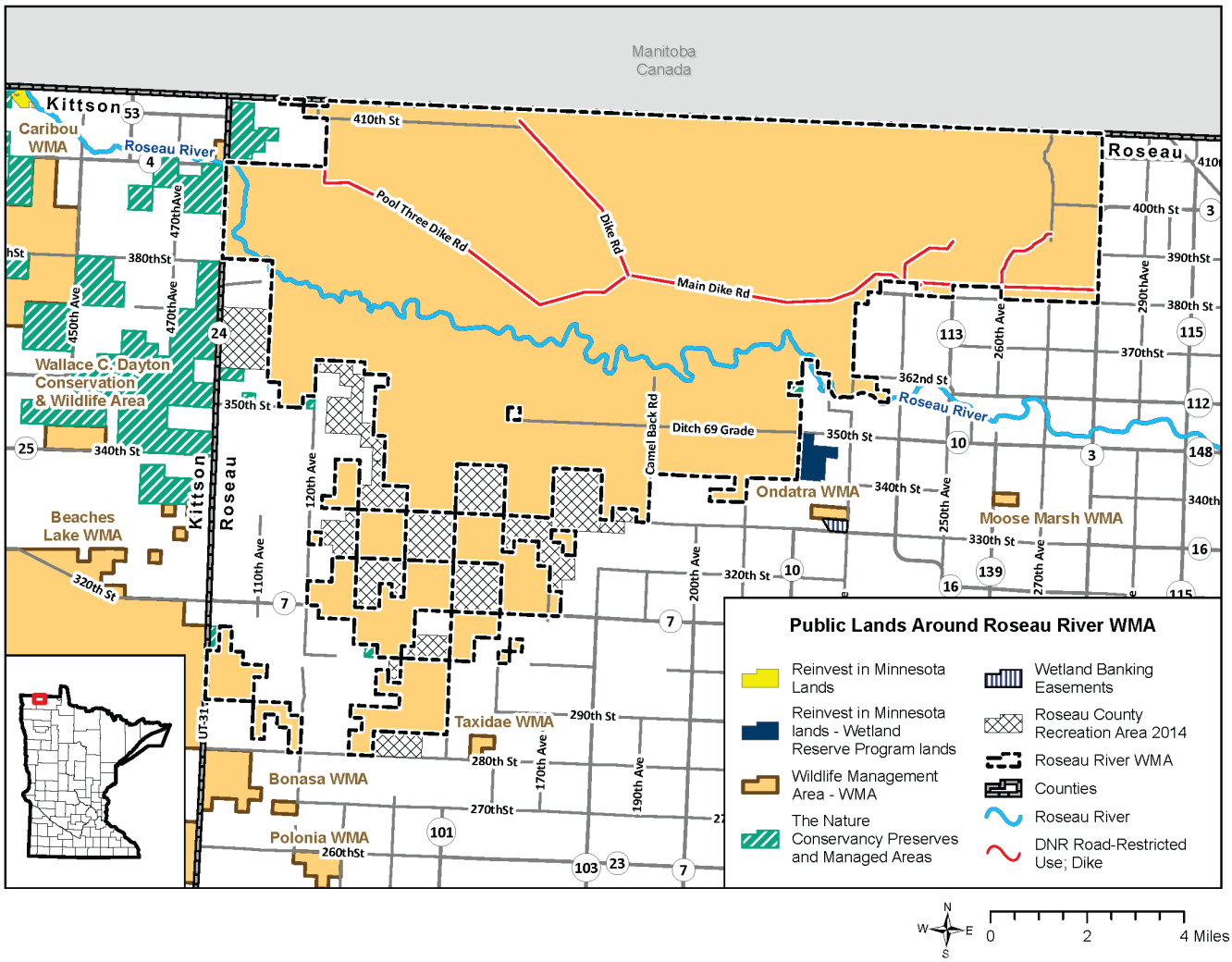
Figure 9. MBS areas of biodiversity significance on Roseau River WMA



Roseau River WMA is near several conservation units in Kittson and Roseau counties (Figure 10). These include:

- Multiple WMAs, including Caribou, Beaches and Roseau Lake WMAs.
- Lake Bronson and Hayes Lake state parks.
- Four scientific and natural areas (SNAs): Pine Creek Peatland, Sprague Creek Peatland, Two Rivers Aspen Parkland and Lake Bronson Parkland.
- Two large state forests: Lost River State Forest (four miles east of Roseau River WMA) and Beltrami Island State Forest (27 miles southeast).
- Multiple county-administered lands.
- Three public water accesses along the Roseau River in or near Roseau River WMA: one in the northwestern corner of the unit, one in the middle of the unit, and one just over one mile east of the unit.

Figure 10. Public lands and other lands managed for natural resources in the vicinity of Roseau River WMA



Socioeconomic Context

Roseau River WMA is in the northwestern Minnesota county of Roseau; its western border is the Kittson County line. The populations of Roseau and Kittson counties are approximately 15,300 and 4,060 people, respectively. Nearby cities include Roseau (population 2,744), Badger (population 429), Greenbush (population 682) and Lancaster (population 364). In 2022, the median household incomes for Roseau and Kittson counties were $70,122 and $66,000, respectively (U.S. Census Bureau, 2022). Roseau County is 1,678 square miles, and nearly 50% of that land is used for agricultural production. The headquarters of Marvin Windows and the largest U.S.-based manufacturing operations of Polaris are in Roseau County. The largest industries in Roseau and Kittson counties are manufacturing (4,337 employed in 2023), agriculture (2,393 employed in 2022), health care and social assistance (1,016 employed in 2023) and retail trade (814 employed in 2023; Minnesota Department of Employment and Economic Development, 2024). Because of its proximity to Canada, Roseau is intertwined with Canadian communities and depends on an international workforce and spending. Public lands and waters in and around Roseau River WMA are an important source of tourism revenue for the local economy, as they attract visitors from across the state with unique recreation opportunities.

Geology and Soils

Geologic action shaped the surface of the Roseau River basin over the past 11,000 years. At the start of this period, the last major Pleistocene ice receded northward and deposited a layer of glacial till and outwash. Glacial Lake Agassiz formed when water from the melting ice and precipitation was trapped between the higher land to the south and the ice to the north. The lake first drained southward. However, new outlets were uncovered as the glacier continued retreating, and the lake drained eastward and then northward. The Roseau River was formed as Glacial Lake Agassiz drained from the basin. Since that time, there has been little vertical erosion by the river. However, the river has moved laterally by abandoning old channels and creating new ones (Reid, et al., 1974).

The soils of Roseau County developed from calcareous material of the late Wisconsin glaciation, nearly all of which was modified by the waters of Glacial Lake Agassiz. Thinly bedded silts and clays form the foundation for most of the soils. Ridges of sand and gravel, some with large boulders, mark the former shorelines of the lake. Other ridges were likely formed as offshore sand bars and spits. Lake silts and clays remained in the deeper portions of the Agassiz basin, particularly around Roseau River WMA. Because of the relative impermeability of these sediments, the water table is normally high. As a result, peat bogs have formed and accumulated in many areas; in some localized depressions, the peat may be as much as 20 feet thick.

Wind action has also been a factor in shaping the land surface. Sand dunes, which are still present in the area, were formed by wind soon after the lakebed was exposed. Wind erosion has often leveled some features of the landscape during dry periods in later years.

Two extensive geographic soil belts, plus a transition zone between the two, are present in the Roseau River Basin. The western part of the basin lies in the northern chernozem zone, and the eastern part lies in the podzol zone. The chernozem soils formed under grass vegetation and characteristically have black or very dark gray surface soils, which are high in organic material and nitrogen. They extend about 15 miles into western Roseau County, including most of Roseau River WMA. The light-colored podzol soils lie east of the transitional belt and formed under forest cover.

There is no exposed bedrock in the Roseau River Basin, but two types of bedrock occur in the management area. Most of the area is underlain by undivided Ordovician rocks, which are mainly carbonate rocks, while the eastern part of the area is underlain by undivided metavolcanic rocks (Sims, 1970). Bedrock is not known to lie more than 250 feet below the surface anywhere in Roseau County. At two sites within five miles of Roseau River WMA, the bedrock was 130 and 225 feet deep (Allison, 1932). The depth of glacial drift overlying the bedrock ranged from less than 100 feet in the eastern part of the watershed to 300 feet in the western part. On Roseau River WMA, the drift thickness is about 100 feet under the east end and about 250 feet at the west end (as of 1980). The drift is largely till, a variable mixture of clay, silt, sand, and gravel that is largely calcareous, sandy, clay containing pebbles and cobbles.

The natural fertility of most soils on Roseau River WMA is low. Most of the soils have poorly developed profiles and poor drainage due to the nearly level terrain of Roseau River WMA and the county. (Figure 11). Table 3 and Table 4 show the percentages and distribution of both soil types and drainage classes, respectively. Around 83%, or approximately 62,722 acres, are classified as very poorly drained while around 11%, or approximately 8,290 acres, are poorly drained. Other soil classes exist on Roseau River WMA, but in much smaller percentages (Table 3). Soil texture matches the drainage types found at Roseau River WMA with around 80%, or approximately

60,149 acres, of Roseau River WMA classified as muck. High concentrations of muck suggest low movement of water and anaerobic conditions in most of Roseau River WMA. Fine sandy loam, unknown, loam, and loamy fine sand are the next most common soil textures at Roseau River WMA (Table 4). These soil types all signify poorer drained soils throughout the remaining portions of Roseau River WMA.

Figure 11. Map of Roseau River WMA soil drainage classes found within WMA boundaries

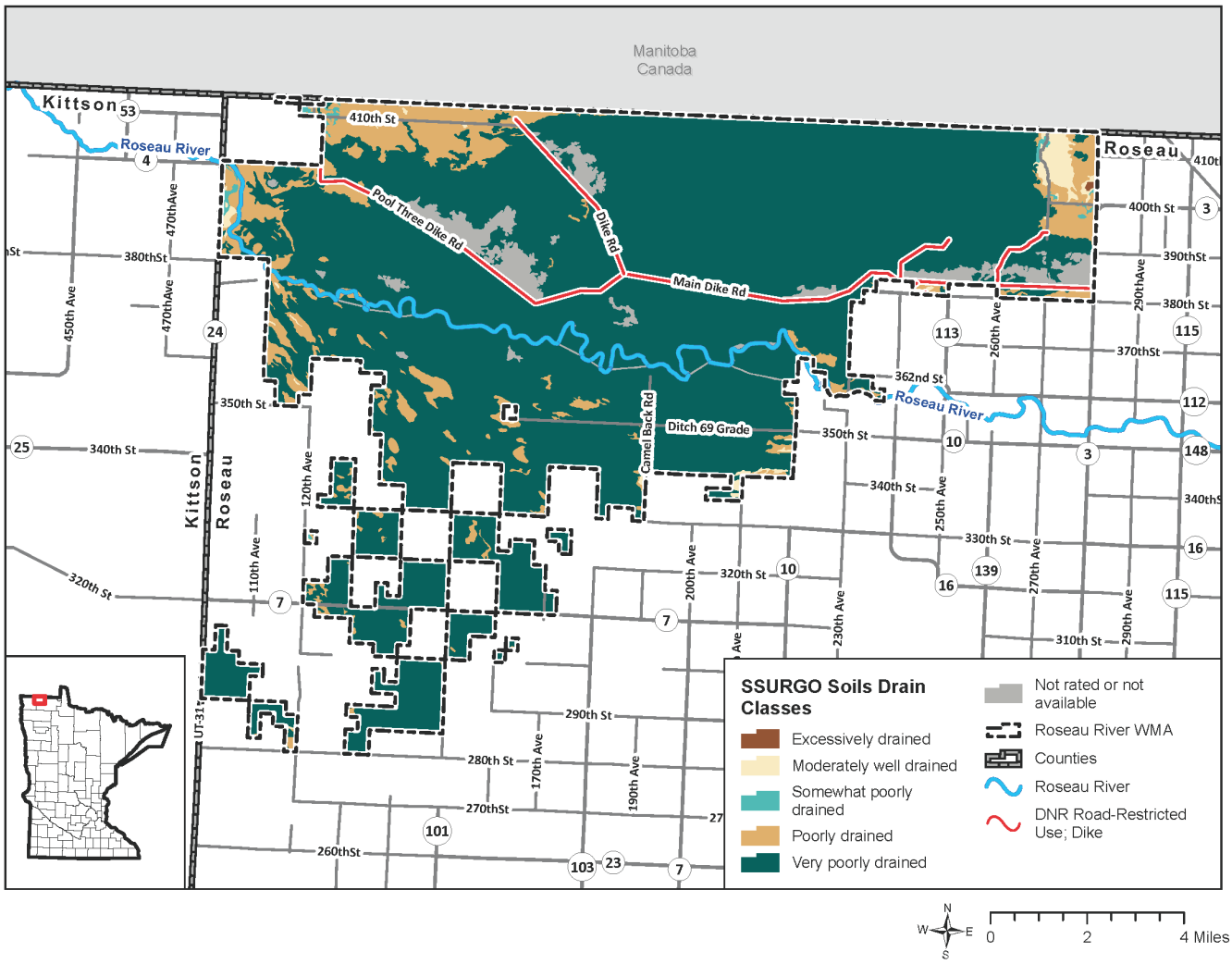


Table 3. Soil drainage classes at Roseau River WMA

Drainage Class	Acres	Percentage of WMA (%)
Very poorly drained	62,722	83
Poorly drained	8,290	11
Unknown	2,860	4
Moderately well drained	933	1
Somewhat poorly drained	303	<1
Excessively drained	54	<1

Table 4. Soil types found at Roseau River WMA

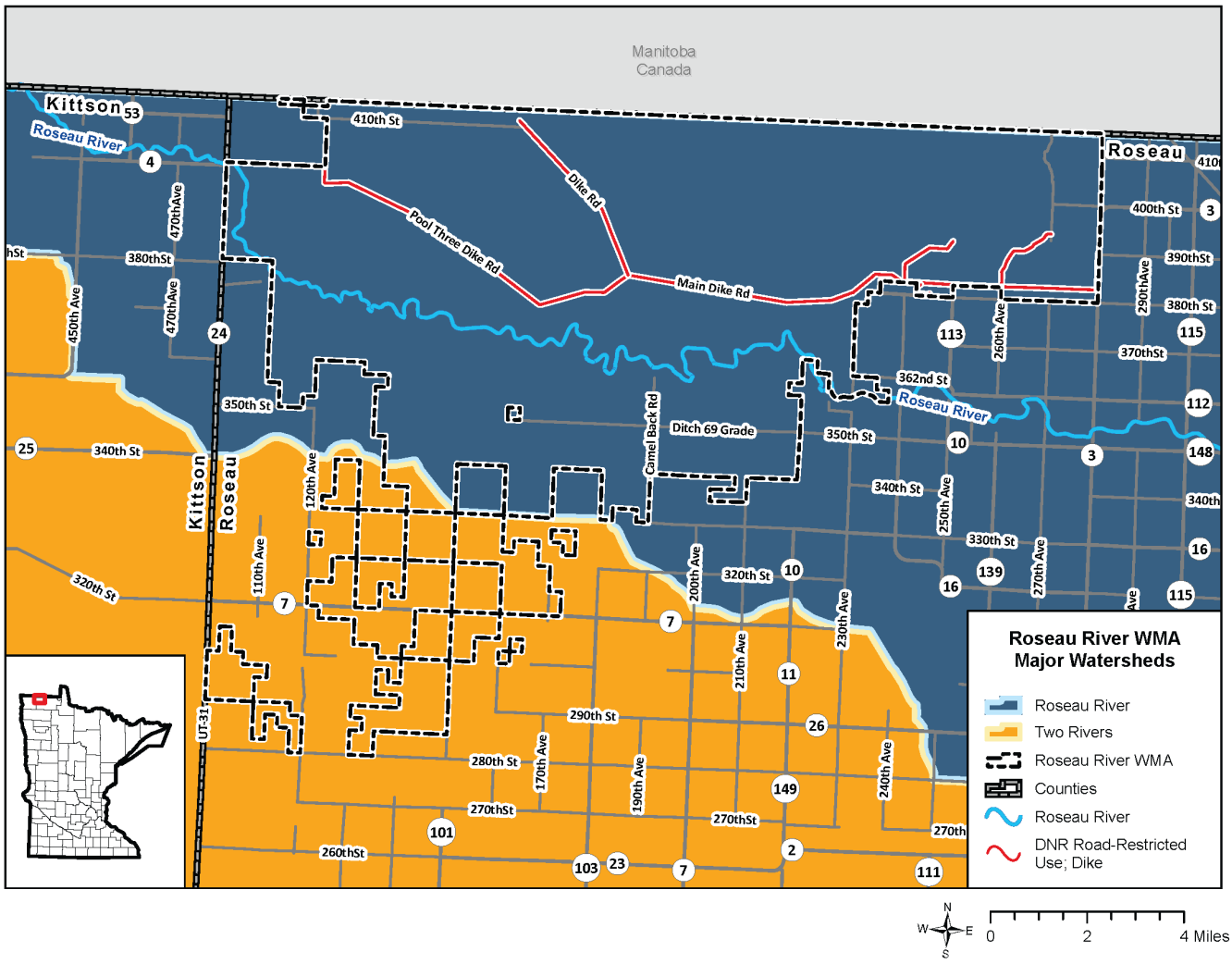
Soil Physical Properties - Surface Texture	Acres	Percentage of WMA (%)
Muck	60,149	80
Fine sandy loam	3,965	5
Unknown	2,860	4
Loam	2,593	3
Loamy fine sand	2,475	3
Clay	1,043	1
Mucky loam	945	1
Clay loam	413	<1
Fine sand	259	<1
Very fine sandy loam	164	<1
Silt loam	159	<1
Loamy sand	96	<1
Sandy loam	12	<1
Extremely gravelly loamy coarse sand	29	<1

Roseau River WMA staff will use soils information, drainage and type for continued management and conservation of wildlife, plant species, and other natural resources. This information will allow for better planning and decision making for management activities. Climate changes (see Climate, Extreme Weather, and Climate Change section) could alter water accumulation, storage, movement, and duration on Roseau River WMA, which in turn could affect the temperature, alkalinity, and permeability of soils. These changes could lead to potential long-term shifts in soil types and productivity.

Hydrology

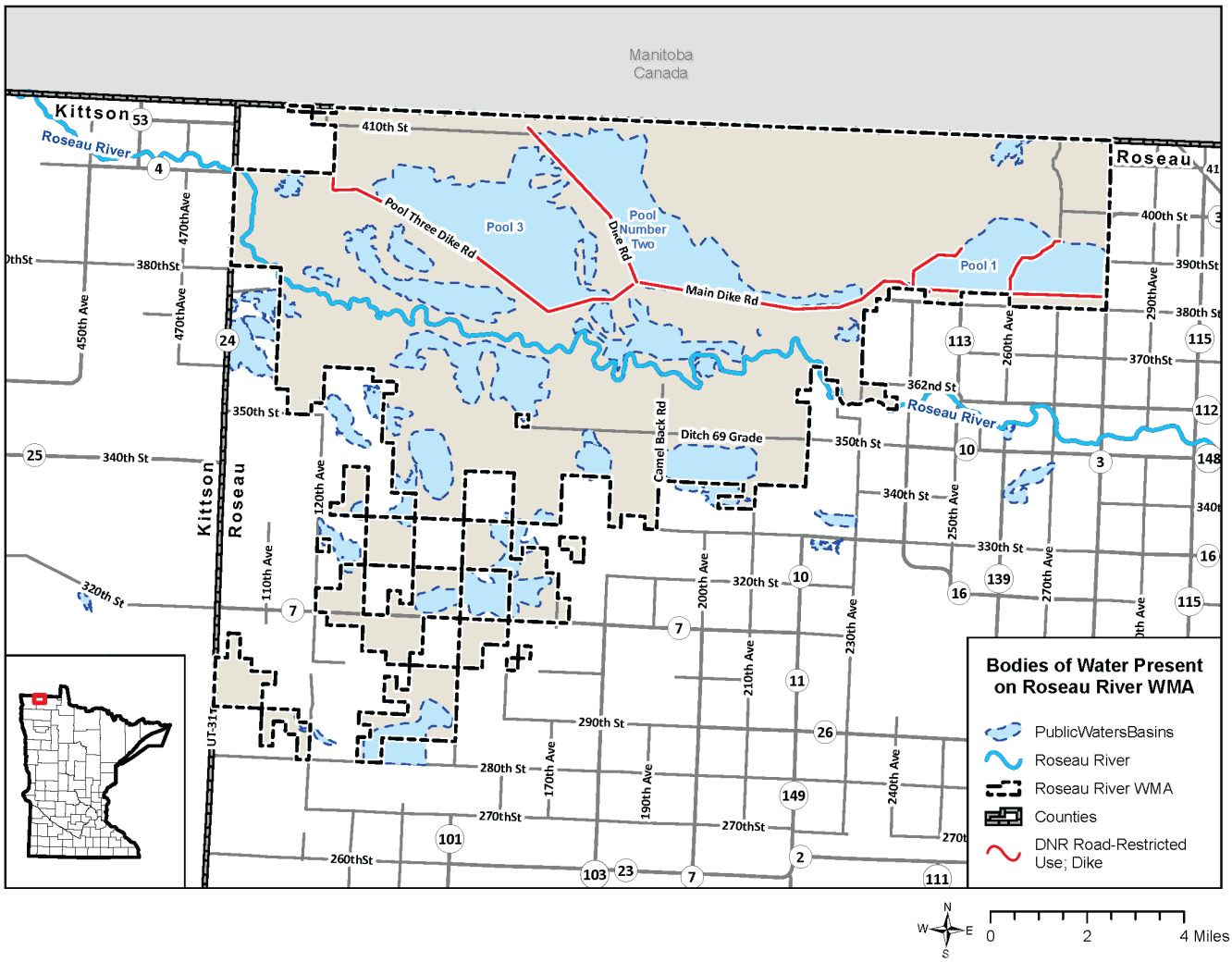
The Roseau River WMA lies within the Roseau River and Two Rivers watersheds (Figure 12). The Roseau River watershed covers 2,057 square miles in northwestern Minnesota and south-central Manitoba, Canada. Approximately 60% of the Roseau River watershed is in the U.S. (Reid et al. 1974). The Two Rivers watershed is 1,462 square miles and is completely within the U.S. border. Both watersheds drain to the Red River. The watershed boundary is approximately two miles south of State Ditch 69 and three miles south of the Roseau River at its closest point in the Big Swamp.

Figure 12. Watersheds in Roseau River WMA



The Roseau River flows generally northwestern and is about 212 miles long. The lower half of the river is in Canada and spans about 94 miles from the border to the Red River confluence. The principal tributaries and drainage areas are South Fork (312 square miles), Hay Creek (81 square miles), Sprague Creek (220 square miles), and Pine Creek (90 square miles). Important natural features in the Roseau River basin include the Roseau River and its tributaries, an abundance of wetlands, Roseau Lake, the Big Swamp, and Lost River and Beltrami state forests. (Figure 13).

Figure 13. Waterbodies within Roseau River WMA



Stream gradients of the Roseau River vary widely. Upstream from Roseau, the slope is about 17 feet per mile. However, the slope decreases considerably below Roseau, especially through the Big Swamp where it is only 0.2 feet per mile. The river is about 20 feet deep and 125 feet wide within the city of Roseau. It increases to about 170 feet wide and 10 to 20 feet deep between the city of Roseau and the Canadian border. However, the river is only about 7 feet deep as it passes through the Big Swamp in Roseau River WMA, with a discharge about 945 cubic feet per second (cfs) to fill the channel to the top of bank (E. Jones, Houston Engineering Inc., personal communication, December 2024). The Roseau River is generally easily navigable by canoes and motorboats; however, shallow water, sandbars and rocks make travel by motorboat difficult during annual periods of low flow.

Roseau Lake is a natural shallow basin. However, because of historic ditching, it only holds water during flood periods. This natural basin is in the process of being rehabilitated through the Roseau Lake Rehabilitation Project. The natural contours of the basin, along with constructed earthen embankments adjacent to the north bank of the river, will capture, hold back, and meter water into the Roseau River. The project will restore 3,000 acres of wildlife habitat in the basin while providing reductions in flood damages near and downstream of the basin.

With the establishment of the Roseau Lake Rehabilitation Project, Pine Creek (also known as State Ditch 87), as a legal ditch, was partially abandoned on May 25, 2022. The channel was rerouted to daylight into Roseau Lake in the fall of 2024. Pine Creek now maintains continuous flow through Roseau Lake and into the Roseau River. Discharge rates will be regulated through the Roseau Lake Operations Plan that was established to meet habitat and flood damage reduction goals.

Substantial natural storage is also provided in the extensive wetland system of the Big Swamp. The Big Swamp is partially located on Roseau River WMA and the Roseau County Recreation Area lands. Some of the Big Swamp area south of the Roseau River originally drained to the south into the Two Rivers watershed. State Ditch 69 and laterals were constructed in the early 1900s, along with State Ditch 72 and laterals, to drain the southern portion of the Big Swamp by watershed. Given the laterals and natural topography, the flooding of the Roseau River can result in water crossing into the Two Rivers watershed. Discussions in 2023 between Kittson and Roseau counties, the two watershed districts and DNR resulted in the creation of the Juneberry Project. The project seeks to reduce breakout flows between the watersheds, improve farmland drainage, increase water storage, and restore wildlife habitat and plant communities through the abandonment and elimination of lateral ditches, which will restore drained wetlands and public waters within the Big Swamp. More information on the management objectives of the Juneberry Project can be found in the Desired Conditions section.

Frequent flooding has occurred in the Roseau River watershed. Flooding is aggravated by more intensive rainfall, altered hydrology and a flat landscape among other factors. The Roseau River reaches its highest peaks in April and May from melted snow runoff and rainfall. Flooding may also occur later in the year following heavy rains. Discharges decline to almost no flow in the late fall and winter. Roseau County's expected annual loss from riverine flooding is $1,733,649.00 as of 2024, which accounts for damage to rural and urban property, crops, roads, and bridges (Roseau Emergency Management, 2024). The National Risk Index rating for riverine flooding in Roseau County, which is determined based on expected annual loss, social vulnerability, and community resilience, is relatively moderate compared to the rest of the United States (Federal Emergency Management Agency, 2025). The extent and type of damage depends on the time of year flooding occurs. Spring floods may delay seeding for several weeks; may lead to decreased or devalued production; and may cause growers to substitute crops planted due to the short growing season. Summer floods could inundate and destroy growing crops and forages. Other agricultural losses include loss of livestock and damage to fences, buildings and machinery. Nonagricultural, residential losses include damage to roads, bridges and buildings throughout the watershed.

The U.S. Geological Survey (USGS) has collected streamflow data at several stations along the Roseau River and its tributaries since 1911. There are currently four active gages within the Roseau River watershed: Malung, Sprague Creek, Ross, and Caribou. The largest flood recorded on the Roseau River occurred in the summer of 2002 when the county experienced nearly 14.5 inches of rainfall. This produced the largest maximum discharge ever recorded at Ross (10,500 cfs) on June 16, 2002 (4.4 ft above major flood stage on the Roseau gage). The Roseau River crested at 23.4 feet. The flood covered about 220 square miles from June 9 through July 2002 (T. Halstensgard, RRWD, personal communication, 2024). The next largest flood occurred in May 1950 with a cfs of 6,560 (3.7 ft above the Ross bank-full stage, Winter et al. 1967). The USGS gauge at Caribou, which is at a bottleneck in the Roseau River, showed about one-half of the water volume reaching the gage in May 1950 (4,080 cfs) and June 2002 (4,350 cfs), while the Malung gage on the South Branch of the Roseau River showed higher discharge values for the floods of 1950 and 2002 compared to the Caribou and Ross gages. Hydrologic

information for Roseau River WMA water level management is based on the Caribou gage on the Roseau River below State Ditch 51 near Caribou.

Channel-forming flows, or bankfull flows, are increasing in the watershed and can have effects on stream channels, erosion, scouring, and deposition. These flows are critical for moving sediment and shaping streams on 1.5-year return intervals, or approximately one to two times a year. Five- and 10-year flood events have increased by 38% and 35%, respectively, over the 48-year discharge record, which means more water is moving through the watershed each year (Minnesota Department of Natural Resources, 2023). Many aquatic organisms rely on bankfull and small flood events to complete various life functions (e.g., reproductive behavior). The seasonal timing, magnitude, and duration is critical for these ecological services.

Baseflows, defined as flows related to a portion of flow not coming from overland runoff, have also increased over time. Changes in baseflow volumes are often closely tied to changes in land use management practices, which can alter surface runoff and prevent water from moving downstream into areas of groundwater storage. At the Caribou gage, baseflows have increases from 174 cfs to 376 cfs over the past 48 years, meaning that more water is entering the watershed (Minnesota Department of Natural Resources, 2023). Baseflow is key in maintaining stream channel conditions in times of little to no precipitation.

Over 680,000 acres in Roseau County (about 64% of the land area) had been drained by the 927 miles of ditches as of 2024. However, the capacities of the river and the ditch system have never been sufficient to prevent frequent flooding of agricultural lands. Drainage ditches have also been constructed in the Canadian portion of the watershed in several areas from Gardenton downstream to the Red River. These ditches may increase flooding in some areas in Canada depending on whether local runoff coincides with the peak flow upstream. Drainage projects on a smaller scale also exist on the Pine Creek and Sprague Creek tributaries. These projects can increase downstream flood peaks since they increase the rate and shorten the period of local runoff.

As of 2025, state and federal permitting is underway for the Roseau River Restoration Project. This river restoration project aims to reconnect and restore 13.6 miles of historic river channel (oxbows), cut off in the 1900s, to its riparian corridor/floodplain, lengthening the reach of the Roseau River through Roseau River WMA from 15 to 22 miles. This will be achieved by removing plugs and benthic material from the historic river channels and depositing the material in the straightened sections. It will also restore rifles and stream morphology, lost through ditching, increasing instream habitat for fish and other aquatic species. More information on the management objectives for the Roseau River Restoration Project can be found in the Desired Conditions section.

Figure 14. Aerial photo of an oxbow of the Roseau River within Roseau River WMA

Impoundments and Dams

Three impoundments, totaling about 10,600 acres, were constructed by the Minnesota DNR on the Roseau River WMA in the early 1950s. The seven-mile-long Pine Creek diversion ditch, which diverts water from Pine Creek into the pools (see Roseau River WMA History section for more information), is designed for a maximum flow of 600 cfs. To improve water management and regulate inputs from the diversion ditch, the subdivision dike was built in 1974 to divide Pool 1 into Pools 1 East and 1 West. Water from the diversion ditch enters Pool 1 West (although beaver dams appear to be shunting a proportion of direct flows) to Pool 2 and can be discharged to Pool 1 East or Pool 2. Pool 2 can discharge to Pool 3 or the Roseau River on the east end of the Big Swamp. Pool 3 can discharge to the river either in the middle of Roseau River WMA and Big Swamp or on the west boundary where it constricts east of Caribou to aid in flood damage reduction. Pool 1 East discharges to County Ditch 17 that serves as the exterior embankment ditch to the Pool 2 outlet and to the river. Discharge is regulated to the subsequent pools or river through eight water control structures and each pool is equipped with an emergency fixed-crest spillway to prevent dike failure.

When filled to the spillway elevations, Pool 1 East & West, Pool 2, and Pool 3 cover approximately 2,300, 4,600, and 3,700 acres, respectively (Table 5). The total storage capacity of the pools is about 22,500 acre-feet. The deepest water, other than the navigation channels, is approximately 5 feet with an average depth of 2.1 feet.

After development, emergent vegetation quickly took over much of the shallow areas of the pools due to the hydrologic alteration of the peatland. Although encroachment by emergent vegetation on the open water areas

is currently progressing very slowly, active management is required to prevent further encroachment. Roseau River WMA staff use cutting and spraying to manage and control the cattail encroachment. More information on proposed vegetation management activities can be found in the Desired Conditions section. Where permitted, all pools can be navigated with a motorboat, but travel is often difficult because of shallow water or dense submergent or emergent vegetation.

Other than the four impoundments and the Roseau River itself, the only other permanent water areas on Roseau River WMA are potholes that formed through burnouts, which are primarily located in the southern and southwestern sections of the WMA. Pool 1 contains many burnouts in the peat, which occurred in dry years before the pool was flooded. Peat was burned to a depth of 1 to 1.5 feet below the pool bottom. The burnouts start about three-quarters of a mile east of the west end of the pool and become larger and more numerous toward the east (Norberg & Quaal, 1953). The Pine Creek Pothole is 210 acres and was the largest pool in the area before the impoundments were constructed. Fashingbauer (1949) suggested that it was created though peat burnout; however, the water chemistry is unique and characteristic of prairie wetlands.

Table 5. Impoundments and ponds on Roseau River WMA

Impoundment	Surface Water Area (acres)	Drainage Area (acres)	Number of Water Control Structures	Year Water Control Structure(s) Constructed	Emergency Spillway Elevation*	RRWD Overwinter Agreement Elevation*
Pool 1 East	1,150	2,304	2	2003/2009		
Pool 1 West	1,150	58,368	1	2016	1036.2	
Pool #2	4,600	63,424	*3*	1983/2001/2016	1030.0/1030.5	1028.0
Pool #3	3,700	14,208	2	1986/2016	1024.5	1023.0

*All elevations reported in 1929 NAVD

Dams are barriers to geomorphic process, aquatic life, and aquatic recreation. Several dams have been constructed on the Roseau River and its tributaries. Low head concrete dams are present at the cities of Roseau and Dominion City. These have little or no effect on flows, as low head dams function as run-of-the-river structures. Recently, the city of Roseau's dam was modified into a rock-arch rapids, as the city no longer needed to impound water for municipal use. The DNR modified the rock-arch rapids in 2023 to provide better fish passage. Similarly, the Malung Dam was removed in 2024 for fish passage. Small low head dams are being removed or modified around the state for similar reasons. The diversion dam on Pine Creek in Manitoba consists of an earthen dike with an 18-inch gate-controlled culvert. The Arbakka Dam in Manitoba diverts the Roseau River into the six-mile-long Gardenton Floodway, which begins about two miles north of the international boundary. This floodway has relieved flooding on nearby agricultural lands, but it has also increased maximum flood flows by up to 20% at and downstream of Gardenton.

Water Quality

The Minnesota Pollution Control Agency (MPCA) monitors the Roseau River watershed on a 10-year rotation of water quality monitoring and assessment. The surface waters in the Roseau River watershed, including river mainstem, streams, ground water, and Hayes Lake, were last monitored in 2015 and 2016. Data from these two years were then used to assign water quality classifications for the watershed and indicated subwatersheds by the MPCA. As of 2018, the Middle Roseau River Subwatershed, or the portion within and close to the WMA boundary, had good water quality, no impairments, and improved conditions since the previous sampling (MPCA, 2018). Water quality in the watershed overall also was considered generally good and supported both aquatic life and aquatic recreation, with a few exceptions within a few of the subwatersheds. More information about water quality in the watershed can be found in the MPCA Total Maximum Daily Load report, Watershed Restoration and Protection report and Stressor Identification report.

There is a continued need for water quality monitoring and assessment on the Roseau River watershed and the Middle Roseau River Subwatershed because of the direct and indirect effect it has on aquatic life, recreation, and water resources for the Roseau River WMA. Future water quality assessments are in development but are dependent upon collaborator resources and availability for survey sampling.

Water Management

The goal of water management on Roseau River WMA is to provide optimum conditions for wetland wildlife, especially waterfowl, on a seasonal basis across the unit's four pools, 10,600 acres of open water wetland impoundments, and eight MSUs. Water levels are currently managed in accordance with an agreement with the RRWD to ensure holding capacity for spring flood events and to limit downstream impacts through discharge during high flows. Operational water levels vary based on annual pool objectives for habitat and wildlife management while considering upstream and downstream effects. Roseau River WMA staff use gauges located at control structures to monitor water levels in individual pools on a weekly basis. Staff also monitor the USGS Caribou gage for discharging.

WMA staff develop annual water management plans to set objectives for each pool and MSU, and to set target water levels to achieve these objectives. The watershed for the pools is 209 square miles (138,304 acres). Inputs are either direct and regulated through an expansive open peatland just north of the pools, or they are received unregulated through the Pine Creek Diversion Ditch. Water control structures regulate the discharge from each pool and serve to manipulate water levels to attain and maintain target levels. Management objectives are not dictated by wet or dry periods; however, the required effort to achieve the objectives during wet periods is far greater due to the unregulated high inputs. Roseau River WMA will monitor and evaluate yearly objectives and goals for continued water management in the future. More information on water management objectives can be found in the Desired Conditions section.

Habitat and Plant Communities

Introduction

Roseau River WMA is a diverse site that provides many different habitat types for wildlife. Habitat is the combination of spatial, temporal, biotic and abiotic factors and interactions that create the conditions necessary

to support free-ranging population(s) of a species through one or more life processes. For some animals (e.g., small mammals, reptiles, amphibians), one habitat may provide for all needs; however, most animals (e.g., wide-ranging mammals and migratory birds) require different habitats, often vastly different and far apart, to optimize reproduction and survival.

DNR uses three habitat classification systems: the Ecological Classification System Native Plant Communities (NPCs), Forest Inventory cover types, and the Wildlife and Aquatic Habitat Management Application. The Forest Inventory cover types is reflective of forest current conditions and helps guide forest management decisions. The Ecological Classification System NPCs is a more detailed classification system and used to understand potential outcomes of management decisions. The Wildlife and Aquatic Habitat Management Application system is a high-level description of habitat conditions.

Native Plant Communities

The habitats at Roseau River WMA can be categorized into distinct NPCs using Minnesota's NPC classification system. This document categorizes habitat types at a system group based on vegetative and hydrological characteristics (e.g., upland forest and woodland systems) and then at the broad ecological system level determined by seasonal delivery and movement of nutrients, and by timing and severity of natural disturbances (e.g., fire-dependent forest; FD). Next, classification moves to a finer NPC class, determined by local environmental conditions (e.g., the floristic region, which is generally northern (n) or northwestern (w) on Roseau River WMA). Finally, it is classified by the specific NPC type (e.g., FDw44 wet-mesic aspen woodland), which is determined by canopy dominants, substrate, and finer environmental conditions.

DNR staff have fully categorized and mapped NPCs on portions of Roseau River WMA. However, many natural areas of Roseau River WMA have not yet been mapped to the NPC class or type level. This is partially due to the complexity of the native communities present and partially because of historic hydrologic manipulation and disturbance. The wetlands are a subtle mix of communities; in many areas of Roseau River WMA, they shift from one community type to another within a few feet. Figure 15 shows the ecological systems and other human-altered cover types at Roseau River WMA. Table 6 shows the relative percentage of the ecological systems and other land types. An NPC-informed management approach recognizes the inherent ecological characteristics of a site and incorporates that information into natural resource management activities.

Figure 15. Overview of NPC ecological systems and other human-altered lands found at Roseau River WMA

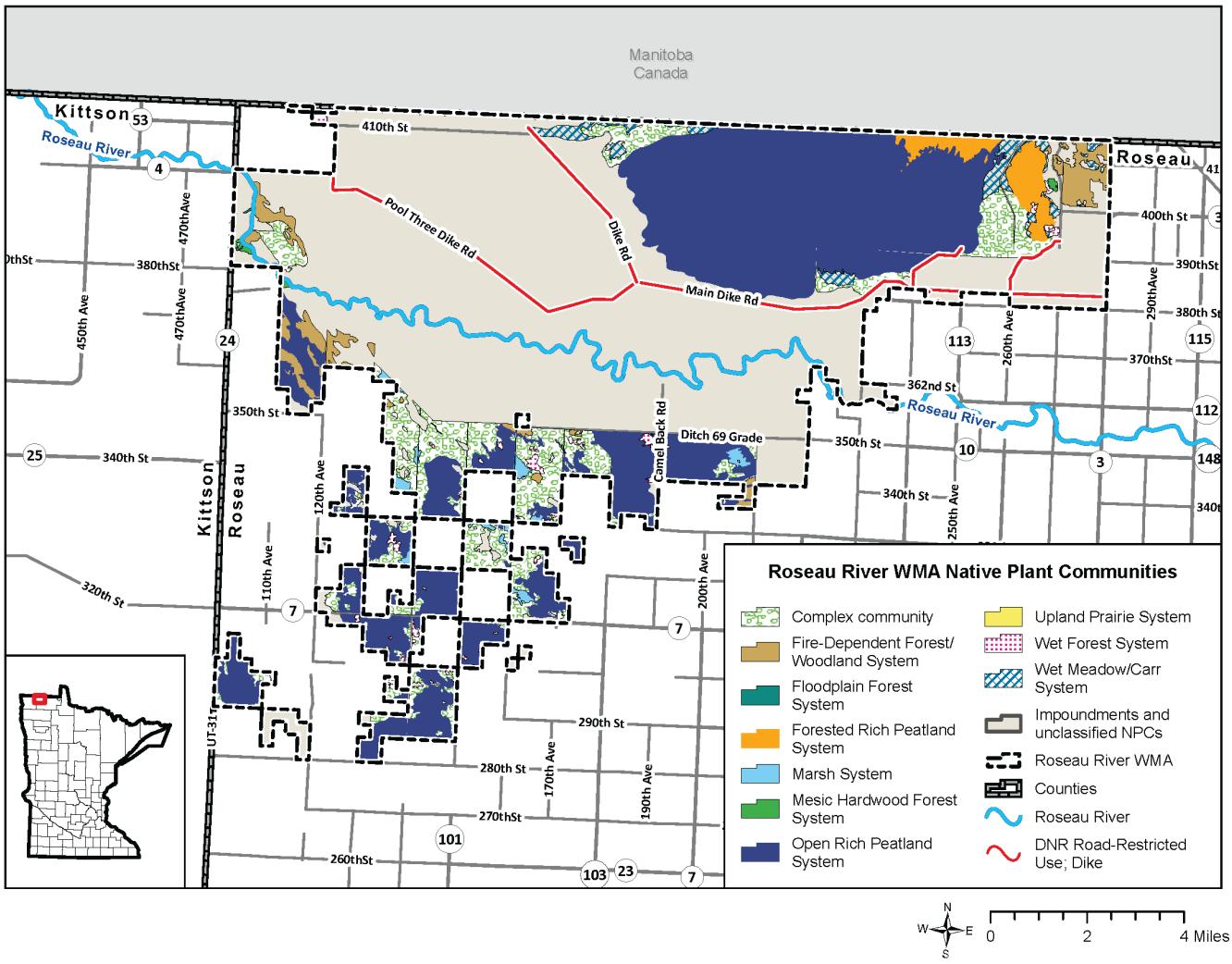


Table 6. NPC ecological systems, approximate acreage, and relative percentage of mapped ecological systems and other land types found at Roseau River WMA

Ecological Systems	Acreage	Percentage of WMA
Impoundments, altered wetlands, and unclassified areas	41,544	55%
Open Rich Peatland System	21,364	28%
Wetland community complexes	7,170	10%
Fire-Dependent Forest/Woodland System	1,744	2%
Forested Rich Peatland System	1,234	2%
Wet Meadow/Carr System	962	1%
Wet Forest System	540	1%
Marsh System	480	1%

Ecological Systems	Acreage	Percentage of WMA
Mesic Hardwood Forest System	120	<1%
Floodplain Forest System	6	<1%
Upland Prairie System	1	<1%

The following sections provide an overview of the NPC system groups, ecological systems, classes, and types documented at Roseau River WMA.

Open Rich Peatland System

Open Rich Peatland plant communities are graminoid or low shrub dominated wetlands on actively forming deep (greater than 16 inches) peat.

There is one class of Open Rich Peatland known to occur at Roseau River WMA:

- OPn91 Northern Rich Fen (Water Track) Class - Open peatlands, primarily in water tracks in interiors of large peatlands. This class is dominated by fine-leaved sedges or low shrubs, with scattered stunted tamarack. The following specific community types within the OPn91 class are known to occur at Roseau River WMA:
    - OPn91a Shrub Rich Fen (Water Track) Type - Plant community dominated by shrubs (greater than 25% cover), interspersed with sparsely vegetated hummocks formed from minerotrophic *Sphagnum* or brown mosses.
    - OPn91b Graminoid Rich Fen (Water Track) Type - Plant community dominated by graminoids with ericaceous shrubs covering less than 25%.

Wet Meadow/Carr System

Wet Meadow/Carr plant communities are graminoid or shrub dominated wetlands that experience moderate inundation following spring runoff or heavy rains and contain little to no standing water during the summer.

There is one class of Wet Meadow/Carr known to occur at Roseau River WMA:

- WMn82 Northern Wet Meadow/Carr Class – Open wetlands dominated by dense cover of broad-leaved graminoids or tall shrubs. This class is present on mineral soils or sapric peat in basins or along streams. The following specific community types within the WMn82 class are known to occur at Roseau River WMA:
    - WMn82a Willow – Dogwood Shrub Swamp Type – Open wetlands with abundant broad-leaved graminoids; shrub cover typically less than 25%.
    - WMn82b Sedge Meadow Type – Open wetlands with abundant broad-leaved graminoids; shrub cover typically greater than 25%.

Marsh System

Marshes are tall forb and graminoid dominated wetland communities that have standing or, in the case of riverine marshes, slow-flowing water present through most of the growing season.

There is one class of Marsh known to occur at Roseau River WMA:

- MRn83 Northern Mixed Cattail Marsh Class – Emergent plant communities typically dominated by cattails. This class is present on floating mats or rooted in mineral soil in shallow wetland basins. The following specific community type within the MRn83 class is known to occur at Roseau River WMA:
    - MRn83a Cattail – Sedge Marsh (Northern) Type – Emergent marshes typically dominated by cattails but with a significant component of sedges, woolgrass or bluejoint grass.

Wetland community complexes

The wetland community complexes are a mix of communities found in Roseau River WMA. They are shaped by subtle changes in landscape position, hydrology and soils.

There are two community complexes mapped in Roseau River WMA:

- MFS-CX Meadow-Marsh-Fen-Swamp Complex – This complex is a mix of three wetland communities, WMn82 Northern Wet Meadow/Carr, MRp83 Prairie Mixed Cattail Marsh, and OPp91 Prairie Rich Fen. The wet meadow and marsh systems have a mineral substrate and are directly controlled by surface hydrology. The fen has a peat substrate and, although it has surface water flow, it is directly affected by groundwater flow allowing for peat formation. This community complex is most common in nearby wetlands in Kittson County, however there are many acres of it in Roseau River WMA.
- SS-CX Shrub Swamp Complex – This complex is a mix of two wetland communities, WMn82 Northern Wet Meadow/Carr and WFn74 Northern Wet Alder Swamp. Both communities occur along streams and drainages with plants typically rooted in mineral soils.

Upland Prairie System

Upland Prairie plant communities are fire-dependent ecological systems dominated by tall and short native grasses and forbs with few or no trees.

There is one class of Upland Prairie known to occur at Roseau River WMA:

- UPn23 Northern Mesic Prairie Class – Grass-dominated but forb-rich herbaceous communities on somewhat poorly drained to well drained loam soils formed in lacustrine sediments, in glacial till, or outwash deposits. Drought stress is irregular in occurrence and usually not severe; fires were historically very frequent. The following specific community type within the UPn23 class is known to occur at Roseau River WMA:
    - UPn23a Mesic Brush –Prairie (Northern) Type – Mixed herb-shrub communities on medium fine to medium –textured loamy soils. Shrub cover is commonly 25% to 50% and sometimes up to 75%.

Fire-Dependent Forest/Woodland System

Fire-Dependent Forest/Woodland plant communities are strongly influenced by wildfires and typically occur on drier sites not protected by wetland communities that serve as fire shadows.

There is one class of Fire-Dependent Forest/Woodland known to occur at Roseau River WMA:

- FDn12 Northern Dry-Sand Pine Woodland Class – Dry jack pine or red pine woodlands on level to gently undulating sandy outwash or lake plains. Crown and surface fires were historically common. The following specific community type within the FDn12 class is known to occur at Roseau River WMA:
    - FDn12a Jack Pine Woodland (Sand) Type - Woodlands on sandy beach ridges and outwash deposits. Canopy is strongly dominated by jack pine. Subcanopy and shrub layers are sparse.

Mesic Hardwood Forest System

Mesic Hardwood Forest plant communities are upland sites with moist soils usually in settings protected from fire. They are characterized by continuous, often dense, canopies of deciduous tree, including aspens, paper birch, and oak, and understories with shade-adapted shrubs and herbs.

There is one class of Mesic Hardwood Forest known to occur at Roseau River WMA:

- MHn44 Northern Wet-Mesic Boreal Hardwood-Conifer Forest Class – Mesic or wet-mesic hardwood and hardwood-conifer forests. This class is most common on level, clay-rich sites with high water tables on glacial lake deposits and till plains. The following specific community type within the MHn44 class is known to occur at Roseau River WMA:
    - MHn44c Aspen-Fir Forest Type– Wet-mesic forests typically with quaking aspen, paper birch, balsam fir or black ash as canopy dominants, and occasionally with white spruce and balsam poplar as dominants.

Floodplain Forest System

Floodplain Forest plant communities occur in wet, lowland areas, particularly along streams. They are most often closed canopy, and are dominated by silver maple, ash, elm and other hardwood tree species including balsam poplar. Mapped floodplain forests on Roseau River WMA contain only black ash and balsam poplar.

There is one class of Floodplain Forest known to occur at Roseau River WMA:

- FFn67 Northern Floodplain Forest Class – Deciduous riparian forests on sandy or silty alluvium on low, level, annually flooded sites along medium and large rivers. The following specific community type within the FFn67 class is known to occur at Roseau River WMA:
    - FFn67a Silver Maple - (Sensitive Fern) Floodplain Forest Type – See above. This is the only NPC type in this class.

Wet Forest System

Wet Forest plant communities occur commonly in narrow zones along the margins of lakes, rivers, and peatlands. They also occur in shallow depressions or other settings where the groundwater table is usually within reach of plant roots but does not remain above the mineral soil surface for long periods during the growing season.

There are three classes of Wet Forest known to occur at Roseau River WMA:

- WFw54 Northwestern Wet Aspen Forest Class - Wet hardwood and hardwood-conifer forests in depressions and on level to gently sloping lacustrine deposits in the Glacial Lake Agassiz plain. The following specific community type within the WFw54 class is known to occur at Roseau River WMA:
    - WFw54a Lowland Black Ash Type – Aspen- Balsam Poplar Forest – See above. This is the only NPC type in this class.
- WFn55 Northern Wet Ash Swamp Class – Wet hardwood forests on mucky mineral soils in shallow basins and ground water seepage area, and on low level terrain near rivers, lakes or wetlands. Typically, this class has standing water in spring but is dry by late summer. The following specific community type within the WFn55 class is known to occur at Roseau River WMA:
    - WFn55c Black Ash Type - Mountain Maple Swamp (Northern) - Wet Forest with canopy dominated by black ash with small amounts of American elm, paper birch, basswood, quaking aspen, or green ash.
- WFn74 Northern Wet Alder Swamp Class (*fact sheet not available*) – Tall shrub wetlands dominated by speckled alder on mineral, muck and occasionally peaty soils that are typically present along low gradient streams. The following specific community type within the WFn74 class is known to occur at Roseau River WMA:
    - WFn74a Alder - (Red Currant-Meadow Rue) Swamp Type – See above. This is the only NPC type in this class.

Forested Rich Peatland System

Forested Rich Peatland Forest communities are conifer or tall shrub dominated wetlands on deep (greater than 15 inches), actively forming peat. They are characterized by mossy ground layers that often have abundant shrubs and forbs.

There are three classes of Forested Rich Peatland System known to occur at Roseau River WMA:

- FPw63 Northwestern Rich Conifer Swamp Class – Tamarack or black spruce dominated swamps in peat-filled depressions on glacial lake plains. This class is typically associated with sandy beach deposits. The following specific community types within the FPw63 class are known to occur at Roseau River WMA:
    - FPw63a Tamarack – Black Spruce Swamp (Aspen Parkland) - Forested peatland with a canopy dominated by tamarack or black spruce on somewhat drier sites at the bases of beach ridges. It has an understory of drier species such as red raspberry, mountain fly honeysuckle and crested fern.
    - FPw63b Tamarack Seepage Swamp (Aspen Parkland) Forested peatland with a canopy dominated by primarily by tamarack frequently with black spruce. It is associated with obvious

groundwater seepage areas and is wetter than FPw63a. It has an understory of wetter species characteristic of rich fens such as cattails, wiregrass sedge and shrubby cinquefoil.

- FPn71 Northern Rich Spruce Swamp (Water Track) Class – Black spruce-dominated swamps on deep peat in large peatland complexes on the Glacial Lake Agassiz Plain. This class typically occurs in settings influenced by lateral flow of mineral-rich groundwater. The following specific community type within the FPn71 class is known to occur at Roseau River WMA:
  - FPn71a Rich Black Spruce Swamp Type – See above. This is the only NPC type in this class.
- FPn81 Northern Rich Tamarack Swamp (Water Track) Class – Tamarack-dominated swamps on deep peat in large peatland complexes on the Glacial Lake Agassiz Plain. Typically occurs in settings influenced by lateral flow of mineral-rich groundwater. The following specific community type within the FPn81 class is known to occur at Roseau River WMA:
  - FPn81a Rich Tamarack (Sundew-Pitcher Plant) Swamp Type – See above. This is the only NPC type in this class.

Some of the plant communities found at Roseau River WMA exhibit excellent ecological integrity and are uncommon in Minnesota (Table 7). The plant communities found at Roseau River WMA range from being quite common to extremely rare, which is defined by a conservation status rank across the state (an S-rank) or globally (G-rank). These ranks are on a scale of 1 to 5; 1 is extremely rare and typically sensitive to anthropogenic disturbances, while 5 is extremely common and adaptable to a wide range of conditions and human disturbances. More information on Conservation Status Ranks can be found in Appendix E and on the DNR NPC status and procedures webpages.

Table 7. NPCs mapped and known to occur at Roseau River WMA and their associated conservation status, acreage on the WMA, and disturbance interval.

NPC	Description	Status Rank	Acres	Disturbance Interval
OPn91; OPn91a; OPn91b	Northern Rich Fen (Water Track); Shrub Rich Fen (Water Track); Graminoid Rich Fen (Water Track)	S2-S4, GNR-G5	9	Disturbance is uncommon. During periods of extreme drought, they are subject to fires and water stress.
MFS_CX; SS_CX	Meadow-Marsh-Fen-Swamp Complex[1]; Shrub Swamp Complex	S1, S3, S4, S5	6,771	Flooding is common. Other disturbances are rare and associated with extreme drought.
WMn82; WMn82a; WMn82b	Northern Wet Meadow Carr; Willow-Dogwood Shrub Swamp; Sedge Meadow	S4-S5, G4-G5	947	Annual flooding with extreme events occurring rarely. Fire is uncommon except during severe drought.

[1] Includes WMn82a, WMn82b, OPp91a, OPp91b, OPp91c, MRp83a, MRp83b NPCs

NPC	Description	Status Rank	Acres	Disturbance Interval
MRn83; MRn83a	Northern Mixed Cattail Marsh; Cattail-Sedge Marsh (Northern)	S2, G4-G5	480	Fire unlikely except under severe drought
UPn23; UPn23a	Northern Mesic Prairie; Mesic Brush-Prairie (Northern)	S2, G2-G3	1	Fires frequent, succession to forest occurs rapidly in the absence. Pre-settlement ungulate trampling and grazing.
FDn12; FDn12a	Northern Dry-Sand Pine Woodland; Jack Pine Woodland (Sand)	S2, G4-G5	73	Fire common. All fire rotation 42 yrs. Moderate surface fire 50 yrs. Catastrophic windthrow 170 yrs.
FDw34; FDw34a; FDw34b	Northwestern Mesic Aspen-Oak Woodland; Aspen- (Prairie Herb) Woodland; Aspen- (Beaked Hazel) Woodland	S3-S4	302	All fire rotation 14 yrs. Catastrophic fire 90 yrs. Catastrophic windthrow 290 yrs.
FDw44; FDw44a; FDw44b	Northwestern Wet-Mesic Aspen Woodland; Aspen-(Cordgrass) Woodland; Aspen-(Chokecherry) Woodland	S3-S4	1,369	All fire rotation 14 yrs. Catastrophic fire 100 yrs. Catastrophic windthrow 230 yrs.
MHw36; MHw36a	Northern Wet-Mesic Hardwood Forest; Green Ash - Bur Oak - Elm Forest	S2	95	Light surface fires 12 years Catastrophic disturbance rare. Catastrophic fires 570 years.
MHn44; MHn44c	Northern Wet-Mesic Boreal Hardwood-Conifer Forest; Aspen-Fir Forest	S2-S4, GNR-G5	25	Surface fires 160 years Rare catastrophic disturbance fire 430 years.
FFn67; FFn67a	Northern Floodplain Forest; Silver Maple- (Sensitive Fern) Floodplain Forest	S3	6	Annual flooding
WFw54; WFw54a	Northwestern Wet Aspen Forest; Lowland Black Ash-Aspen-Balsam Poplar Forest	S4	498	Light surface fires 20 years Catastrophic disturbance infrequent. Catastrophic fire 490 years.
WFn55; WFn55c	Northern Wet Ash Swamp; Black Ash – Mountain Maple Swamp (Northern)	S3-S4, G4	32	Catastrophic disturbance infrequent. Catastrophic fires greater than 1000 yrs.

NPC	Description	Status Rank	Acres	Disturbance Interval
WFn74; WFn74a	Northern Wet Alder Swamp; Alder - (Red Currant-Meadow Rue) Swamp	S3, GNR	9	
FPw63	Northern Rich Conifer Swamp	S3, G4	569	Subjected to periodic severe droughts
FPn71	Northern Rich Spruce Swamp (Water Track)	S3, GNR	234	Partial mortality of canopy somewhat common ~ 80 yrs. Catastrophic fire 430 yrs. Catastrophic windthrow 700 yr.
FPn81; FPn81a	Northern Rich Tamarack Swamp (Water Track); Rich Tamarack (Sundew-Pitcher Plant) Swamp	S4, GNR	350	Catastrophic disturbances uncommon. Fire during drought 390 yrs.

S1/G1 – Critically imperiled, S2/ G2 – Imperiled, S3/G3 – Vulnerable, S4/G4 – Apparently Secure, S5/G5 – Secure.
GNR – no global rank

Forest Inventory Cover Types

DNR forest inventory is based on different cover types other than NPCs (Figure 16). Forest habitat management goals are largely based on cover type while management prescriptions are based on NPCs. Aspen is the most common forested cover type, comprising 7,800 acres in 407 stands (Table 8; Figure 16; Figure 17; Figure 18). Tamarack is the next most common forested cover type, comprising 1,125 acres in in 31 stands. Other individual cover types do not exceed 200 acres; however, species like bur oak, can be found scattered within other major cover types (Figure 19).

Table 8. Age class distributions of quaking aspen, balsam poplar, bur oak, and jack pine in 10-year increments on Roseau River WMA as of November 2024.

Age Class	Quaking Aspen No. Stands	Quaking Aspen Acres	Balsam Poplar No. Stands	Balsam Poplar Acres	Bur Oak No. Stands	Bur Oak Acres	Jack Pine No. Stands	Jack Pine Acres
0-9	36	693	0	0	0	0	3	29
10-19	38	729	1	13	0	0	0	0
20-29	108	2,833	2	33	1	45	5	29
30-39	84	1,510	1	2	1	1	3	66
40-49	73	886	4	30	0	0	0	0
50-59	30	455	1	13	1	2	1	4
60-69	14	245	2	64	2	1	2	7
70-79	18	375	2	19	5	68	1	5

Age Class	Quaking Aspen No. Stands	Quaking Aspen Acres	Balsam Poplar No. Stands	Balsam Poplar Acres	Bur Oak No. Stands	Bur Oak Acres	Jack Pine No. Stands	Jack Pine Acres
80-89	5	52	0	0	3	20	1	4
90-99	1	21	1	6	1	5	0	0
100-109	0	0	0	0	2	31	0	0
Total	407	7,799	14	180	16	172	16	143

Figure 16. Age class distribution of quaking aspen on Roseau River WMA

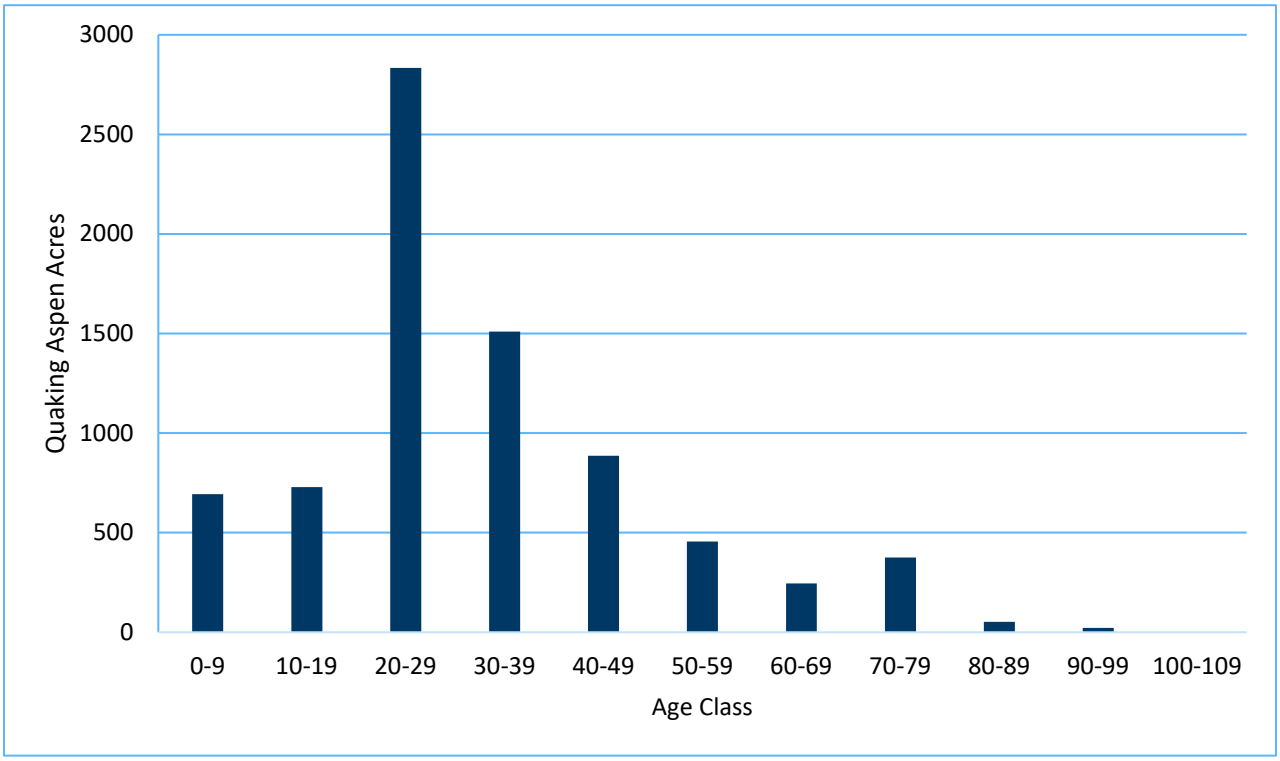


Figure 17. Forest inventory for Roseau River WMA

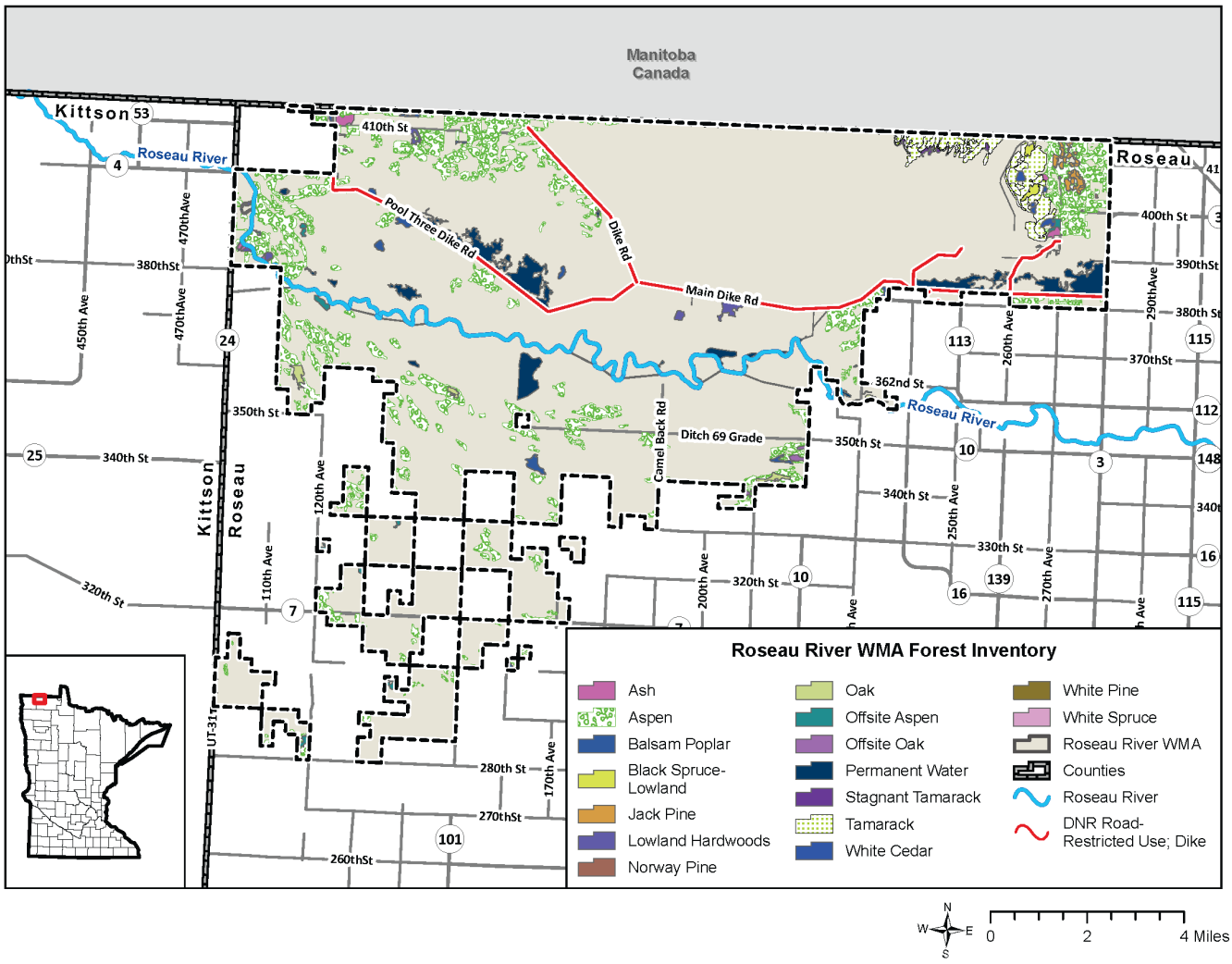


Figure 18. Current quaking aspen distribution

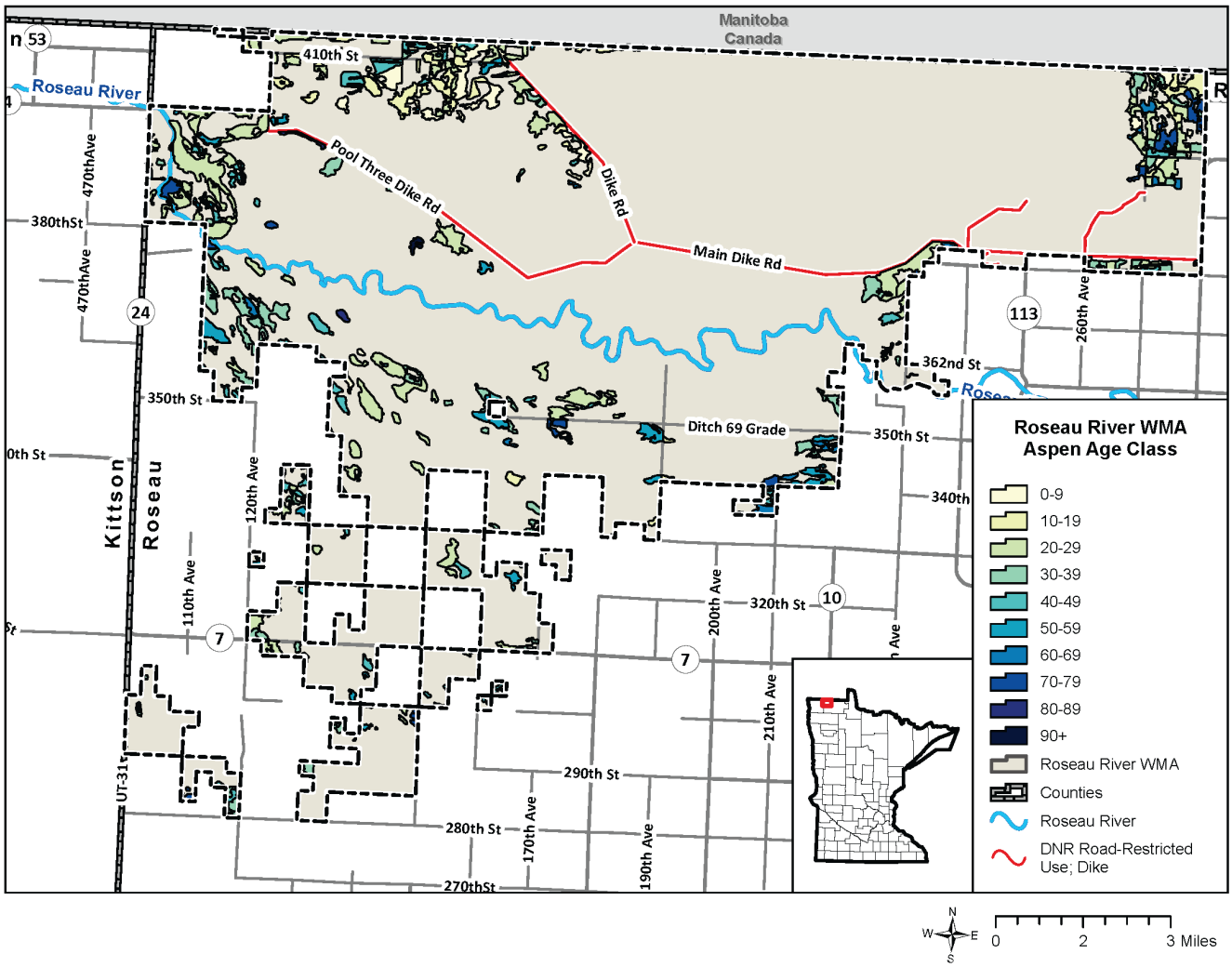
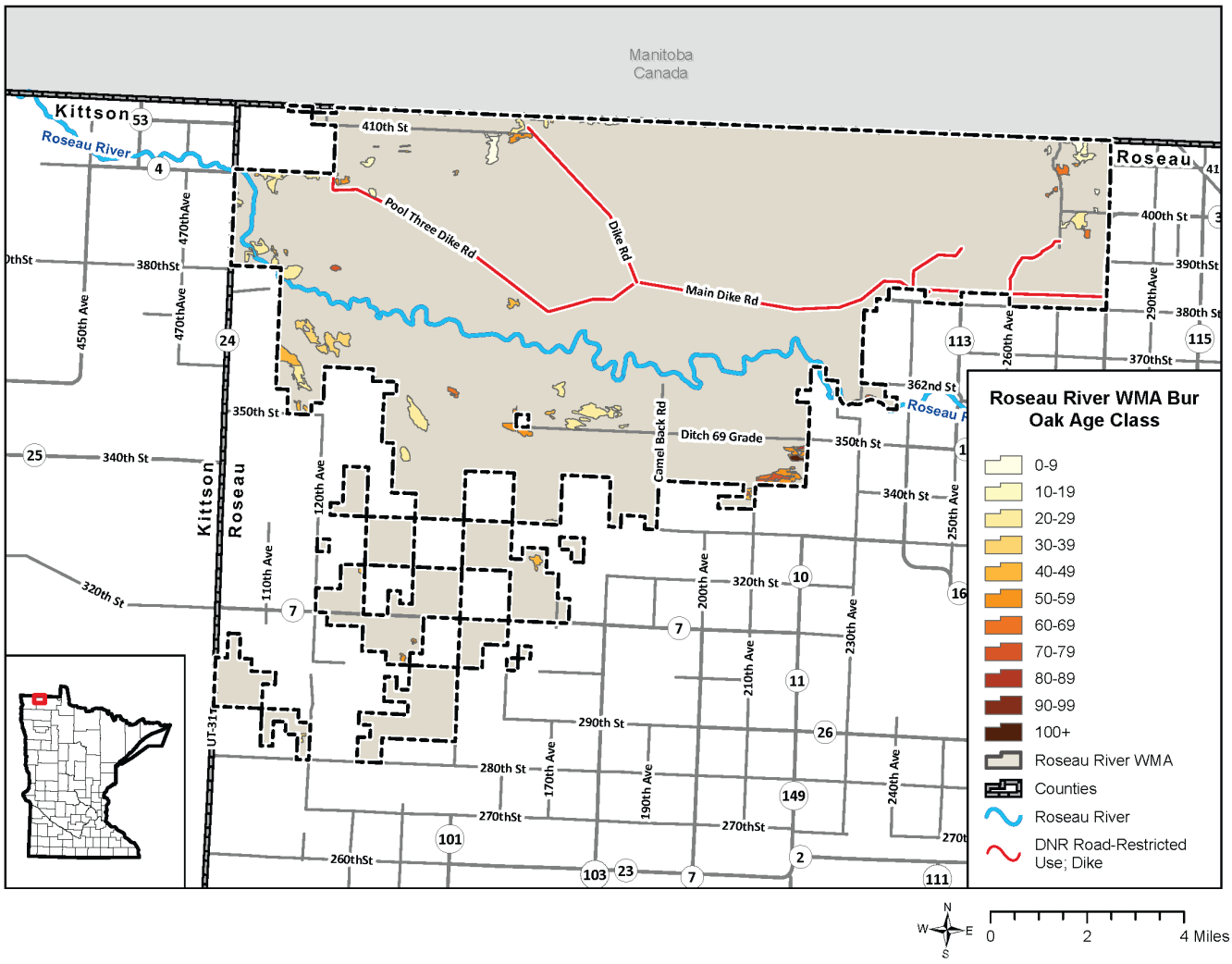


Figure 19. Current bur oak distribution.



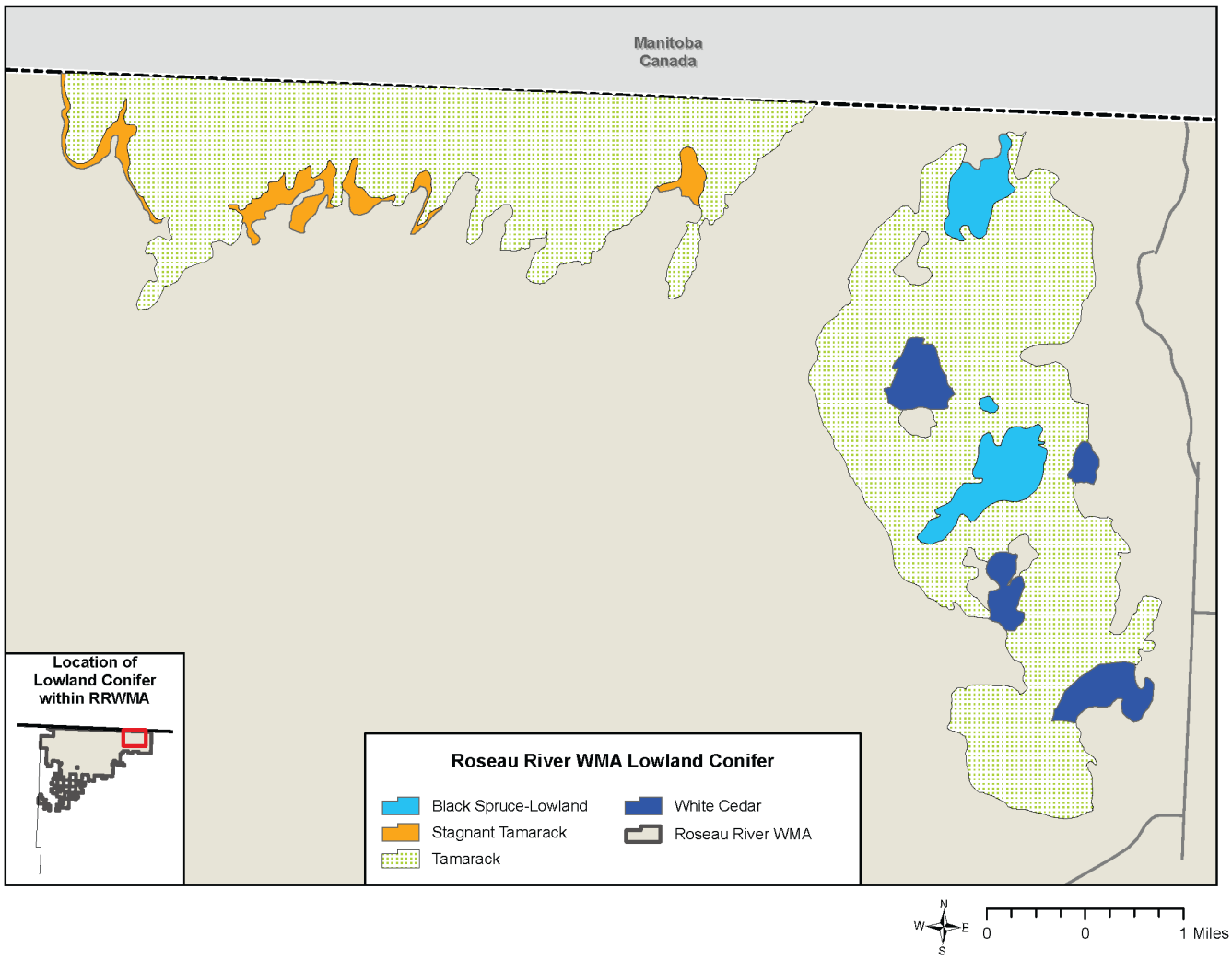
Lowland Conifers

All inventoried lowland conifer stands occur in two complexes in the northeastern corner of the Roseau River WMA (Figure 20). Both complexes are included in the Sundown-Boroos West Lowland Conifer Patch Management Opportunity Area (MOA). The intent of the MOA is to preserve the patches as intact (unfragmented) older patches. Stands within this MOA might be considered for Lowland Conifer old growth designation in the future.

Along the Canadian border and to the west of the diversion ditch, one complex consists of 16 tamarack stands totaling 513 acres. These stands all have the same attribute data in the forestry inventory: stand age 93 years in 1983 (134 years in 2024), site index of 27, and same size, height, density, and cord volume. The complex is fringed by five stands of stagnant tamarack totaling 45 acres, which are all 57 years old as of 1983. This complex may be inaccessible for timber management without considerable accommodations due to the width and depth of the diversion ditch and the Canadian border.

East of the diversion ditch, another lowland conifer complex contains stands of tamarack, black spruce, and white cedar. This includes 15 stands of tamarack (613 acres) ranging in age from 76 to 102 years; three stands of black spruce (62 acres), which are all 94 years old; and four stands of white cedar (60 acres) ranging in age from 59 to 111 years (all ages are from 2024).

Figure 20. Current lowland conifer distribution



Other Cover Types

Roseau River WMA has 195 acres of black ash/lowland hardwoods (19 stands), 8 acres of white spruce (4 stands), 3 acres of red pine in two planted stands, and 3 acres of white pine in a single stand that may be of natural origin.

Land Cover Types

The Section of Wildlife further classifies land cover types within WMAs using the Wildlife and Aquatic Habitat Management Application (WAHMA) land cover types. Figure 21 shows the WAHMA land cover types mapped within Roseau River WMA, and Table 9 shows the approximate acreage and relative percentage of each land

cover type. The WAHMA classification system is distinct from the NPC classification system described above; habitat acreages and areas defined in the NPC classification system above may not directly line up with the WAHMA classifications.

Figure 21. WAHMA land cover types found at Roseau River WMA

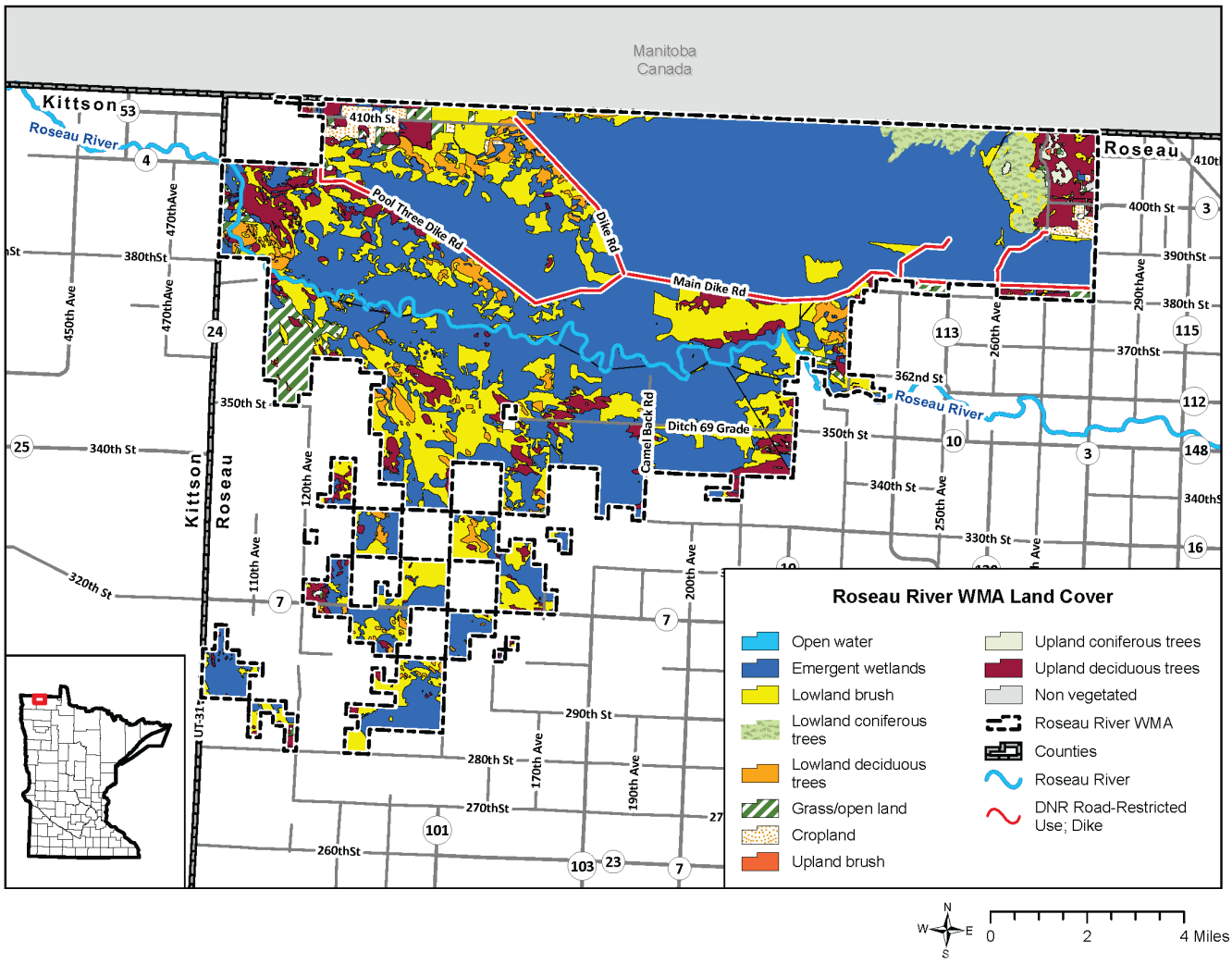


Table 9. Approximate acreage of WAHMA land cover types found at Roseau River WMA

Land Cover Type	Acreage	Percent of WMA
Emergent Wetlands	45,796	61%
Lowland Brush	15,833	21%
Upland Deciduous Trees	5,989	8%
Lowland Deciduous Trees	2,378	3%
Grass/Open Land	2,172	3%
Lowland Coniferous Trees	1,356	2%
Cropland	763	1%

Land Cover Type	Acreage	Percent of WMA
Non-vegetated	345	<1%
Open Water	254	<1%
Upland Coniferous Trees	207	<1%
Undefined	79	<1%
Upland Brush	24	<1%

Rare Plants

Rare plant species found at Roseau River WMA are listed in Table 10. State status designation is also included. A species is designated as endangered (END) if threatened with extinction throughout all or a significant portion of its range. A species is designated as threatened (THR) if the species is likely to become endangered in the future throughout all or a significant portion of its range. A species is designated as a species of special concern (SPC) if, although the species is not endangered or threatened, it is extremely uncommon in this state or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations. Additional information on Minnesota's rare species can be found in the DNR Rare Species Guide. Species that are federally listed receive additional protection.

Table 10. Rare plant species known to occur at Roseau River WMA.

Common Name	Scientific Name	State Status
Upswept moonwort	*Botrychium ascendens*	END
Mingan moonwort	*Botrychium minganese*	SPC
New world moonwort	*Botrychium neolunaria*	THR
Least moonwort	*Botrychium simplex*	SPC
Twig rush	*Cladium marsicoides*	SPC
English sundew	*Drosera anglica*	SPC
Few-flowered spikerush	*Eleocharis quinqueflora*	SPC
Nuttal's sunflower	*Helianthus nuttalli ssp. rydbergii*	SPC
McCalla's willow	*Salix mccalliana*	SPC
Sheathed pondweed	*Stuckenia vaginata*	END

Shallow and Open Water Communities

Roseau River WMA contains four large wetland impoundments: Pool 1 East (1,150 acres), Pool 1 West (1,150 acres), Pool 2 (4,600 acres), and Pool 3 (3,700 acres; Figure 13). These impoundments serve dual purpose as

wildlife habitat and flood damage reduction in the Roseau River watershed. As part of a 2016 project, in partnership with the RRWD, DNR replaced and added water control structures to allow for improved regulation of flows out of the impoundments and an alternate outlet on the west end of Roseau River WMA. The pools have been surveyed by DNR Shallow Lakes Program staff in the past, and reports on their findings are available. All pools are dominated by narrow-leaf and hybrid cattails that quickly invaded the shallow areas following the development of the impoundments.

Pool 1 East is very different from the other pools on Roseau River WMA. Water chemistry in this pool is more like that of a prairie pothole wetland (i.e., high alkalinity and pH), resulting in a less diverse plant community. The most recent plant survey found only nine aquatic plant species present, with coontail (*Ceratophyllum demersum*) and northern water milfoil (*Myriophyllum sibiricum*) as the most abundant submerged plants. Plant diversity in the other pools is much higher than that of Pool 1 East.

Pool 1 West has a very diverse submergent and emergent plant community according to the latest Shallow Lakes Survey. In 2018, the Shallow Lakes Program surveyed the pool and recorded 18 species across the survey points. Staff also visually identified a few additional species that were not sampled at any of the survey points but were present in the pool during the survey. A state endangered submergent plant, sheathed pondweed (*Stuckenia vaginata*), was also collected at this time and submitted to MBS. Water chemistry in the other pools is like that of a northern bog lake – low in nutrients and high in tannins.

Figure 22. Photo of Pool 1 East mudflats during the 2021 drought

Most of Pool 2 (4,600 ac) is choked with cattails with a narrow band of open water near the embankment. Vegetation within the pool in the open water areas is very dense and diverse. Water inside the pool is typically tannin-stained but generally clear. Pool 3 (3,700 ac) is very similar to Pool 2 (i.e., densely vegetated with cattails) but also has a diverse and dense submergent vegetation community. In 2016, the RRWD partnered with the DNR to replace two water control structures on Pools 2 and 3 to improve water conveyance, which has improved water management capability.

Wild rice (*Zizania palustris*) is not common in this part of the state but is established in Pools 2 and 3. Initial attempts to establish wild rice occurred in 1954 but the effort largely failed due to what was thought to be high sulfate concentrations. A small patch, which was likely accidently introduced via a boat, became established by the Pool 2 Spillway in the 1980s. By 1997, wild rice was abundant but restricted to one bay in Pool 2. Following subsequent establishment efforts undertaken by WMA staff, wild rice has thrived in the south portion of Pool 2 and Pool 3. Wild rice management includes thinning the wild rice stands to encourage more submerged aquatic plants.

Agricultural Lands

Roseau River WMA has approximately 820 acres of hay lands managed through cooperative farming agreements (CFAs), which are a legal contract with local farmers to farm or hay fields on a WMA on a sharecrop basis. The state typically receives one-fourth share of the crops produced, which is usually left standing over winter as a food source for wildlife. The DNR receives payment for its portion of the hay that is sold. Haying is a practice used to maintain open lands for future restoration, to maintain legumes forages, and to maintain areas of short grass for sharp-tailed grouse and other wildlife.

Cooperative grazing agreements are an important aspect of grassland management. Grazing functions as a natural disturbance to integrate structural heterogeneity as well as shape species diversity and abundance, which are critical to functional grassland ecosystems and grassland birds. Roseau River WMA has a 105-acre grazing complex and will be installing the infrastructure for a 650-acre complex in the summer of 2025. The 105-acre unit was developed specifically to address reed canary grass and smooth brome in a wet prairie and upland system, and it has proven effective.

Roseau River staff also plant agricultural crops. These food plots are often small and hard to access with larger farming equipment. In total, staff plant up to 250 acres annually on 18 different plots. All food plot acres are enrolled in the Minnesota Agricultural Water Quality Certification Program (MAWQCP), which implements conservation practices to improve water quality. Within the Roseau River WMA, this specifies that all fields are planted using no till practices, cover crops are integrated, soil sampling directs fertilizer use, and Integrated Pest Management guides pesticide applications. Crops planted include sunflowers, corn and soybeans with cover crops interseeded, as well as diverse (20 or more species) wildlife mixes for soil health, season-long forage, and invertebrate diversity. Fields are also idled to provide old field habitat. All crops remain standing though the winter. Food plots are strategically located throughout the unit close to deer and sharp-tailed grouse wintering areas to provide food and cover for resident wildlife. These fields and surrounding cover are popular with wildlife viewers and bear, deer and sharp-tailed grouse hunters.

Wildlife

Introduction

Roseau River WMA provides habitat for 258 species of birds, 56 species of mammals, 33 species of fish, and 18 species of reptiles and amphibians during some part of the year. Abundant populations of diverse wildlife species are found at Roseau River WMA largely due to the wide diversity and quality of habitats.

Birds

Approximately 258 resident and non-resident bird species have been observed in the vicinity of Roseau River WMA. A full list of bird species known to occur or likely to occur on or near the unit can be found in Appendix F. A non-exhaustive list of common bird species found at Roseau River WMA and their associated habitats can be found in Table 11.

Roseau River WMA provides habitat for many high-priority bird species. These birds include Species of Greatest Conservation Need (SGCN), a designation in MNWAP that indicates a species whose population is rare, declining or vulnerable, and for which there are concerns for their long-term health and stability. All state-listed species and federally listed species that occur in Minnesota are automatically SGCN; additional non-listed species are SGCN based on specific criteria and expert opinion. Seventy-two bird species designated as SGCN have been observed in Roseau River WMA (Appendix F). Of these 72 species, there are 13 that are state listed as special concern: American goshawk, boreal owl, Nelson's sparrow, short-eared owl, lark sparrow, yellow rail, trumpeter swan, peregrine falcon, Franklin's gull, marbled godwit, American white pelican, purple martin, Forster's tern. Threatened and endangered state listed species include Wilson's phalarope, horned grebe, and common tern.

Table 11. Common or important bird species found at Roseau River WMA and their associated habitats.

Habitat	Game Species	Nongame Species
Lakes, Wetlands and Waterways	Canada goose, snow goose, wood duck, mallard, northern pintail, American wigeon, green-winged teal, blue-winged teal, gadwall, northern shoveler, canvasback, redhead, ring-necked duck, lesser scaup, bufflehead, common goldeneye, hooded merganser, common merganser, ruddy duck, sandhill crane, Wilson's snipe, sora, American coot	Trumpeter swan, tundra swan, pied-billed grebe, red-necked grebe, horned grebe, eared grebe, western grebe, American white pelican, double-crested cormorant, lesser yellowlegs, Wilson's phalarope, Franklin's gull, black tern, Forster's tern, American bittern, least bittern, great-blue heron, green heron, bald eagle, northern harrier, belted kingfisher (SGCN), marsh wren, sedge wren, common yellowthroat, red-winged blackbird, yellow-headed blackbird, Nelson's sharp-tailed sparrow, LeConte's sparrow
Grasslands	Nesting waterfowl, Sharp-tailed grouse, Hungarian partridge	Northern harrier, red-tailed hawk, marbled godwit, short-eared owl, eastern kingbird, great crested flycatcher, horned lark, clay-colored sparrow,

Habitat	Game Species	Nongame Species
		grasshopper sparrow, savannah sparrow, bobolink, western meadowlark, Brewer's blackbird
Brushlands	Sharp-tailed grouse, sandhill crane	Alder flycatcher, tree swallow, sedge wren, veery, gray catbird, brown thrasher, common yellowthroat, yellow warbler
Forests	Ruffed grouse, American woodcock	Broad-winged hawk, barred owl, great horned owl, great gray owl, northern saw-whet owl, common nighthawk, eastern whip-poor-will, ruby-throated hummingbird, yellow-bellied sapsucker, northern flicker, pileated woodpecker, hairy woodpecker, downy woodpecker, olive-sided flycatcher, eastern wood pewee, yellow-bellied flycatcher, yellow-throated vireo, red-eyed vireo, gray jay, blue jay, black-capped chickadee, boreal chickadee, red-breasted nuthatch, white-breasted nuthatch, golden-crowned kinglet, American robin veery, cedar waxwing, black-and-white warbler, American redstart, chestnut-sided warbler, yellow-rumped warbler, ovenbird, white-throated sparrow, dark-eyed junco, Baltimore oriole, purple finch, pine siskin
Agricultural or Developed Areas	Wild turkey, mourning dove, sandhill crane	American kestrels, killdeer, spotted sandpipers, eastern phoebes, eastern kingbird, black-billed magpie, blue jay, American crow, common raven. tree swallow, barn swallow, cliff swallow, house wren, eastern bluebird, American robin, vesper sparrow, song sparrow, snow bunting, common grackle, brown-headed cowbird, American goldfinch

SGCN = Species of Greatest Conservation Need

Waterfowl and Game Birds

Waterfowl. At least 26 different waterfowl species have been documented at Roseau River WMA. Most of these species use Roseau River WMA as a migration stopover during spring and fall migration, while others nest at the WMA. Roseau River WMA was one of the original sites for Canada goose reestablishment beginning in 1960. For decades, management focused on goose production and attracting and holding migrating Canada geese. Canada geese are now abundant across the state; intensive management is no longer required or effective in attracting and holding Canada geese. Spring and fall migration bring common dabbling and diving species of ducks, including mallards, blue-winged teal, green-winged teal, gadwall, American wigeon, northern pintail, redhead, canvasback, lesser scaup, ring-necked ducks, bufflehead, and hooded mergansers. Trumpeter and tundra swans are also common during migration.

Roseau River WMA hosts numerous nesting waterfowl throughout the breeding season in addition to the migration periods (Figure 23, Figure 24). While many of the species commonly found during spring and fall migration will nest at the WMA, the most abundantly noted nesters are trumpeter swan, Canada goose, mallard,

blue-winged teal, and ring-necked duck. Nesting waterfowl can be found in the uplands adjoining wetland habitat. Over-water nesting species, such as trumpeter swan and ring-necked duck, can be found within the impoundments. The impoundments also provide brood cover for nesting waterfowl. Young wild rice, cattails, and other emergent vegetation provide over-head cover for waterfowl broods, while the submergent species provide habitat for invertebrates necessary for waterfowl growth. Surveys of both breeding pairs and broods are conducted annually on Roseau River WMA to assess nesting waterfowl use and productivity.

Figure 23. Annual duck broods at Roseau River WMA by species group, 1988 - 2024

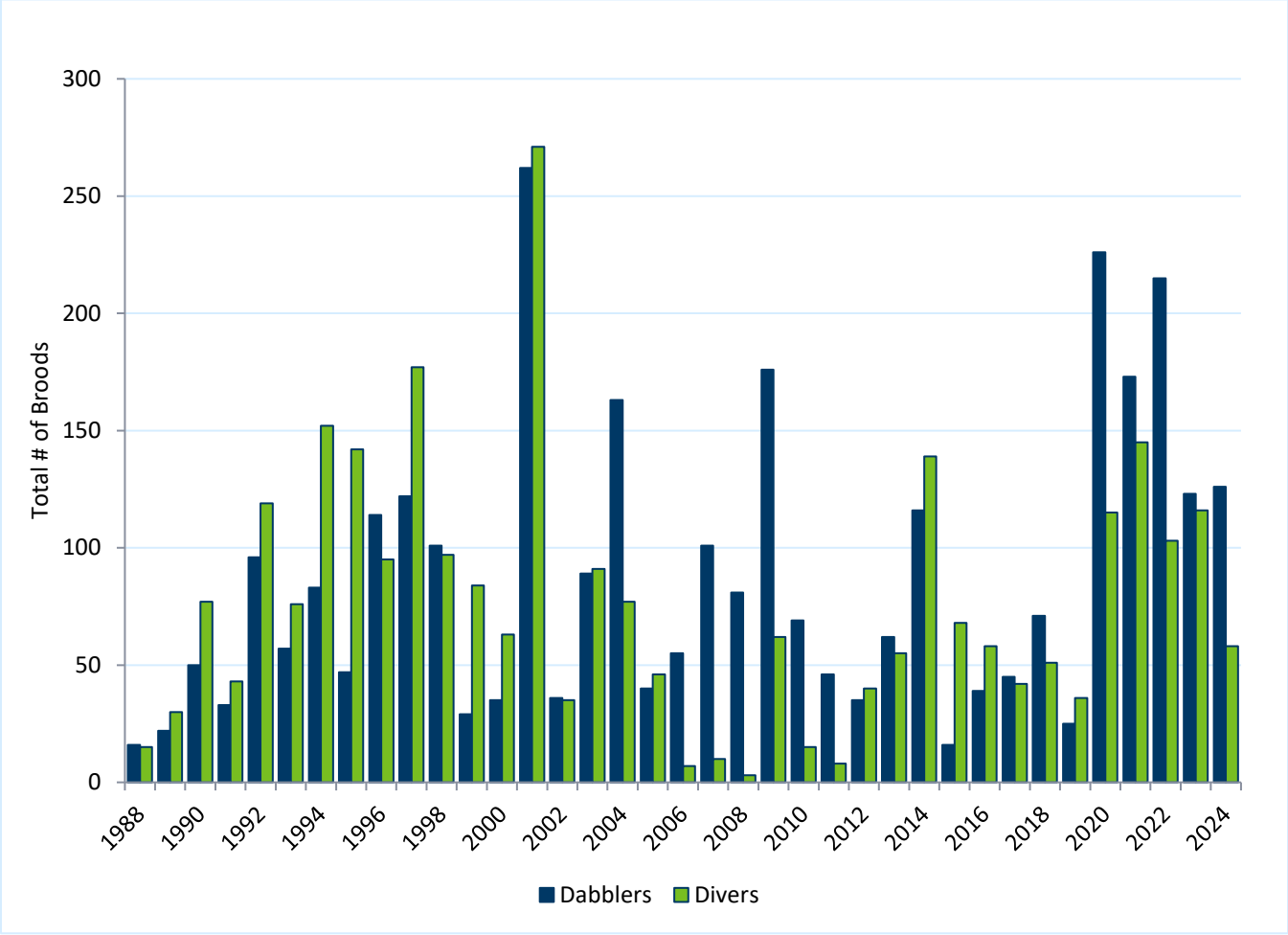
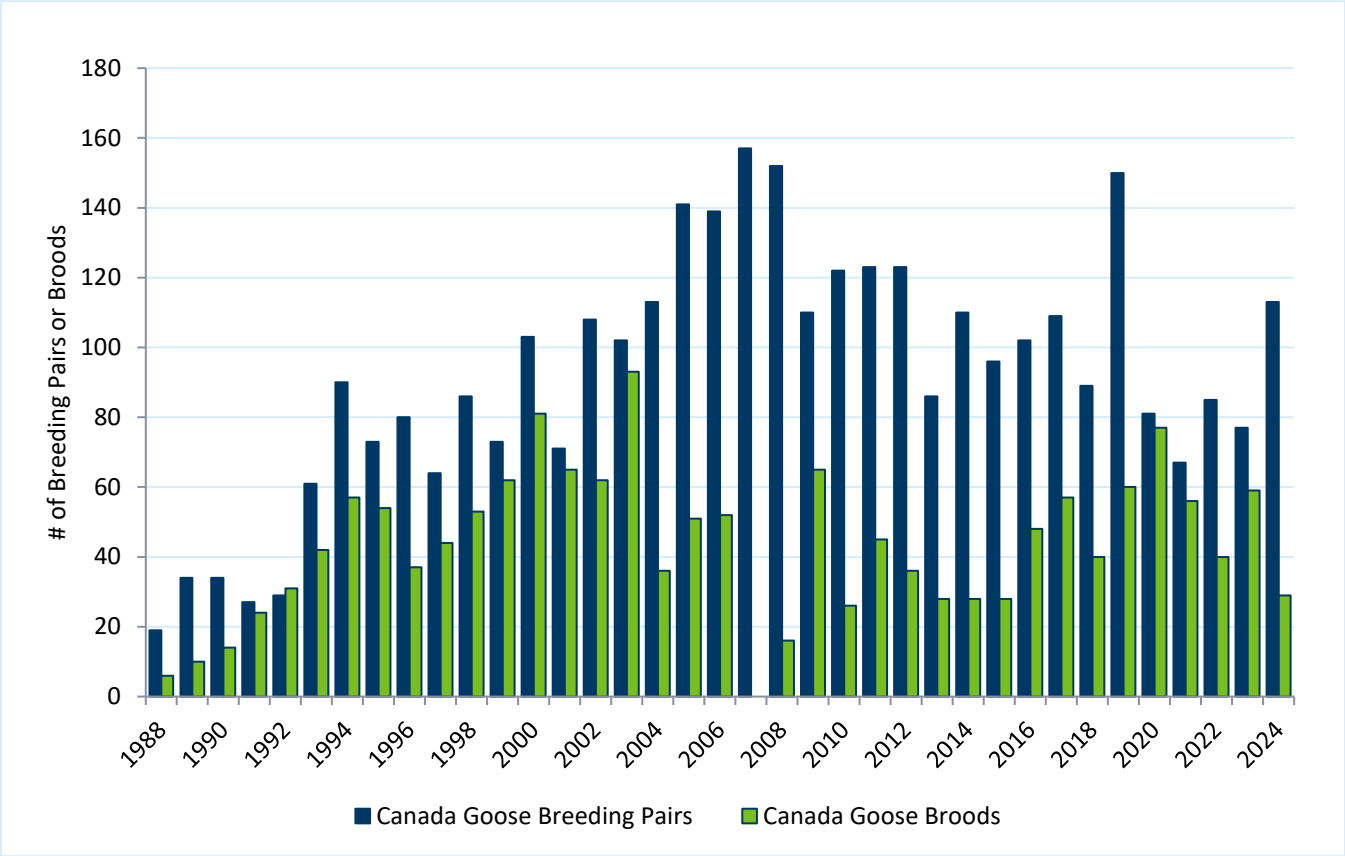


Figure 24. Canada goose breeding pairs and broods on Roseau River WMA, 1988 - 2024



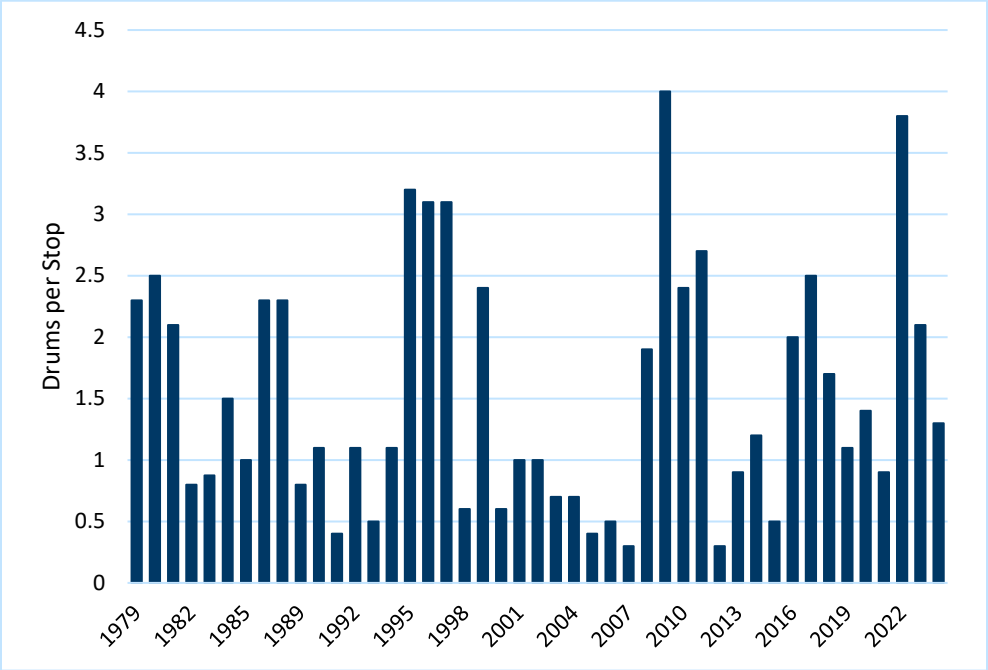
Waterfowl management on Roseau River WMA focuses on both migration and nesting habitat. The pools are managed for both emergent and submergent vegetation important to waterfowl species throughout the year. Wild rice, while an important waterfowl food, can grow in stands too thick to benefit many of the waterfowl species found at Roseau River WMA and can reduce submergent vegetation diversity. Thinning wild rice stands through water management is common at Roseau River WMA to meet waterfowl management goals. Invasive cattail stands are also actively managed to increase open water, emergent diversity, and submergent vegetation within the pools. Staff at Roseau River WMA also maintain roughly 150 nesting boxes along the Roseau River and dike system. Nesting box use is primarily by hooded mergansers with more historic use by wood ducks. Common goldeneyes have also been noted.

Ruffed Grouse. Ruffed grouse are associated with deciduous and mixed deciduous-coniferous forests and reach the highest densities in MHn44 aspen communities. Ruffed grouse prefer younger aspen stands but need a mix of young and old aspen as well as mixed aspen stands in proximity to find the right combination of food and cover. Pole-sized and sapling aspen stands are needed for various life stages. Recent research (Kouffeld, 2011; Gutierrez, 2012) suggests a greater importance of conifers than the classic research of Gordon Gullion. Conifers can be important thermal cover in winter, especially in warmer winters with less snow cover. Coarse woody debris (i.e., fallen logs) found in older forests or retained after harvest provides male ruffed grouse drumming logs for breeding displays. Recent research by Aylward et al. (2024) documented that ruffed grouse occupancy was negatively associated with red pine stands in Minnesota, likely because red pine plantations provide little winter food and sparse understory cover for grouse concealment while providing overstory cover for aerial

predators as pointed out by Gullion (1967). Generally, more mature forests provide more food and snow roosting cover than young stands.

Roseau River WMA's ruffed grouse drumming count route is on the west half of the WMA. The average ruffed grouse drumming count was 1.5 drums per stop (dps) from 1990 through 2024 (Figure 25). The 2024 count averaged 1.3 dps compared to the average of 0.66 dps for routes in northwestern Minnesota.

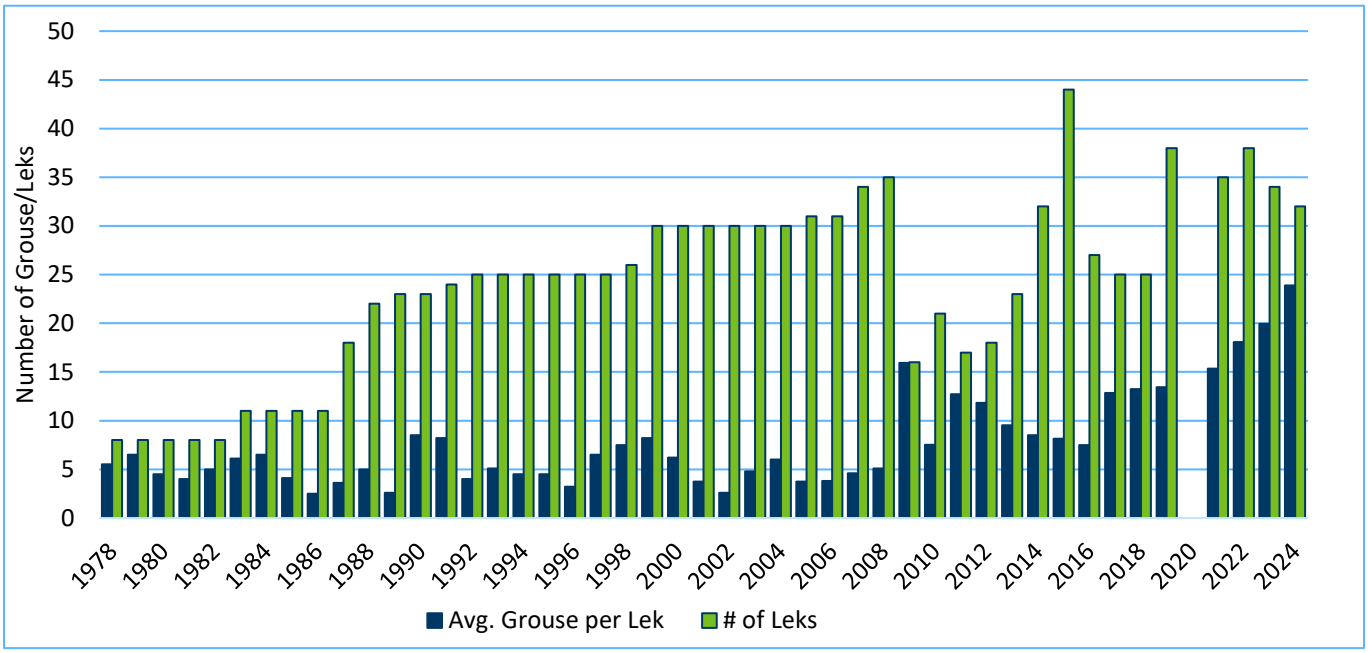
Figure 25. Ruffed grouse drumming survey results from 1979 – 2024



Sharp-tailed Grouse. Sharp-tailed grouse occur in open landscapes, including grasslands, sedge meadows, brushlands, savannahs, and boreal peatlands. Roseau River WMA is within the northwestern portion of the greater Minnesota sharp-tailed grouse range. The mating system of sharp-tailed grouse involves a lek, or dancing ground, where males congregate to display, or "dance", and females visit to select a mate. Dancing grounds occur in open landscapes where predators can be detected. As the amount of brush cover increases within about 1 kilometer of a dancing ground, the suitability of an area as a dancing ground decreases (Hanowski et al., 2000; Bailey & Larson, n.d.). However, brush cover away from dancing grounds is an important component of sharp-tailed grouse habitat for nesting, hiding, brood-rearing and winter survival (Bailey & Larson, n.d.). A study in Canada found that leks are abandoned when aspen cover exceeds 56% in a 1-kilometer radius and when grass and sedge cover decrease below 15% (Berger & Baydack, 1992). Other species that potentially benefit from sharp-tailed grouse habitat management include sandhill cranes, yellow rails, short-eared owls, northern harriers and moose. Surveys of active leks have been conducted since 1978 over a 92-mile survey route around Roseau River WMA with an average over the last decade of 32 active leks observed per year and 14 grouse per lek (Figure 27). In 2024, 31 active leks were found with an average of 23.9 grouse per lek.

Figure 26. Photo of a sharp-tailed grouse

Figure 27. Sharp-tailed grouse lek survey results from 1978 – 2024



Spruce Grouse. Spruce grouse were formerly uncommon and found mainly in the jack pine area north of Pool 1. However, it is not known whether spruce grouse still currently remain on the unit. Jack pine and black spruce are important summer and winter habitat components for spruce grouse, and both habitat types will be managed to provide habitat for spruce grouse. Broods sometimes use the edge of clearcuts if lowland coniferous forest is nearby. Spruce grouse eat needles of conifer species along with short needles, leaves, berries, mushrooms, insects and buds. In winter, they roost in deep, powder-like snow when available; when the snow has a thin crust, they use conifers for roosting. Essential habitat components for spruce grouse are thought to be dense (2,500-3,500 stems/acre), early successional conifer stands 7 to 14 meters (23 to 46 feet) in height, with branches that touch or nearly touch the ground; preferred jack pine stands are typically less than 12 meters (39 feet) tall and have not yet reached the self-pruning stage (Gregg et al., 2004).

Wild Turkey. Wild turkeys are not yet residents on Roseau River WMA, although their range is expanding north towards the Canadian border and throughout Minnesota. Some turkeys have been spotted in the spring on the WMA and are established as close as three miles along agricultural reaches of the Roseau River. Managers expect that wild turkeys will become established in the available suitable habitat on Roseau River WMA in the next 10 years.

Sandhill Crane. Sandhill cranes in far northwestern Minnesota belong to the "greater" subspecies; however, they migrate westward with the midcontinent population rather than southeast with the rest of Minnesota's greater sandhill cranes (Wolfson et al., 2017). Maintenance of wetland habitats, particularly seasonally flooded and scrub-shrub wetlands, is the primary need for all populations of sandhill cranes (Tacha et al., 1994). Roseau River WMA and the surrounding areas provide an important staging area for migrating sandhill cranes in the fall. The WMA is also within the northwest Sandhill Crane Zone where limited harvest is allowed.

Wilson's Snipe, Sora, and Virginia Rail. These species are common on Roseau River WMA and frequently taken incidentally during waterfowl hunting; however, some hunters target them specifically. Wilson's snipe nest in grasses and sedges on moist ground near water and typically lay four eggs. Virginia rails and soras are secretive marsh birds that nest in robust emergent vegetation over open water and typically lay eight and ten eggs, respectively. Sora and rail nests are susceptible to flooding if water levels fluctuate too much. Water management regimes that allow for open mudflats, areas of open water and diverse species of emergent vegetation provide both food and cover for these species.

American Woodcock. The American woodcock is the only shorebird that inhabits the forest floor. This species needs a variety of habitats for their life cycle and is typically found in moist woodlands and edges of marshes and fields. Woodcock habitat on Roseau River WMA is young forest, particularly aspen, or other brushy areas located near forest openings, which are used for courtship displays and night roosting. A variety of openings are used by woodcock including timber harvest areas, natural openings, roads and grasslands. Openings are usually within 100 meters (328 feet) of diurnal cover, which includes areas of early successional growth, shrublands or dense understory in forests (Kelley et al., 2008). Woodcocks are common on Roseau River WMA where habitat is suitable, but trend data is unavailable.

Nongame Birds

Roseau River WMA is important to a wide variety of nongame birds. Of the birds in Appendix F, 219 are nongame, and 72 are listed as SGCN in the MNWAP. Roseau River WMA has observed some species that are rare

in the state or over their range. For example, marbled godwits nest in open fields between headquarters and Pool 1, and upland sandpipers nest in open areas north of the pools. Other rare species observed at Roseau River WMA include great gray owls, yellow rail, scarlet tanager, Connecticut warbler, Wilson's warbler, LeConte's sparrow, boreal chickadee, Nelson's sparrow, and sedge wren. Shorebirds are common on the area's mudflats during migration periods. Western cattle egrets were reported for the first time in the summer of 1978. Common loons nest each year in the pools and are regularly seen with young.

Owls. Roseau River WMA staff have surveyed two Western Great Lakes Owl Survey routes since 2016 that occur partly or almost entirely within the WMA. On these routes, staff have detected a total of 92 great horned owls, 28 northern saw-whet owls, 27 barred owls, 10 great gray owls, three long-eared owls, two northern hawk owls, one short-eared owls, one eastern screech owl, and 12 owls unidentified to species. The 10 great gray owls detected around Roseau River WMA constitute 17% of the great gray owls detected on all routes in the Western Great Lakes Owl Survey, which is a significant concentration. Lowland conifers provide important foraging habitat and winter cover for great gray owls, while large aspen are often important nest sites. However, they are frequently seen in aspen communities across the WMA.

Yellow Rails. Roseau River WMA is one of the two or three most important locations in Minnesota for breeding yellow rails. Four survey routes containing 36 survey points were established on Roseau River WMA in 2021. These 36 survey points constituted 23% of 158 survey points established on 19 routes statewide, but those points accounted for 67% detections statewide. Similarly, a yellow rail capture effort in 2008 found far more yellow rails at Roseau River WMA than they did at four other sites in Minnesota, Wisconsin, Michigan, and Manitoba (Popper, 2009). Yellow rail habitat on Roseau River WMA is abundant, inaccessible and under surveyed. Known occupied habitats occur in the rich fen and sedge meadows northwest of Pool 1 West and north of Pool 3, but they are expected to occur elsewhere too.

Woodpeckers. Woodpeckers are important cavity-excavating species. Pileated woodpeckers and northern flickers are particularly important because they are the only species that create larger cavities that can be used by wood ducks, common goldeneyes, buffleheads, hooded mergansers, owls, American kestrels, martens and fishers. Pileated woodpeckers require aspen at least 13.75 inches in diameter but prefer aspen greater than 15.75 inches in diameter for nesting. Pileated woodpeckers also excavate a few cavities for roosting, and roost trees can be slightly smaller diameter than nest trees. Northern flickers require birch, aspen or dead jack pine at least 9 to 10 inches in diameter; however, they prefer trees 12 to 16 inches in diameter for nesting.

Yellow-bellied sapsuckers are also an important cavity-producing species for smaller secondary users such as tree swallows, eastern bluebirds or flying squirrels. Sapsuckers create a regular pattern of holes called sapwells to harvest tree sap. They often target birch trees. Sapwells are an important food source not just for sapsuckers and their nestlings, but also for ruby-throated hummingbirds, squirrels, bees and other insects.

Nelson's Sparrows. Roseau River WMA is one of the most important locations in Minnesota for breeding Nelson's sparrows. Nelson's sparrow habitat on Roseau River WMA, like yellow rail habitat, is abundant and inaccessible. Surveys have only covered a fraction of the available habitat, but Nelson's sparrow has been detected in the rich fen north of Pool 1 West and in the Big Swamp. This species needs sedge- or grass-dominated wetlands and avoids cattail-dominated marshes.

Mammals

Most mammal species found at Roseau River WMA today were present during pre-European settlement times. As European settlement progressed, habitat destruction and unregulated hunting and trapping decimated populations of several larger mammals. The historical distribution of small, inconspicuous species is unknown. Mammal species present at Roseau River WMA were determined from information supplied by Section of Wildlife records and observations from staff working at Roseau River WMA. Fifty-six mammal species are known to occur on or near Roseau River WMA (Appendix G). Twenty of these 56 mammal species are identified as game species, 10 are state listed as special concern, six are considered SGCNs, one is a state-threatened species, and one is a federally endangered species.

Large Mammals and Big Game

Moose were common in the region during pre-settlement times. By the 1920s, moose had nearly been eliminated by land use changes and unregulated hunting; however, populations later rebounded when lands reverted to brush and moose hunting was banned from 1923 to 1970. By the 1970s, moose populations were estimated at two per square mile on Roseau River WMA, which was among the highest densities in the state. The average population was 2,900 from 1970 to 1983 in the Northwest Prairie Zone. As a result, regulated hunting was reinstated in 1971. Hunting success was high, and harvest ranged from 24 to 44 moose off Roseau River WMA and surrounding lands annually. By 1990, the moose population began to collapse, and the season was closed in 1997. The decline in moose populations in the early 1990s was not unique to northwestern Minnesota; declines also occurred across the entire southern portion of their range, including in northeastern Minnesota. Today, fewer than 100 moose are thought to persist in northwestern Minnesota, and 12 or fewer individuals exist on Roseau River WMA.

Woodland caribou were once found over much of northern Minnesota. However, by the 1930s, caribou had been reduced to a small remnant herd in the Red Lake bog north of Upper Red Lake. In 1938, 10 caribou from Canada were released in the bog to replenish the herd. This effort failed and there have been no reports of caribou in the area since 1943 (Gunderson & Beer, 1953).

Elk originally occupied much of the prairie and open woodland in Minnesota; however, they were extirpated by the late 1800s. Since 1913, a series of efforts have been undertaken to reestablish elk in Minnesota. The closest elk population to Roseau River WMA is the Caribou-Vita herd, which is often found within a few miles of Roseau River WMA and is thought to have emigrated from Manitoba. Elk may be found using the uplands along the western edge of Roseau River WMA. Rarely, they may cross into the northeast corner of the WMA from Canada. However, elk avoid the interior wetland complexes that make up much of Roseau River WMA.

White-tailed deer are the most common large mammal in the area. However, they were probably uncommon in the prairie-forest transition zone at European settlement. Deer numbers increased following the passage of protections from unregulated harvest in the 1930s. Roseau River WMA supports a moderate white-tailed deer population of approximately seven to 15 deer per square mile, with a target of 11 deer per square mile for Deer Permit Area 201 based on 2019 goal setting. Deer are a generalist species and prefer habitat diversity and edge. They can be found using all of Roseau River WMA's habitats, but densities are highest in the uplands followed by lowland brush communities on the periphery of Roseau River WMA. Deer are near the northern limit of their historic range, and populations on Roseau River WMA are most sensitive to winter severity, the effects of which

can be compounded by predation. The back-to-back severe winters of 1996 and 1997 (Winter Severity Index, WSI, values of 220 and 214, respectively) devastated the deer population (see Winter Severity under the Climate, Extreme Weather, and Climate Change Section for more details about the index and its correlation to deer populations). The population had generally recovered by 2003 and has remained stable since, with an average annual antlered buck harvest of 108 deer (Figure 33).

Black bears were considered furbearers or pests until 1927 when they were given big game status in Minnesota. A bounty remained on black bear until 1965. DNR established a modern season in 1971 and quotas in 1982. Roseau River WMA was outside of black bear range in Minnesota in the 1980s; however, established populations occupied nearby Sandilands Provincial Forest in Manitoba. The 1980 plan references low densities restricted to the Juneberry area. In the early 1990s, most observations occurred in the forested habitats along the border (R. Prachar, personal communication). The 1995 food failure across their primary range is thought to have driven black bears to the transition zone to find food. They have since remained and established in northwestern Minnesota. Research in the area on habitat use has shown that bears in the more agricultural areas of northwestern Minnesota have the largest home ranges currently documented. Today, black bears are common across Roseau River WMA and attract large hunter numbers due to its status as a No-Quota area. The average annual harvest since 1985 in the 201 DPA has been 14 bears with an average sex ratio of 70/30 males to females harvested. From 2020 to 2024, the average annual harvest has been 29 bears with an average sex ratio of 74/26 (Figure 34). Given the extensive habitat in Manitoba adjoining Roseau River WMA, immigration and emigration is high and the WMA's population remains stable.

The gray wolf was likely common pre-European settlement, but unregulated harvest nearly extirpated the species from Minnesota and the continental United States. The gray wolf was afforded special protection as a Federally Threatened Species under the Endangered Species Act in 1978. Wolves rebounded across their primary range within Minnesota. Contiguous habitat in Manitoba connects Roseau River WMA to the primary range, which has resulted in consistent but transient use of Roseau River WMA by wolves since the 1970s. In 2012, the wolf was delisted, and management responsibility was shifted to the state. Wolf hunting and trapping seasons were held from 2012 to 2014. A federal court decision on Dec. 19, 2014 placed the wolf back on the endangered species list. Subsequent unsuccessful attempts have been made to return management to the states. The first established packs on Roseau River WMA were observed in 2021. Wolves are opportunistic with a diet primarily consisting of white-tailed deer; beaver have also been documented as an important food source.

Cougars were found throughout Minnesota in low numbers prior to European settlement. Today, cougars are occasionally sighted in the state. Verified observations indicate that their occurrence is a result of transient animals from the Western Dakotas. At least one radio-collared individual has been documented on the unit in recent decades (R. Prachar, personal communication). There is no evidence for a resident breeding population in the state.

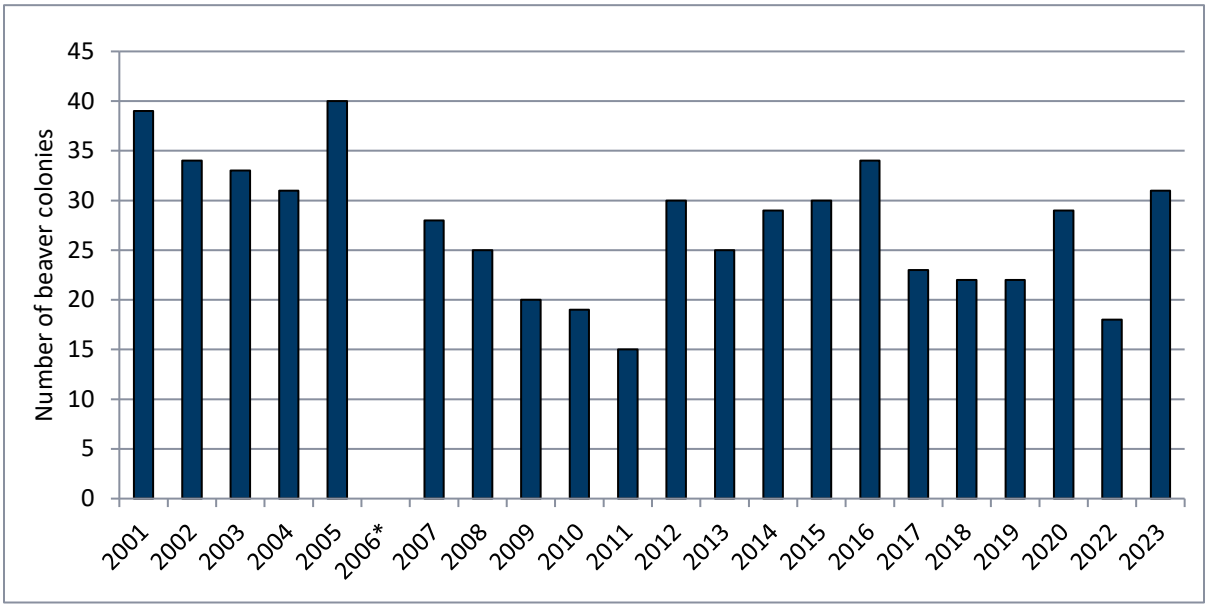
Mid-sized Mammals, Small Game, and Furbearers

Roseau River WMA is home to several mid-sized mammals, many of which are classified as small game in hunting regulations or as furbearers in trapping regulations, that fill important ecological roles. The snowshoe hare is a common small game mammal hunted at Roseau River WMA. Important furbearers at Roseau River WMA include fox, coyote, muskrat, mink, beaver, otter and raccoon. Many furbearers are associated with water and wetlands (e.g., muskrat, otter, beaver, and mink). Other mammal species, like striped skunk, bobcat, gray

and red fox, coyote, opossum and weasel, can be found in a wide variety of habitats, including croplands, prairie, brushlands and forests.

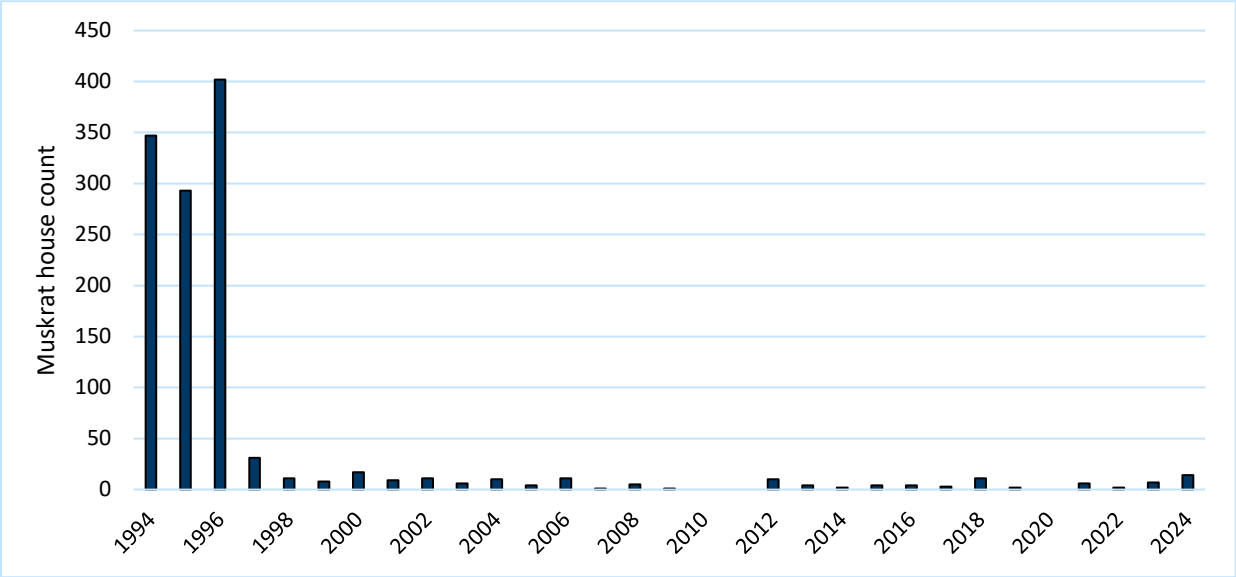
Beavers are abundant on Roseau River WMA and are exceptional engineers of wetland habitats. Annual food pile counts serve as an indirect beaver population and activity measure on the WMA. In 1991, WMA staff established survey routes that cover 50 miles of dikes and ditch networks on the WMA and are surveyed each fall (Figure 28). Survey data from 2001 to present show that Pools 2 and 3 have an average of seven and 10 colonies per year, respectively. While beavers are a critical species to the WMA's ecosystems, they have the capacity to damage infrastructure or conflict with other ecosystem management goals. Conflicts are generally managed through access for recreational harvest but may involve coordination with the county and contract removal in legal ditch systems. The internal WMA dike system is open annually during the muzzleloader season to provide access for trappers to target beaver along the dike that may be causing or are likely to cause damage to WMA infrastructure. Potential closures and changes to dike access during this time are dependent on annual environmental conditions.

Figure 28. Beaver colony surveys on Roseau River WMA from 2001 to 2023



Muskrats were historically abundant on Roseau River WMA and provide important open water and nesting habitat for waterfowl and other wetland birds. They were commonly trapped and, along with mink, were the most numerous species harvested on the WMA. In high numbers, muskrats present a concern for dike infrastructure; the 1980 plan wetland management objective included managing the impoundments "…for maximum muskrat production within the limits imposed by damage to dikes". The winter of 1996 led to a collapse in the muskrat population from which they never recovered. Since 1994, muskrat populations have been monitored on the pools through muskrat house counts. Present counts are approximately 4% of that before 1996 (Figure 29).

Figure 29. Muskrat houses on Roseau River WMA from 1994 to 2004



Lynx were historically found across northern Minnesota in relative abundance. Prior to 1984, lynx were hunted and trapped in the state. As of 2000, the species was designated as a federally threatened species as well as a state special concern species. Lynx do not appear to be a resident species of the WMA; however, they are observed on or around the WMA every few years.

Roseau River WMA also participates in state-wide survey efforts to monitor other furbearing species of interest. Furbearer winter track surveys are conducted between December and February. This survey, established in 1991, includes an established route on the WMA. Surveyors record tracks of species like fisher, marten, bobcat, wolves, red fox, coyote, gray fox, snowshoe hare and weasel across the 10-mile route. Carnivore scent station surveys, started in 1975, are completed annually in September. These surveys help to passively record elusive species. Although designed for monitoring statewide trends, the winter track survey and carnivore scent station survey also provide long-term trend information for species at the WMA.

There is internal consideration at the DNR to adjust survey methods for furbearing and carnivore species in the state. As of 2024, no set changes have occurred to surveys for these species, but future WMA recording efforts may change to allow for stronger species population estimates across the state.

Small Mammals

Small mammals are important to ecosystems, serving as food for predators, seed distributors, grazers, and invertebrate consumers. Although generally inconspicuous, small mammals are present in deciduous forests, wetlands, and grassland communities at Roseau River WMA. Small mammal composition has remained mostly unchanged since the 1980 plan. Plains pocket gophers were previously listed as “possible occurrence” in the 1980 plan and now have known occurrences. Prairie shrew and eastern cottontail were not listed in the previous plan but are now suspected to occur. Survey efforts using small mammal trap grids, visual observations and acoustic detectors have enhanced the knowledge of these species.

Small mammal trap grids have been conducted by WMA staff and volunteers since 2001 on predetermined routes through both forested and transition areas of the WMA. These trapping efforts are coordinated by the 1854 Treaty Authority to sample northern and central Minnesota to obtain species capture indices over time. Seven species of small mammals have been detected at the WMA, including deer mouse, southern red-backed vole, northern short-tailed shrew, eastern meadow vole, masked/pygmy shrew and house mouse (Table 12). Masked shrew and pygmy shrew are listed together because they are difficult to differentiate during surveys.

Table 12. Small mammal species surveyed at Roseau River WMA, 2001 to 2024. Data courtesy of 1854 Treaty Authority. Table only includes species that occurred at least once at the WMA.

Common Name	Scientific Name
North American mouse not identified to species	*Peromyscus spp.*
Southern red-backed vole	*Myodes gapperi*
Northern short-tailed shrew	*Blarina brevicauda*
Eastern meadow vole	*Microtus pennsylvanicus*
Masked/pygmy shrew	*Sorex cinereus/hoyi*
Arctic shrew	*Sorex arcticus*
House mouse	*Mus musculus*

Five species of bats have been documented to occur at Roseau River WMA, including the little brown myotis, big brown bat, eastern red bat, northern hoary bat and silver-haired bat. In 2023, a stationary acoustic detector was deployed near the refuge headquarters over 14 nights to record bat calls (Table 13). Detectors captured four species of bats, and the highest concentration of calls were from the silver-haired bat. In addition, crews from the University of Minnesota Duluth Natural Resources Research Institute (NRRI) conducted mist net surveys for the northern long-eared bat (*Myotis septentrionalis*), a federally endangered species, in 2016. Although none were captured, the habitat is likely suitable for them. No northern long-eared bats were detected during the most recent stationary acoustic detector survey in 2023. Recent studies by NRRI (Swingen, et al., 2017), found that northern long-eared bats prefer decaying and larger diameter aspen for maternal den roost sites in northern Minnesota forests where tree cover equals or exceeds 80% near the maternal roost tree and where forest cover is extensive within an 800-meter (1/2 mile) radius of the roost tree.

Table 13. Results from a stationary acoustic detector from June 14, 2023 to Aug. 24, 2023 near the refuge headquarters

Species	Scientific Name	No. **Calls Detected**
Big brown bat	*Eptesicus fuscus*	6
Eastern red bat	*Lasiurus borealis*	4
Northern hoary bat	*Lasiurus cinereus*	104
Silver-haired bat	*Lasionycteris noctivagans*	271

Due to possible continued uncertainty on species persistence and occurrence on the WMA, there is a need to track long-term trends of small mammal and small game species. Roseau River WMA staff will continue to participate in yearly small mammal survey efforts to help evaluate long-term, state-wide trends of small

mammal species. The WMA will assess the need for increased surveys or changes in local management, dependent on changes of species' listing and consideration of available resources and staff. Species lists, in addition to other data sources and reports, guide future conservation and survey efforts for these and other species in Minnesota. Future survey efforts and goals related to small mammal management on the WMA are outlined in the Desired Conditions section.

Fish

There have been 34 fish species sampled at or near Roseau River WMA. The primary game fish found in the Roseau River include channel catfish, northern pike and walleye. DNR Fisheries are working to restore lake sturgeon to the Roseau River by increasing fish passage in the Roseau River and stocking of young-of-year lake sturgeon into the Roseau River near Roseau River WMA. Other species sampled at or near the WMA can be found in Appendix H.

Herpetofauna

Roseau River WMA has a moderate diversity of reptiles and amphibians that is influenced by the diversity of habitats, native plant communities and their landscape connections. Eleven amphibian and seven reptile species are known to occur at Roseau River WMA (Appendix I). The Habitat Management Guidelines for Amphibians and Reptiles of the Midwestern United States provides guidelines for reptiles and amphibians management.

Invertebrates

MBS has conducted some invertebrate surveys in and around Roseau River WMA. The results of a 2015 bee survey are listed in Table 14. Other lepidopteran (i.e. moth and butterfly) surveys have been conducted nearby in Manitoba, Canada and at Pine Creek Peatland SNA. A 1991 survey found a peatland specialist, bog fritilary (*Boloria eunomia*) at the WMA. Other nearby surveys have identified other SGCN. For example, a recent survey at Pine Creek Peatland SNA noted 341 Lepidopteran species, including one SGCN (Zigzag darner, *Aeshna sitchensis*), and a threatened caddisfly species.

Table 14. Results of a 2015 bee survey at Roseau River WMA

Species	Lecty	Behavior	Nest type
Agapostemon subtilior	polylectic		ground
Andrena wilkella	oligolectic	solitary	ground
Anthophora terminalis	polylectic	solitary	wood
Apis mellifera	polylectic	eusocial	hives
Bombus borealis	polylectic	eusocial	hives
Bombus fervidus	polylectic	eusocial	hives
Bombus griseocollis	polylectic	eusocial	hives
Bombus pensylvanicus	polylectic	eusocial	hives
Bombus rufocinctus	polylectic	eusocial	hives
Bombus ternarius	polylectic	eusocial	hives
Bombus vagans	polylectic	eusocial	hives

Species	Lecty	Behavior	Nest type
Coelioxys porterae	polylectic	cleptoparasitic or socially parasitic	cavities
Heriades carinata	polylectic	solitary	stems
Heriades variolosa	oligolectic	solitary	stems
Hoplitis pilosifrons	polylectic	solitary	stems
Hoplitis producta	polylectic	solitary	stems
Hylaeus affinis	polylectic	solitary	stems
Hylaeus mesillae group	polylectic	solitary	stems
Lasioglossum viridatum	polylectic	eusocial	ground
Megachile gemula	polylectic	solitary	cavities
Megachile relativa	polylectic	solitary	cavities
Melissodes agilis	oligolectic	solitary	ground
Melissodes trinodis	oligolectic	solitary	ground

oligolectic: collects pollen from a single plant species, genus, or family (specialist)
polylectic: collects from a variety of plants (generalist)

Public Use

Introduction

By statute, Minnesota's WMAs are used for public hunting, trapping, fishing, and other activities compatible with wildlife and fish management. Hunting has consistently accounted for the largest share of public use at Roseau River WMA followed by fishing. Roseau River WMA is also used for other compatible activities, including wildlife watching, foraging, hiking, biking, and canoeing. Knowledge of the present use levels is necessary to predict the future demand for outdoor recreation and guide management objectives and strategies. A recent questionnaire revealed that, beyond hunting and fishing, the following activities are popular at Roseau River WMA: enjoying solitude/relaxing in the outdoors; viewing or photographing wildlife and/or nature; hiking; and bird watching. See Appendix C for a summary of the Fall 2024 public scoping results.

Hunting

Waterfowl Hunting

Roseau River WMA is well known as a destination for waterfowl hunting. Waterfowl hunting at Roseau River WMA can be subdivided into the controlled hunt from the designated hunting blinds, hunting over the managed pools, and hunting along the Roseau River and its oxbows.

The controlled hunt occurs at designated blinds on the east end of the WMA, around Pool 1 East. Two blinds within the controlled hunting zone (CHZ), Blinds #1 and #10, are wheelchair accessible. The following general restrictions apply at Roseau River WMA controlled hunt:

- Hunters must use designated hunting stations on a first-come, first-served basis.
- No one may park in or otherwise occupy any designated CHZ parking lot or any hunting station from 10 p.m. to 5 a.m.

- General regulations for WMAs and state game refuges apply to hunters using designated blinds.
- Hunters must also comply with all other waterfowl and general hunting regulations.
- No one may leave any refuse, offal, or feathers on public lands in the CHZ, parking lot or designated overnight use area of the management area.
- No alcoholic beverages may be consumed or possessed at any hunting stations on public lands.

Pools 1, 2, and 3 are all popular destinations for waterfowl hunting, and each pool has a Wildlife Sanctuary where no hunting or trespassing is allowed. Hunters also hunt along the Roseau River, which flows through the WMA, and focus on the shallow water habitat of the oxbows. Boats are often the best way to access the WMA and hunt waterfowl. There are six boat launches available for public use: two on the east and west ends of Pool 1 west, one at the northwest corner of Pool 2, one by the second spillway on the southeast side of Pool 2, one at the west end of Pool 3, and one at the spillway on Pool 3. There are also three public access boat launches on the Roseau River on or near the WMA. The boat launches are used extensively throughout the waterfowl hunting season. WMA staff have conducted waterfowl bag checks throughout the regular waterfowl season since 1989. Harvest and hunter use data is gathered through voluntary hunter record cards available at all access locations as well as weekly waterfowl bag checks. Bag checks are conducted Saturday, Sunday, and Monday of opening weekend of the regular waterfowl season; Saturdays and two weekdays through MEA weekend; and Saturdays and one weekday from MEA through freeze-up or the end of the season. Car counts are completed every Sunday throughout the season. WMA staff use these data to extrapolate hunter use and harvest.

Figure 30. Photo of the west boat launch on Pool 1 West

Roseau River WMA is within the Sandhill Crane Zone in far northwestern Minnesota. Hunters pursue sandhill cranes at the WMA as well as nearby public and private lands. Sandhill crane season is relatively short; it coincides with the small game opener and runs through mid-October. Most opportunities occur during the first two weeks of the season. Hunters must possess a small game license and a sandhill crane permit. A current limit of two cranes/day is in effect in the Sandhill Crane Zone.

Waterfowl hunters largely pass-shoot Canada geese from the CHZ blinds, and harvest ducks, cranes, snipe and sharp-tailed grouse. Pass-shooting is also common in the areas south of Pool 1. Hunter use of blinds has declined over the years; only approximately 10% of the WMA's hunters now use this area.

Waterfowl hunting has been a tradition at Roseau River WMA. Many groups have hunted the WMA for decades and continue to camp at the many campgrounds during their stay. Historically, over 30% of the waterfowl hunting was opening weekend; however, there has been a trend toward a more even distribution of use over the first three weeks of the season with increased use on weekends. Waterfowl hunter-days, an estimate of hunter use, exceeded 2,000 until 1996. By 2007, hunter-days declined to below 1,000, and hunter-days have been around 600 since 2020. A significant portion of the decline can be attributed to declining use of the CHZ and blinds. Duck hunter success has increased consistently over time; the three highest yearly success rates have

occurred since 2020. Annual duck harvest fluctuates in response to many factors, including habitat conditions, migration timing, accessibility and hunter numbers. Hunter Canada goose success has remained stable over time, but annual harvest has declined (Figure 31; Figure 32).

Figure 31. Waterfowl hunter use and hunter success on Roseau River WMA, 1989 - 2023

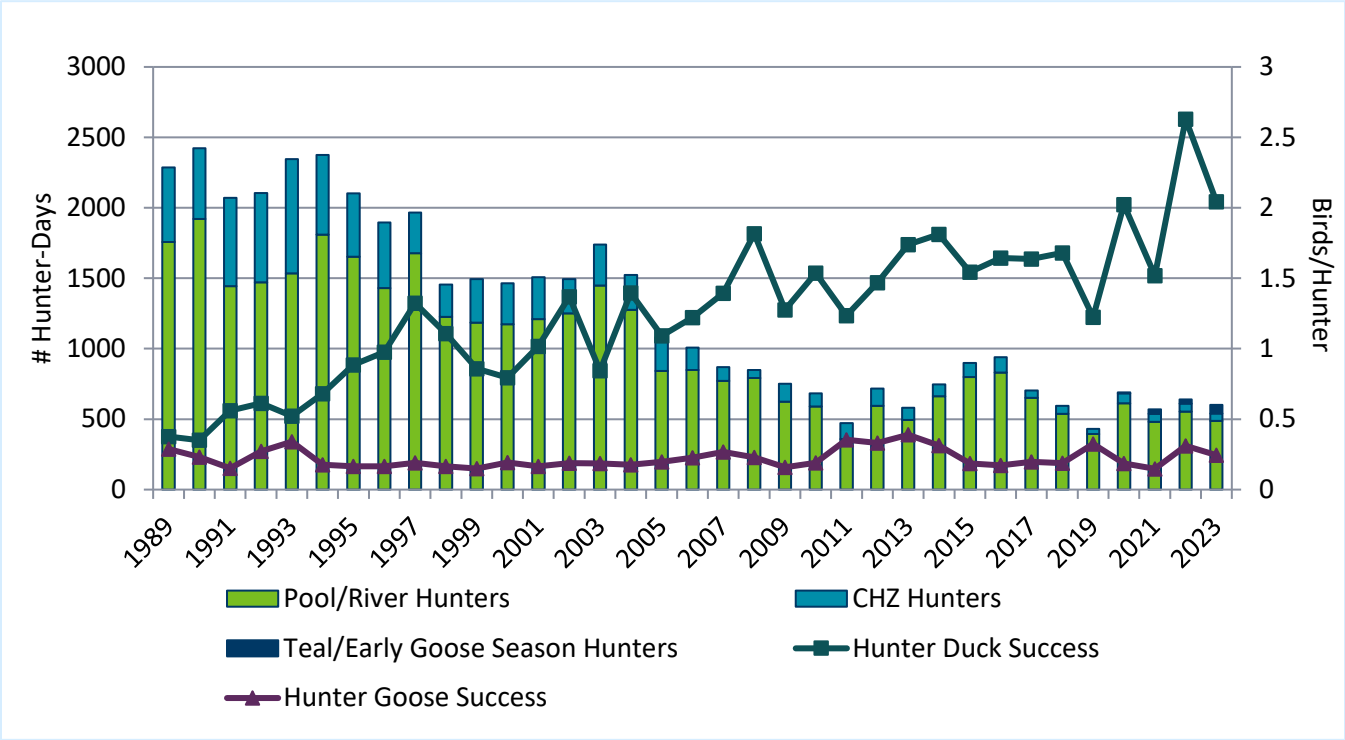
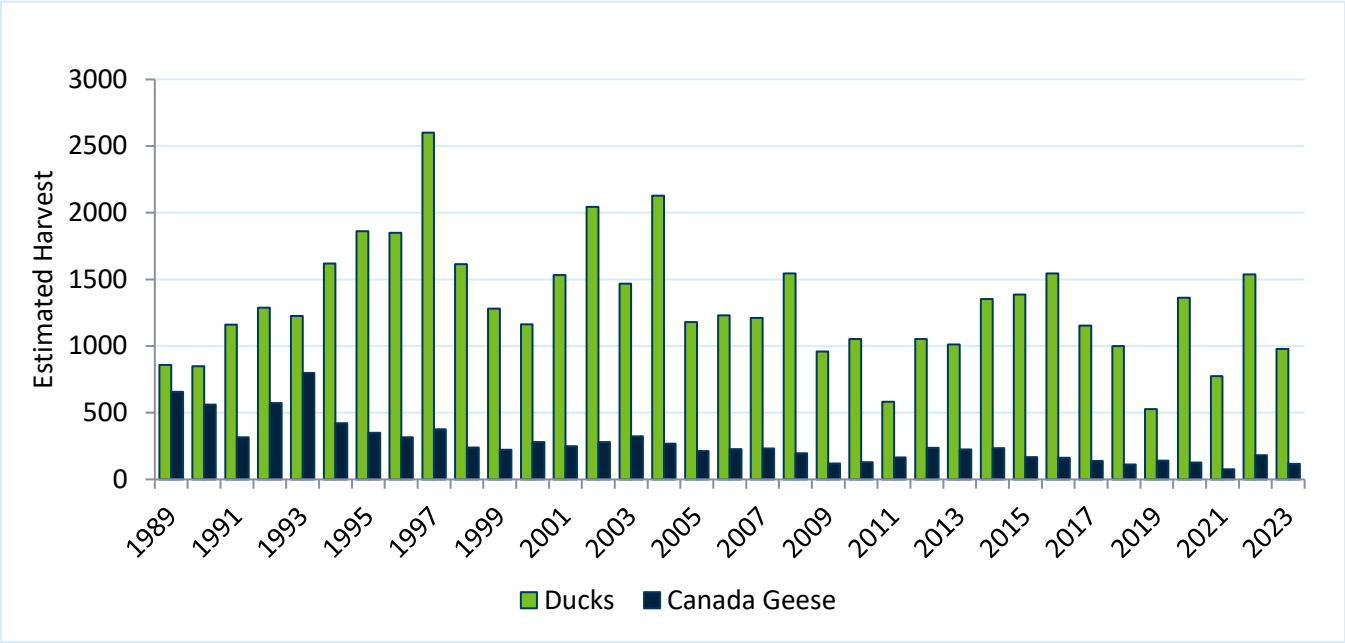


Figure 32. Estimated waterfowl harvest on Roseau River WMA from 1989 - 2023



Waterfowl hunters on the pools primarily use small watercraft. Electric motors and gas motors of 10 horsepower or less are allowed for use on the WMA during waterfowl season only. Most hunters use decoys and either hunt from their boat or stand on the floating cattail mat or on the man-made nesting islands, while others pass shoot from the dike system. Species harvested varies based on conditions and local production. Over the last 12 years, ring-necked ducks have made up 28% of the harvest followed by mallards and blue-winged teal (20% and 13%, respectively). Dabbling ducks consist of 60% of the harvest.

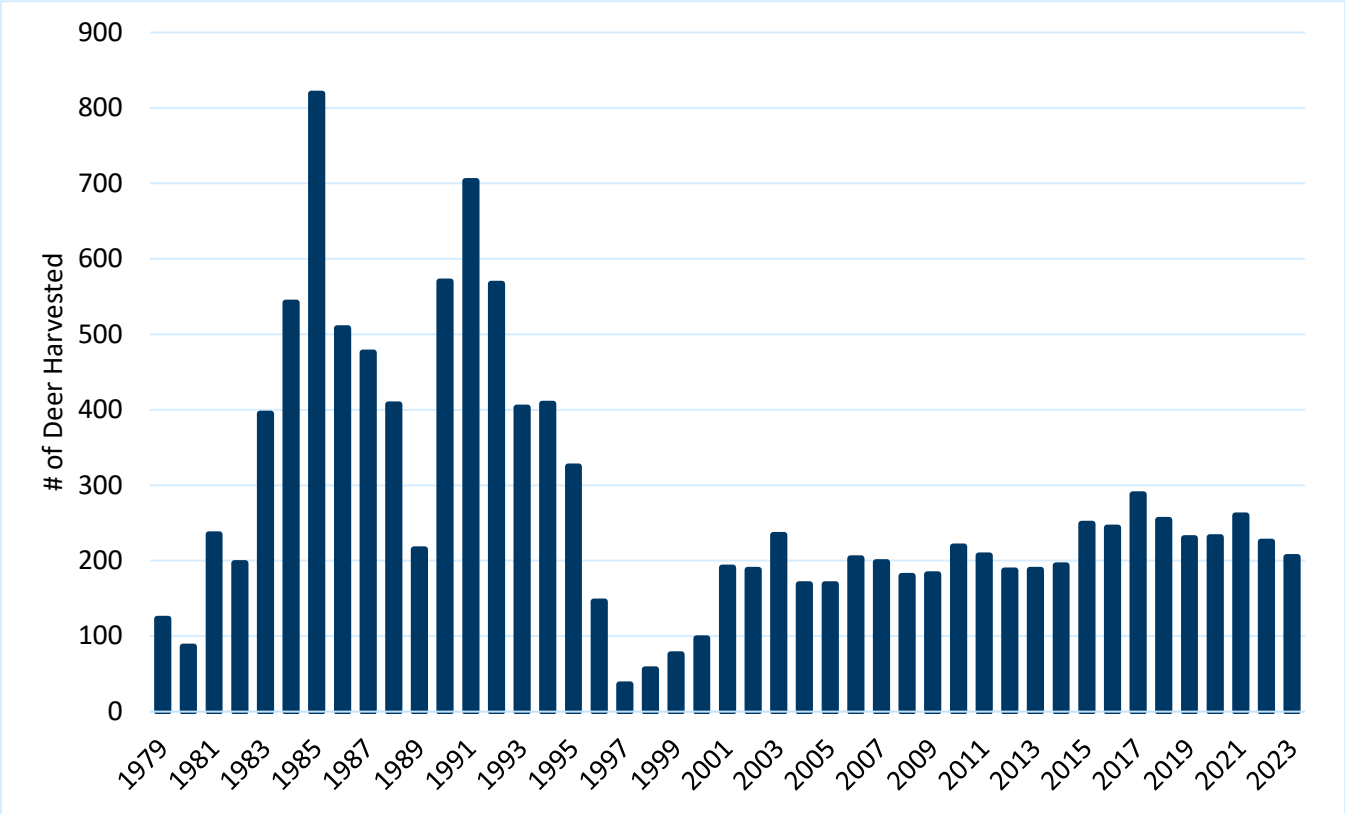
Waterfowl hunting on the Roseau River is like the pools but there is no motor horsepower restriction. Most hunting occurs in the old Roseau River oxbows where the river no longer has perennial flow and submergent vegetation establishes and attracts waterfowl. Waterfowl production on the river is highly variable depending on the stability of the river during the nesting season. The Roseau River produces blue-winged teal, green-winged teal, mallards and wood ducks for early season. Most local ducks, particularly wood ducks, have migrated by mid-October. Green-winged teal, mallards, and blue-winged teal typically make up 73% of the harvest on the river.

White-tailed Deer Hunting

White-tailed deer hunting is another popular activity at Roseau River WMA. Population goals are set through a stakeholder-informed process and hunting pressure is the primary tool available for management. Annual population modeling and hunter harvest data are used by DNR staff to develop harvest regulations that help meet deer density goals. The current goal was established in 2019 set at a density of 11 deer per square mile for Deer Permit Area (DPA) 201. The adjacent DPAs, 263 and 267, have goals of a 25% increase and nine deer per square mile, respectively.

Deer regulations for DPA 201 have remained relatively stable since 2003 as either a one deer either sex or two deer area. The average harvest since 2003 is 215 deer annually and 108 antlered male deer (Figure 33).

Figure 33. Deer harvest on DPA 201 from 1979 - 2023



Deer hunting occurs across all habitats, but the greatest pressure is in the upland habitats. Vegetation density can be very high, and so the area food plots and trails attract many hunters. One ADA-accessible blind north of the headquarters is situated overlooking a food plot and is reservable.

The northwest sanctuary opens to all hunting Nov. 1. The sanctuary that covers Pool 1 East and its MSUs, headquarters and residences opens to hunting during the deer muzzleloader season, which typically attracts black powder hunters.

Portable deer stands are allowed on the WMA from Nov. 1 through the end of the calendar year. A hunter is allowed three portable deer stands on the WMA, and identifying information for the hunter must be affixed to the stand.

Upland Bird Hunting

Upland game bird hunting is popular throughout much of northern Minnesota, including Roseau River WMA. Ruffed grouse, American woodcock and sharp-tailed grouse can all be found on the WMA. Spruce grouse was also historically found on the WMA, although the last spruce grouse reported as harvest on the WMA was in the 1990s. While much of the WMA is open wetland or lowland shrub habitats that primarily provide wintering habitat for the resident species, there are upland habitats that support these game birds. Ruffed grouse and American woodcock can be found in the upland deciduous forests, especially those with a strong quaking aspen component. Sharp-tailed grouse are found throughout northwestern Minnesota in grasslands and brushlands,

which are found scattered around Roseau River WMA. Sharp-tailed grouse hunting is currently only permitted in the northwestern part of the state.

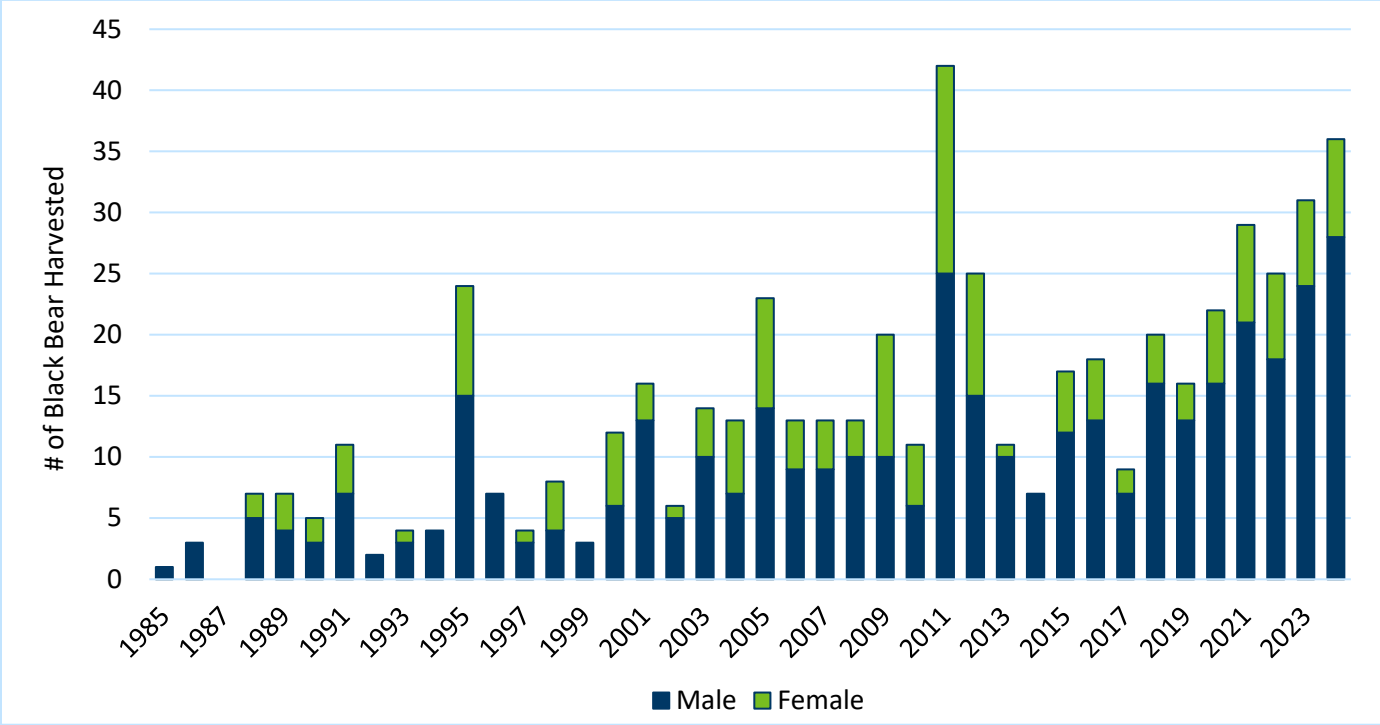
Hunter walking trails (HWTs) are an important resource for area users to experience Roseau River WMA. While they are intended for hunter access and upland hunting opportunities, they can also provide benefits and opportunities for other area users. Roseau River WMA staff maintain 21 miles of HWTs across the unit through a mix of upland and lowland habitats managed for a variety of successional stages. HWTs on Roseau River WMA offer good opportunities for encountering upland game and are popular among upland hunters.

Seasons for grouse begin the Saturday nearest Sept. 16. The season ends Nov. 30 for sharp-tailed grouse and continues until Jan. 1 for ruffed and spruce grouse. Since American woodcock are a migratory species, hunting seasons are set by federal frameworks. Current rule states that a 45-day season will begin the Saturday on or nearest Sept. 22.

Bear Hunting

Bear hunting has become very popular throughout Roseau River WMA since black bear expanded their range to northwestern Minnesota in 1995. Roseau River WMA falls in the No-Quota Area, meaning that hunters can purchase a bear license over the counter and there are no limits for number of licenses available to the public. Bear season begins Sept. 1 and closes mid-October. Figure 34 shows the black bear harvest on Roseau River WMA from 1985 to 2024.

Figure 34. Black bear harvest for DPA 201, 1985 - 2024

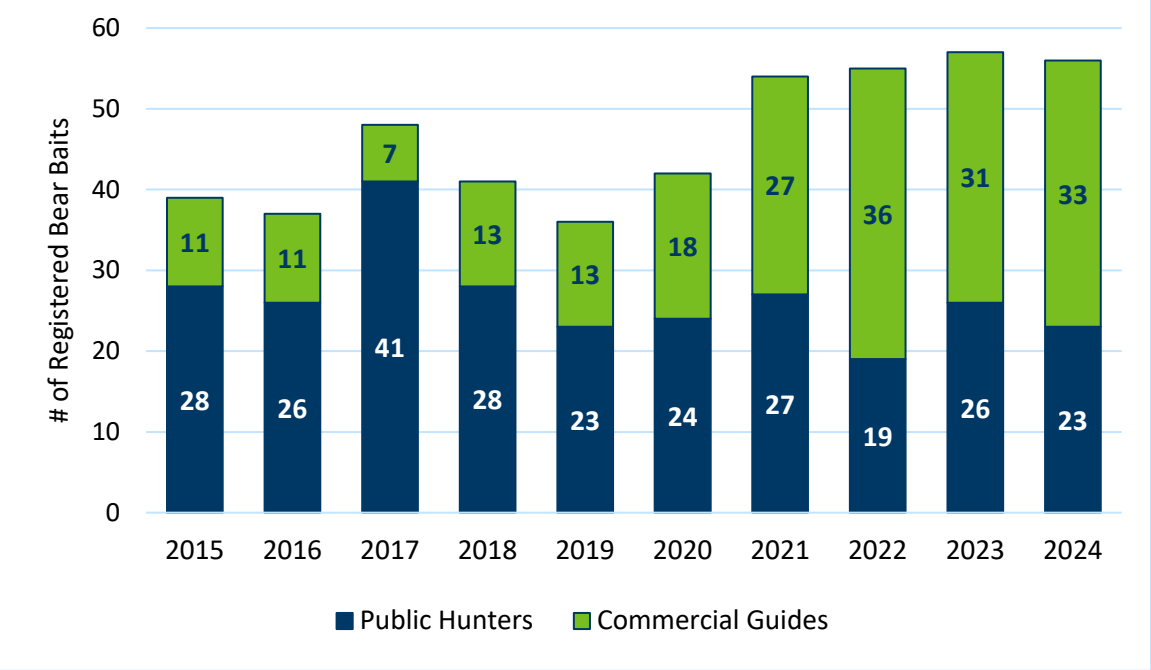


Most bear hunters use a bear bait to attract bears to their location. Currently, a hunter may establish up to three bear baits beginning mid-August that must be registered. The use of a barrel or drum is permitted with the purchase of an additional license, provided the drum is chained to a tree and labeled with the hunter's

identifying information. A tree stand is also permitted at a legally established bear bait; the stand must also have identifying information and be removed prior to the opening of archery deer season or removed daily thereafter. Bear baits may consist of readily biodegradable food items, including candy, cereals, breads, sweets, and grease. Baits are commonly placed in a shallow hole in the ground and covered with logs to keep small bears and raccoons out. Bear hunting usually occurs in woods with a thick canopy and lots of shade, which attracts bears when temperatures are warm.

Commercial bear guides are currently allowed to operate on WMAs. In recent years, between two to five guide services have established baits and guided hunters on the WMA. This has led to some displacement of non-commercial public hunting activity and conflicts in the field. Conflicts usually involve tampering with bear baits to keep bears from coming into what is seen as a competing hunter's bait. Historically, most of the guiding occurred on the far west side of the WMA. However, guides are now established on all sides of the WMA and account for most baits (Figure 35).

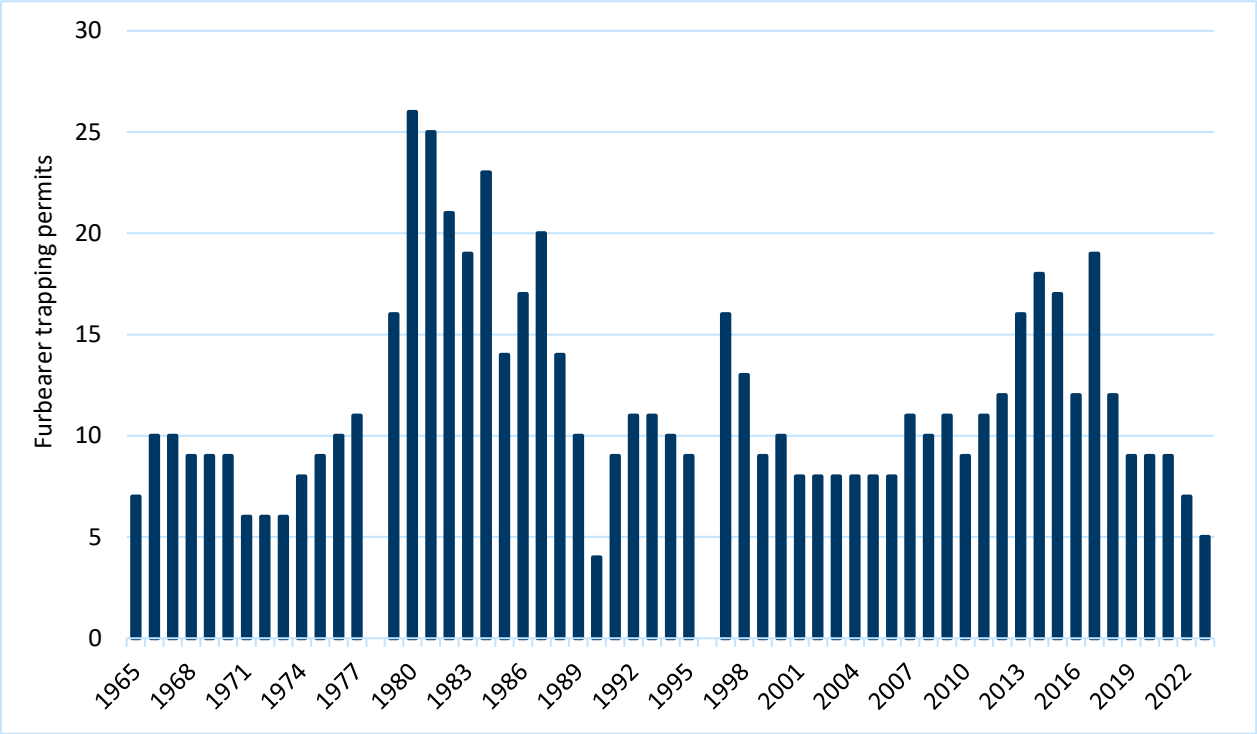
Figure 35. Registered bear baits on Roseau River WMA, 2015 - 2024



Trapping

All trappers at Roseau River WMA are required to obtain a special use permit, which allows managers to monitor trapping pressure and harvest. Over the last 20 years, an average of 10 trappers have applied for permits annually. Figure 36 shows the numbers of fall trapping permits given out to trappers since 1965. Permit data records show a decline in the number of trapping permits issued each year, which is likely correlated to fur prices declining and more trappers aging out. Harvest data has been tracked on 15 species at Roseau River WMA since 1965: muskrat, beaver, otter, raccoon, red fox, coyote, wolf, bobcat, lynx, mink, fisher, pine marten, weasel, badger, and striped skunk. The species with the highest harvest totals from 2004 to 2023 are beaver, raccoon, muskrat, mink and weasel, respectively.

Figure 36. Number of fall furbearer trapping permits issued at Roseau River WMA from 1965 to 2023



Roseau River WMA is a popular location for trapping beaver and otter in water sets, as well as trapping bobcat, fisher and American marten during a season that begins late December. Bobcat harvest over the last 10 years has remained stable; however, harvest is larger over the last 10 years than harvest from 1977 through the mid-1990s. Fisher harvest since the early 2000s has declined compared to harvests from the late 1980s through late 1990s. After being reduced to far northeastern Minnesota by the 1930s, American martens are now found throughout the Northern Superior Uplands, Northern Minnesota and Ontario Peatlands, northern portions of the Northern Minnesota Drift and Lake Plains, and northern portions of the LAP Section. Marten trapping was permitted in Roseau County beginning in 1998. Marten harvest numbers in Roseau County have been too inconsistent over time to allow for interpretation of trends, but the greatest harvests (greater than 100 individuals) occurred between 2002 and 2004. Otter harvest records go back to 1978 on the WMA and show somewhat consistent harvests since the late 1970s. Peak harvests for otter were during 2003 and 2005 with an average of 70 individuals taken per year.

Other harvested mammal species in Roseau County include coyote, red fox, gray fox, mink, muskrat, badger, weasel, striped skunk, opossum and raccoon. County-level data and population assessments for these species are primarily from voluntary hunter-harvested reports going back to 2002 and are highly dependent on trapper numbers and effort. Coyote harvests varied between 2002 and 2024; annual harvest numbers of 200 or greater coyotes were recorded in 2014 to 2015 and 2018 to 2019. Red fox harvest is variable and does not have an easily distinguishable trend; however, there are harvests of over 100 individuals in many years. Gray fox reports from Roseau County indicate that total annual harvest numbers were in the single digits between 2006 and 2022. Mink harvest has been declining since the early 2000s; less than 100 individuals have been harvested each year for the last 10 years. Over 1,000 muskrats were harvested in both 2006 and 2011, likely due to temporary

increases in muskrat pelt prices; however, annual harvest has decreased in the county since then. Annual raccoon harvests in Roseau County have ranged between less than 10 to several hundred individuals since the early 2000s.

Fishing

Fishing occurs on the Roseau River and the main pools. The primary species of fish sought are northern pike in the pools and northern pike, walleye, and channel catfish in the Roseau River. Fishing on the pools is mainly from shore and usually occurs near the water control structures, particularly on Pool 2. Some anglers will walk or bike two miles to the second Pool 2 water control structure when the gate is closed during nesting season in the spring and early summer. Dike gates are opened for spring and summer wildlife drives (see Wildlife Observation section) to allow for wildlife viewing and angling. Motorized watercraft with 10 horsepower or less are currently only allowed on Roseau River WMA pools during open waterfowl season. Limits are six walleye/sauger, 10 northern pike, and five channel catfish, with length restrictions applying to all species.

Fishing is quite popular on the Roseau River from boats, shore or one of the bridges that crosses the river. Since most of the river is affected by frequent winter kills, connectivity with the Red River of the North is important for sustaining this resource. Fishing success during the year is often dependent on water levels.

Wildlife Observation

Wildlife observation is a widespread activity, but it is often difficult to quantify. Nearly all visitors to Roseau River WMA are looking to observe wildlife, whether they are hunting or not. Wildlife observation is one of the fastest-growing wildlife-related recreation activities in the United States, and as such, it has significant implications for the work of wildlife agencies (Sinkular et al., 2022).

Roseau River WMA is along the Pine to Prairie Birding Trail. This trail highlights areas for birders in northwestern Minnesota. The pools at the WMA are popular for viewing waterfowl and other waterbirds throughout the year, especially during spring and fall migrations. Roseau River WMA's network of HWTs presents additional opportunities across a variety of lowland to upland habitats. A current bird checklist for the WMA consists of more than 250 species that may be found in the area during some part of the year. In addition, the dike is opened for two annual wildlife drives to offer additional viewing opportunities on the WMA. The gates are open one weekend in the spring and 10 days plus the two following weekends in late July and early August.

Resource Gathering

Resource gathering, also known as foraging, is an activity where edible foods are harvested for personal use. No commercial harvest of any plants (except trees) or animals is permitted on Roseau River WMA. A variety of wild foods commonly collected for personal consumption include mushrooms, berries, hazelnuts and wild rice. Foraging is a growing activity in the area.

Canoeing and Kayaking

Canoeing and kayaking occurs primarily on the river as an extension of the Roseau River Water Trail. Non-motorized watercraft are also permitted on the pools although accesses are gated. Both are growing in popularity in the area.

Hiking and Bicycling

The dike system, WMA roads and the HWT network offer recreational hiking and biking. HWTs are not maintained throughout the year and users may encounter standing water. Both activities are generally tied to other area uses such as wildlife watching, foraging or fishing.

Strategic Considerations

Climate, Extreme Weather, and Climate Change

The climate of the Roseau River area is characterized by short, mild summers and long, cold winters. The average temperature is 67°F in July and 1°F in January based on data from the Minnesota Climate Explorer summary from 1895 to 2024. Winter temperatures of -40°F are not uncommon, with annual average snowfall amounts around 38 inches in Roseau County and snow cover of 1 inch or greater for about 110 days. Prevailing winds are northwest during the winter, changing to the south and southwest during the spring and summer. Killing frosts are expected from late September through late May. Low-lying areas may experience frost throughout the summer, although this has become increasingly uncommon. Climate data taken from the Minnesota Climate Explorer from January 1985 to November 2024 shows that the average annual precipitation is 21 inches, and average monthly precipitation ranges from 1 inch in February to 4 inches in June. About 15 inches, or 68% of the annual total, occurs from May to September.

Annual temperatures for Roseau River WMA have increased on average from 1895-2023 by 0.4° F (Figure 37) with a slight increase in trend (0.6°F) but significant increase in variability in the last 30 years (1994-2023). Annual precipitation trends depict cyclic drought and wet periods with an increase of up to 1 inch on average from 1895-2024, (Figure 38) and high annual variability over the last 30-years (1994-2023; Minnesota State Climatology Office, 2024a).

Figure 37. 129-year average annual temperature across Roseau River WMA, 1895-2023

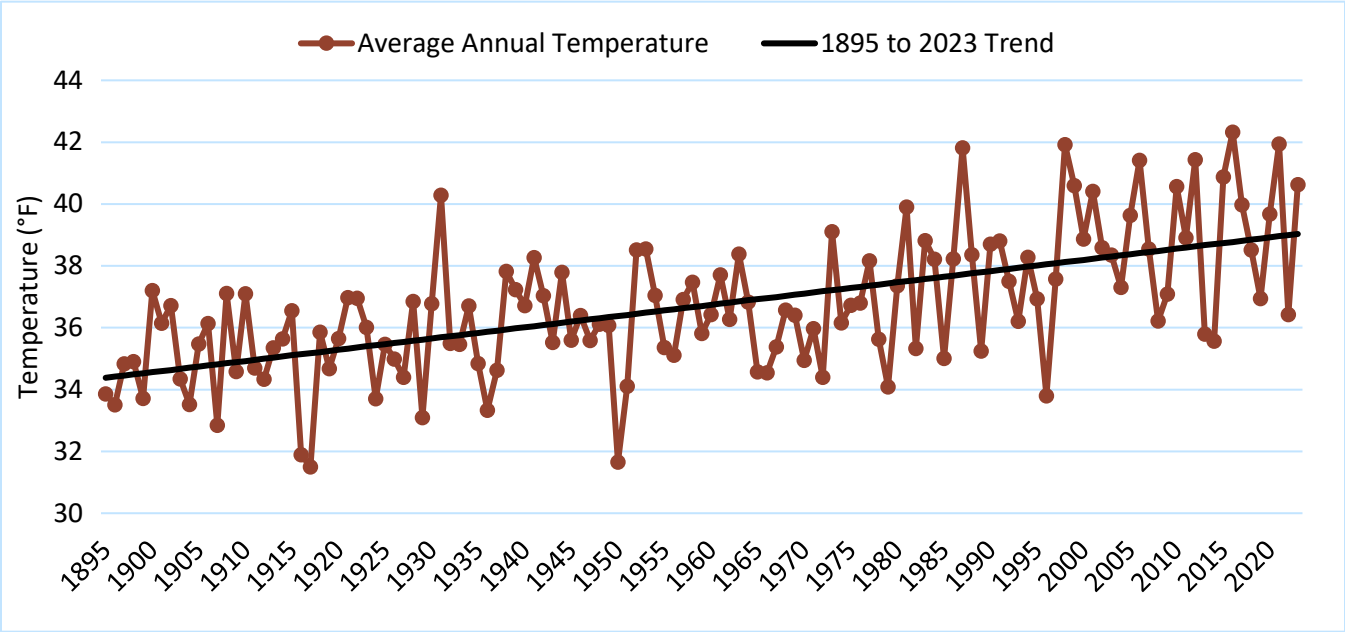
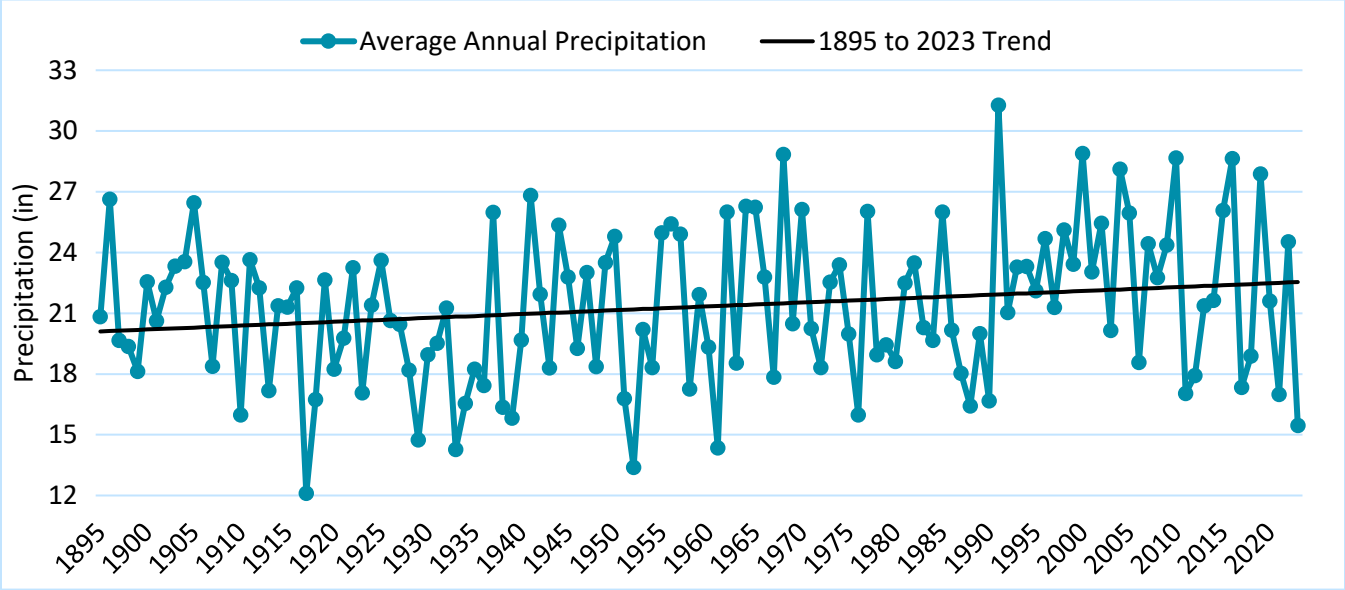


Figure 38. 129-year average annual precipitation trend across Roseau River WMA, 1895-2024



The future climate of Roseau River WMA is projected to be more extreme in annual variability. Table 15 and Table 16 contain the historical (1895-1969) and current (1991–2020) average seasonal precipitation and temperature values, as well as projected end-of-century values under a modeled moderate greenhouse gas emissions scenario for the Roseau River WMA. The moderate greenhouse gas emissions scenario takes into

consideration that emissions decline after peaking around 2040 and then decline steadily (Minnesota State Climatology Office, 2024a).

Table 15. Precipitation by season for Roseau River WMA

Season	1895–1969 mean (inches)	1991–2020 mean (inches)	2080–2099 (inches) (mean under a moderate emissions scenario)
Winter (December–February)	2.10	2.40	3.12
Spring (March–May)	4.66	5.17	5.61
Summer (June–August)	9.16	10.20	11.04
Fall (September–November)	4.68	5.66	7.46

Table 16. Temperature by season for Roseau River WMA

Season	1895–1969 mean (°F)	1991–2020 mean (°F)	2080–2099 (°F) (mean under a moderate emissions scenario)
Winter (December–February)	2.99	8.17	14.16
Spring (March–May)	35.96	38.94	44.55
Summer (June–August)	63.34	65.24	70.02
Fall (September–November)	39.31	41.56	45.63

Northwestern Minnesota is known to be one of the driest regions in the state; it is characterized by periodic drought, and some degree of drought can occur every year. The last severe drought occurred in 2021, which was as severe as the 1988 drought. Though it seems like drought is persistent year to year in the northwest, annual average precipitation trends show a general increase in rainfall, which is most noticeable and consistent from 1993 to 2010. The overall trend over the long-term record shows a slight increase in the annual precipitation amounts. However, during the last 30 years, that trend has shifted to a decrease in annual precipitation for the Roseau River WMA due to a series of dry years (2011, 2012, 2017, 2021, 2022 and 2023). Precipitation is highly variable across the entire record with increasing variability in recent years. The increasing variability in annual precipitation is generally due to the increasing frequency of extreme weather events, which are often during the spring and summer months.

Extreme Weather

One result of climate change is more extreme weather, especially heat and heavy precipitation. The frequency of near-record high seasonal temperatures and precipitation totals are increasing in the Roseau River watershed. From 2013-2024, the Roseau River watershed experienced 21 extreme weather records for seasonal precipitation events or average temperatures (1985-2023; Table 17). There are successively fewer such records in the previous three decades (15 records from 2003-2013, 17 records in 1992-2002, and 16 records in 1981-1991).

Table 17. Recent extreme weather records, by season, for Roseau River watershed

Year	Winter	Spring	Summer	Fall
2013		10th coldest		
2014	7th coldest			
2015				3rd warmest
2016	6th warmest	7th warmest		1st warmest (warmest to date)
2017	4th wettest			
2018			6th warmest	
2019	10th wettest			1st wettest (wettest to date)
2020			6th warmest 7th wettest	
2021		8th warmest	2nd warmest 7th driest	4th warmest
2022	3rd wettest	8th wettest		
2023			9th driest	8th warmest
2024	1st warmest (warmest to date)			

An increasing likelihood of extreme rainfall events suggest managers should prepare infrastructure and vegetation in the WMA for greater threats from flooding (Minnesota State Climatology Office, 2024b). Mega-rains are defined as 6-inch or greater rainfalls within 24 hours covering at least 1,000 square miles with at least one location receiving 8 inches or more. Heavy precipitation events such as these are predicted to increase across the country (U.S. Global Change Research Program, 2017). Since 1970, there have been four flash flood events documented in Roseau County: one in 1975 with 3 to 8 inches of precipitation in a 12- to 15-hour period, one in 1982 with up to 7 inches of precipitation in 3 hours, one in 1985 with 4 to 6 inches of precipitation in 24 hours, and one in 2002 with 8 to 14 inches of precipitation in 48 hours. Flash flood events can lead to devastating damage to roads, properties, and cropland (Minnesota State Climatology Office, 2024b). Timing of the events is also critical to their impact. The fall flood of 2019 resulted from 10 inches of rain over 4 weeks and was not classified as a flash flood. The flood waters froze before receding and the ice exacerbated the damages to infrastructure, as well as impacts to habitats and their associated wildlife below the high-water mark.

Winter Severity

Winter temperatures are predicted to increase more than any other seasonal temperature or precipitation value. Days with snow coverage are also predicted to decrease (Liess, et al., 2022). A shift toward milder winters can already be seen in data the DNR collects. Roseau River WMA measures snow depth and cold temperatures

from November through May to calculate WSI values, which estimates winter effects on wildlife. Days of extreme cold (below 0°F) or deep snow (15 inches or more) result in a WSI point, which correlates with lower deer survival. WSI ratings are used to classify mild (WSI less than or equal to 50), moderate (WSI 51 to 119), or severe (WSI 120 or more) winters. Winter severity indices for Roseau River WMA have been recorded since winter 1989-1990 (Figure 39). Over the period of record, seven of the past 35 years were classified as mild winters, 20 as moderate, and eight as severe. The most severe winters were back-to-back, in 1995-96 and 1996-97. The average snow depth over the same period ranged from 3.5 inches to 18.6 inches (Figure 40). Since 1989, 28 of the past 35 years had average snow depths of less than 12 inches.

Figure 39. WSI recorded at Roseau River WMA, 1989-2024

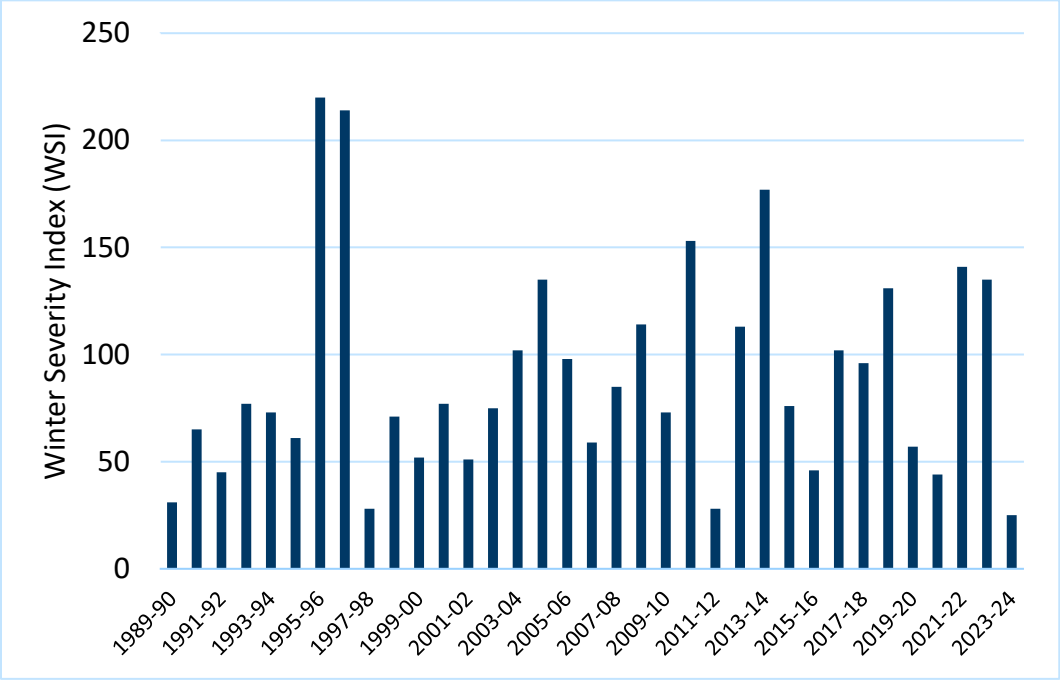
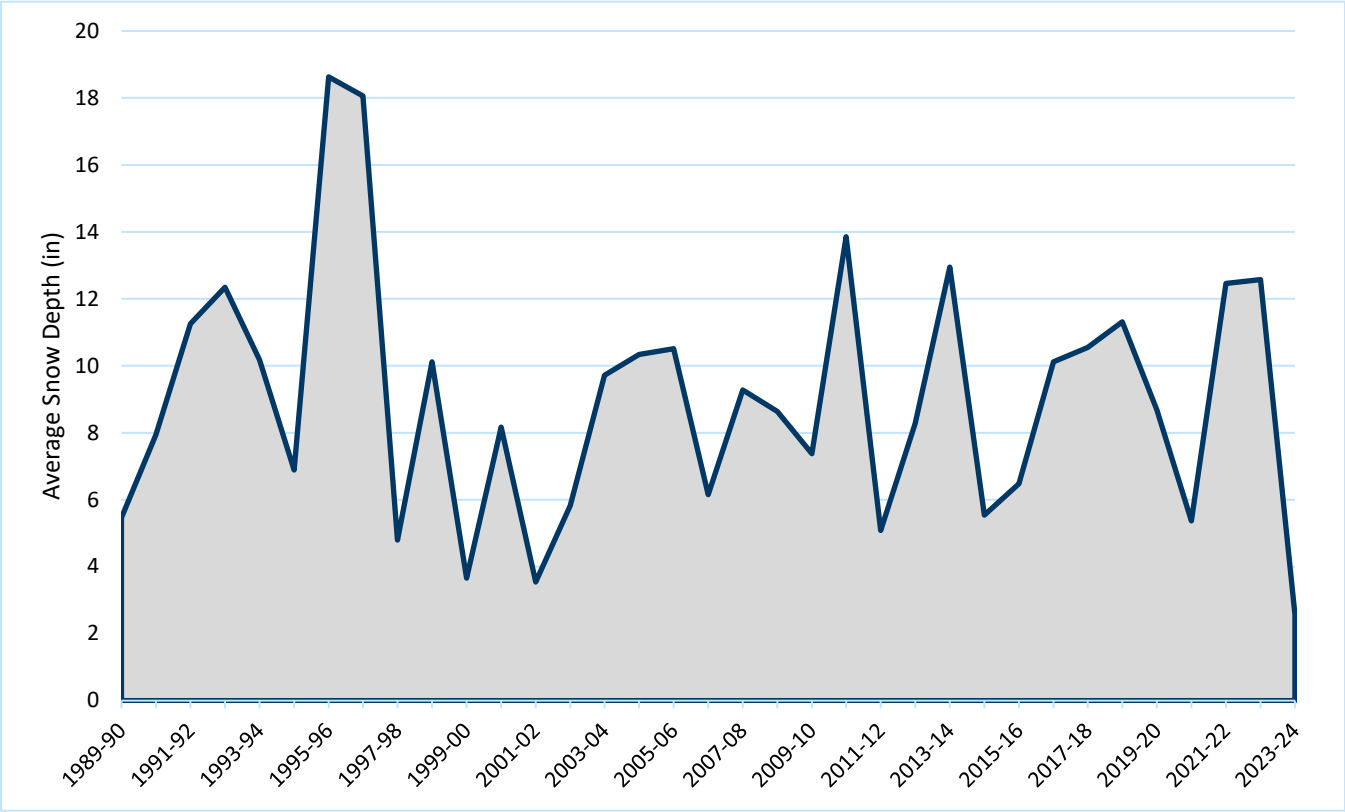


Figure 40. Snow depths recorded at Roseau River WMA, 1989-2024



Potential Wildlife Effects

Climate changes are predicted to influence fish, wildlife, and plant populations with both direct and indirect effects on species through environmental shifts. Increased temperatures will likely affect distribution, development, reproduction and survival of species. Animals and plants could be exposed to environmental conditions, such as warmer annual temperatures, decreased snow cover, shifts in aquatic dissolved oxygen regimes, and drought conditions, that could alter their persistence or survivability. These changes likely will benefit certain wildlife and plant species (e.g., species generalists) and harm others (e.g., rare species, specialist species and species less resilient to change).

Populations of popular native species like walleye, ruffed grouse and moose could decline in Minnesota as the climate warms. For example, increased wintertime temperatures could lead to decreased snow depth and decreased opportunities for snow roosting for ruffed grouse (Shipley & Zuckerberg, 2023), which increases their vulnerability to severe weather and predation (Shipley et al., 2020). Earlier ice-off days on lakes could negatively affect walleye by causing timing misalignment with natural spawning and decrease natural recruitment (Barta, et al., 2024). Moose are projected to decline across their range due to both direct and indirect effects of environmental shifts (e.g., warmer temperatures, increase of winter ticks, increased deer numbers, increased disease spread, and predation; Weiskopf, Ledee, & Thompson, 2019).

Climate change will affect resource management in addition to affecting wildlife and plant species. The application of prescribed fire, lowland brush mechanical treatments, and timber harvest may be affected by

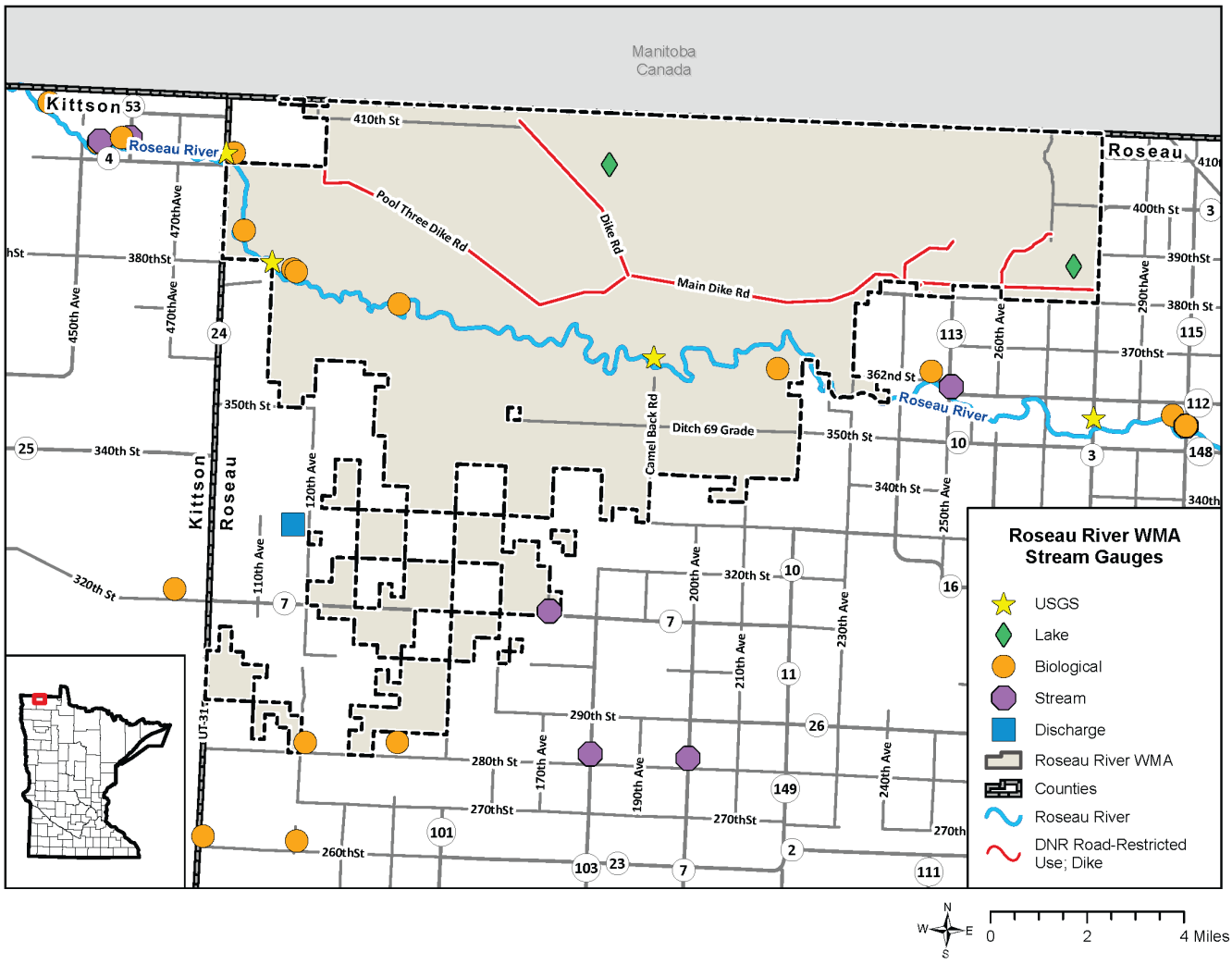
climate change and will require adaptation. Climate adaptation and mitigation guidance in is available through DNR Operational Order 131.

Altered Hydrology

Altered hydrology is defined as a discernable change in stream discharge flow and/or volume throughout the entire annual hydrologic cycle that exceeds the measurement error compared to a benchmark condition. Metrics are typically a hydrologic statistic derived from the annual discharge record across a long period of time (at least 20 years). The Roseau River watershed has experienced altered hydrology. There are networks of ditches and streams across the watershed that drain hydrologic storage areas like wetlands. The state of Minnesota and its citizens previously worked to drain the landscape for better farmland (see History section), and the effects of these projects can still be seen across the watershed. To restore and enhance some of the watershed, projects such as the Roseau River Restoration and Roseau Lake Rehabilitation Project are being implemented to hold water, restore hydrologic function, and enhance stream morphology.

There are three USGS stream gages with long term gage data on discharge (Figure 41). The Caribou gage on State Ditch 51 was used in the DNR Evaluation of Hydrologic Change analysis. The discharge data shows the change in hydrology occurred around 1992. Pre-1992, the mean annual discharge was 253 cfs, and post-1992, the mean annual discharge increased to 528 cfs, which is a significant change in the amount of water flowing through the Caribou site. The peak annual discharge increased from 1,646 cfs pre-1992 to 2,298 cfs post 1992. Increases in mean and peak annual discharges can have negative effects on stream morphology, aquatic life, and recreation (Minnesota Department of Natural Resources, 2023). More water in streams and ditches means more bed and bank erosion, bank sloughing, sediment deposition in aquatic habitats, or loss of fields due to weakened banks. More water also can cause damage to surrounding land and changes in wetland plant composition if the water stays on the surface. Roseau River's changes in hydrology are comparable to the western and southwest portion of Minnesota, where larger changes are noted.

Figure 41. Locations of stream gages across Roseau River WMA



Fire Regimes

The plant communities that comprise the TAP Province were shaped and maintained by fire. Frequent fire is necessary to maintain open habitats and heterogeneity, and prescribed fire is a critical tool for the current and future management of Roseau River WMA. The windows to conduct prescribed fire and achieve the desired habitat objectives are small. Peat is considered an unburnable fuel up to a critical moisture content of 120% but saturation can vary widely over a landscape by elevation, adjacency to ditches and hydrologic inputs. Once ignited, it slowly combusts and can smolder for weeks, if not overwinter and eventually reignite. As climate conditions become more volatile, concerns of peat ignition increase, and certain times of the year become less frequently available for prescribed burning. Increased precipitation can also limit the prescribed fire window. WMA staff will need to invest more time into burn unit development and planning to ensure that WMA staff can conduct prescribed burns when conditions are suitable (see Desired Conditions section for WMA specific goals and plans for fire management).

Invasive Species

Non-native invasive plants and animals can pose a serious threat to native ecosystems. They can out compete native species for sunlight, food, space and other resources and often have no natural predators. Based on DNR invasive species monitoring data, there are relatively few invasive plant and animal species within and adjacent to Roseau River WMA. However, hybrid cattail, reed canary grass, and purple loosestrife are established on the WMA. Due to the low prevalence of invasive species, WMA staff efforts have been directed toward early detection and eradication. However, pressures from invasive species are increasing and may have a significant effect on habitat, which will require additional resources to control. Although WMA staff efforts are high and the DNR's monitoring programs have increased, species distribution is likely underreported. In the future, the number and abundance of different invasive species will increase, and these organisms may pose significant risks to native species. Educating users, early detection, and aggressive treatment of invasive species can effectively minimize new introductions and their spread. For more information on invasive species in Minnesota and how the DNR works to help prevent the spread and promote the management of invasive species, visit the DNR Invasive Species page.

Monitoring and Control

The DNR proactively uses tools to help prevent the introduction of new invasive species, including the tools outlined in DNR Operational Order 113 Invasive Species Prevention and Management and FAW's guidelines on Operational Order 113. These documents outline how DNR staff are to minimize the spread of invasive species and pathogens on state lands. Protocols include day-to-day guidelines on preventing the introduction or spread of invasive species, monitoring, reporting, training, and incorporating invasive species spread prevention in contracts and grants.

Staff report new infestations of invasive species to the DNR Invasive Species Program using the Early Detection Distribution and Mapping System (EDDMapS) website or app, or the Invasive Species Reporting Form. DNR invasive species specialists verify invasive species reports. With the help of these invasive species specialists, WMA staff can rapidly respond to new invasive plants and animals found at Roseau River WMA. New invasive discoveries on Roseau River WMA should be prioritized with the goal of eradication.

For invasive plants and animals already present at Roseau River WMA, control of limited populations on higher-quality sites in larger project areas will be prioritized. Prioritizing these limited invasions will reduce their spread into uninvaded areas. Funding for future invasive species control should be identified and applied to multiple invasive species using multiple control tactics.

The following paragraphs list plants and animal species in or near Roseau River WMA. Species that could be potential invaders over the next ten years are also listed. Because of shortages in staff time to monitor invasive species populations, this is likely a partial list.

Animals

Terrestrial Invasive Animals

Several non-native terrestrial animals are well established in and around Roseau River WMA and are not tracked in invasive species databases, including European starlings, house sparrows, and invasive earthworms. These species are undesirable because they compete with native cavity-nesting birds and affect habitat structure. There is currently no cost-effective control method for these species.

Feral pigs are becoming a concern across northwest Minnesota. Currently in Minnesota there is no established population of feral swine. All reports of feral swine in the past 10 years have been loose domestic swine from farms. Feral pigs dig up vegetation, damaging planted crops and native habitats; eat native species; cause increased turbidity in water and bank erosion that affect rivers and streams, disrupting food webs; and can carry diseases that spread to humans and livestock. Currently the DNR works with Board of Animal Health to locate owners reporting lose swine and USDA-Wildlife Services on monitoring and removal of feral swine if needed. Any lose swine or thought to be feral swine seen should be reported immediately to the Wildlife Damage Program.

Aquatic Invasive Animals

While the impoundments make up a large portion of Roseau River WMA, no invasive aquatic animals are currently found on the WMA. Lake of the Woods, approximately 30 miles east of the WMA, is listed for invasive spiny water fleas and zebra mussels. Given how these species spread (i.e., on fishing and boating equipment) and given that limited watercraft are used on the WMA, it is unlikely that these invasive species will spread to the WMA from Lake of the Woods. The Roseau River would be a more likely introduction pathway if it were to become infested with zebra mussels. Users of the WMA are still encouraged to clean, drain, and dispose: clean all watercraft and water equipment (including waterfowl hunting decoys) of plants, mud, and debris before entering the WMA; drain all watercraft of water that could potentially carry invasive species; and dispose of unwanted bait in the trash.

Common carp (*Cyprinus carpio*) have been found in the Roseau River in or around Roseau River WMA and were documented in Pool 3 in the 1990s. DNR Fisheries treated the borrow ditches during drawdowns during the 1970s or 80s (R. Prachar, personal communication). Carp are uncommon in the impoundments and control measures have not been implemented in decades. Common carp are a benthivorous, or bottom-feeding, fish species that agitate lake and river bottoms, which suspends sediments and reduces available light to aquatic plants. Common carp also release nutrients into the water column that can be used by algae, further reducing water clarity and quality. Quality of waterfowl habitat is generally reduced in the presence of common carp. Common carp could be controlled reasonably effectively in the shallow wetland impoundments through drawdowns and piscicides if necessary.

Plants

Woody Invasive Plants

There are a few invasive woody species known to occur within Roseau River WMA:

- Common Buckthorn (*Rhamnus cathartica*)
- Exotic honeysuckle (*Lonicera* spp.)
- Siberian peashrub (*Caragana arborescens*)

Buckthorn species are newly found in the WMA. Aggressive monitoring and control are likely to eradicate the current infestation. Adjacent lands should be inspected to investigate the source of buckthorn; if necessary, coordination with adjacent landowners could be pursued. Common buckthorn can out compete all native vegetation and spreads quickly by seed via birds and small mammals.

Exotic honeysuckle has been found at the WMA; however, it has been found at low density and has not seemed to spread. Bush honeysuckles have been noted but have not been recorded on the WMA. There are observations of honeysuckle within two miles of the WMA. They are a shade-intolerant species and may show more where harvests or open areas are available. Bush honeysuckles can reproduce via root suckering and are spread by birds.

Siberian peashrub is present around the headquarters and old homesteads on the WMA. Where it occurs, it forms dense colonies that preclude other species; however, spread is minimal. Sites have been identified and slated for treatment to prevent expanding.

Herbaceous Invasive Plants

There are several herbaceous invasive plant species known to occur on Roseau River WMA:

- Leafy spurge (*Euphorbia esula*)
- Spotted knapweed (*Centaurea stoebe*)
- Burdock (*Arctium minus*)
- Crown vetch (*Securigera varia*)
- Common tansy (*Tancetum vulgare*)
- Canada thistle (*Circium arvense*)
- Bird's foot trefoil (*Lotus corniculatus*)
- Smooth brome (*Bromus inermis*)
- Corn Chamomile (*Anthemis arvensis)*

Leafy spurge is present in small quantities. Significant effort should be directed toward locating areas of leafy spurge and gaining control due to the extreme difficulty of managing advanced infestations. This species produces seed that explodes from the seedpods and can travel up to 20 feet. The seed can remain viable for up to 10 years. The milky sap is toxic to cattle and horse. Contact with human skin can cause rashes. It prefers dry sites in full sun, but it can tolerate a range of conditions and invade moist rich soils as well.

A single spotted knapweed plant has been found on the dike system. It has been mechanically removed and monitored; however, knapweed species are becoming more common in the Roseau County area and are known to occur at gravel pits used by WMA contractors. WMA staff should be alert. Spotted knapweed is native to Europe and Asia. It threatens dry prairie, oak savannas, and sandy ridges, as it is phytotoxic and spreads rapidly.

Burdock is found sporadically in disturbed areas along the dike system and one forest stand. Infestations of burdock along the dikes were treated mechanically and with herbicides.

Crown vetch was found in one patch on the dike system and treated with herbicide. However, crown vetch is abundant nearby along Highway 11 and in adjacent gravel pits.

Common tansy was found in two locations along roadsides and treated with herbicide. Monitoring of those sites is conducted annually.

Canada thistle is abundant in disturbed sites and on dike slopes. Treatment is limited on dike slopes due to adjacent aquatic habitats. Competition following control is limited on the aforementioned areas and roadsides.

Birds-foot trefoil is present in low diversity prairie restorations and acquisitions with a history of intensive grazing.

Smooth brome is abundant across Roseau County and the uplands of Roseau River WMA.

Corn chamomile can be an issue in disturbed areas. It is currently controlled in clay borrow areas and waterfowl bait sites but has been found in and around food plots.

Over the next 10 years, these invasive herbaceous plants are expected to increase across private lands in Roseau County and pose a greater risk to Roseau River WMA. Most of the aggressive invasive species listed are individual records that were successfully eradicated or prevented from spreading. However, many of these detections have occurred in the last 5 years and the pressure will only increase.

Aquatic Invasive Plants

There are three known invasive aquatic plant species occurring within Red Lake WMA: hybrid cattail (*Typha* x *glauca*), reed canary grass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*). Each of these species have the potential to negatively affect the quality of wetlands.

Hybrid cattail is abundant within the WMA and is difficult to control. Dense stands of hybrid cattail outcompete more beneficial native plants and form floating bogs that clog water control structures. Reed canary grass is present throughout Roseau River WMA in many wetlands. It is a major threat to wetland habitats as it often outcompetes native species by forming dense stands. Invasion by reed canary grass is generally associated with disturbance, compaction of wetland soils, or altered hydrology. Small stands of purple loosestrife are currently controlled on the WMA with targeted herbicides to reduce spreading.

Figure 42. Photo of cattail spraying on Roseau River WMA

Invasive aquatic plants that are not known to exist on Roseau River WMA but would likely have negative effects if introduced include Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), non-native phragmites (*Phragmites australis* subsp. *australis*) and starry stonewort *(Nitellopsis obtusa*). Each of these species can outcompete more beneficial native plants, in particular native submerged vegetation and wild rice. Except for non-native phragmites, these invasive species typically spread by moving infested boats, trailers and other water gear from different infested waters. Non-native phragmites is most likely to be spread by infested construction or maintenance equipment.

Threats to Fish and Wildlife Health

The diseases and parasites listed below can potentially affect fish and wildlife populations at Roseau River WMA. DNR responses to diseases and parasites will vary depending on the scale and cause. All actions will be closely coordinated with other DNR divisions, FAW's Health Programs, and partners (i.e., state, federal, and tribal agencies) as appropriate.

Waterfowl Diseases

Waterfowl are susceptible to several infectious diseases that cause mortality including avian cholera, avian botulism, avian tuberculosis, avian salmonellosis, chlamydiosis, duck plague, aspergillosis and avian influenza. Common denominators among outbreaks are a concentration of waterfowl and often poor water quality. Avian salmonellosis and aspergillosis also infect songbirds, but the source of these outbreaks is usually moldy,

contaminated food at feeders. Avian influenza research has been conducted for more than 15 years on Roseau River WMA with data collected from both waterfowl and wetlands. The research has sought to quantify active infections, exposure and the duration of viable virus on the landscape.

Chronic Wasting Disease

Chronic wasting disease (CWD) is a contagious neurological disease affecting cervid species, including deer, elk and moose. It causes a characteristic spongy degeneration of the brains of infected animals resulting in emaciation, abnormal behavior, loss of bodily functions and death. See the following link for the current DNR CWD response plan. CWD has not been detected on Roseau River WMA or in the surrounding counties.

P. Tenuis

Parelaphostrongylus tenuis (*P. Tenuis* or brainworm) is a parasitic nematode that infects cervid species. *P. tenuis* is transmitted through the accidental ingestion of infected snails. White-tailed deer are a primary host that rarely exhibits signs of illness but can spread the parasite. Moose are susceptible to *P. tenuis* and infections lead to abnormal behavior, emaciation and death. A study on moose mortality in northeast Minnesota found that *P. tenuis* likely effected 23-42% of the moose mortalities investigated (Carstensen, et al., 2017).

Epizootic Hemorrhagic Disease

Epizootic hemorrhagic disease (EHD) is a naturally occurring viral disease that can spread to white-tailed deer by biting *Culicoides* midges. The disease can dramatically reduce a local deer population in the short-term but has a relatively small effect on the overall deer population. There are no management interventions available to combat the disease. EHD is seasonal and often occurs during drought-like conditions in the late summer and early fall. Frost will kill midge that carries the virus, ending the potential infection period. Finding multiple healthy-looking deer dead near water is typical of an EHD die-off. Fever drives the animals to seek water, and they die from internal lesions and hemorrhages.

Mange

Mange, particularly sarcoptic mange, is a disease transmitted by mites and affects mainly canids (e.g., wolves, foxes and coyotes) but also bears, raccoons, porcupines, and some rabbits and squirrels. The mites are transferred from one individual to another through direct contact or transfer at den sites. The disease causes hair loss, and in some cases exposed skin becomes encrusted or oozes fluids, often resulting in death. Red foxes are particularly susceptible to mange and thousands can die during an outbreak.

Canine Distemper

Canine distemper is a highly contagious disease caused by a paramyxovirus. It is a widespread disease affecting wild and domestic carnivores and primarily affects raccoons, grey foxes and skunks in the spring and fall. Transmission occurs from contact with infected saliva, urine, feces, or respiratory secretions. Animals can shed virus up to two weeks after they recover. The virus can survive long periods in the environment if the temperatures are below freezing.

Rabies

Rabies is an acute infectious disease of the central nervous system caused by a virus transmitted in saliva through bites. Rabies is most common in raccoons, skunks, bats, and foxes, but can occur in any mammal. Once signs of the illness manifest, rabies is 100% fatal.

White-nose Syndrome

In 2017, white-nose syndrome (WNS), a fungus affecting hibernating bat species, was confirmed in multiple locations in Minnesota. This fungus causes significant mortality to cave hibernating bats. White-nose syndrome has been confirmed in the following Minnesota native bats: big brown bats (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and tricolored bat (*Perimyotis subflavus*). All species confirmed with WNS are suffering population declines in Minnesota.

Northern long-eared bats have been particularly hard hit by habitat loss, direct mortality and WNS combined. Due to threat of global extinction, USFWS listed the northern long-eared bat as federally endangered in 2022. Federal endangered species status comes with many legal protections including protection against take and legal protection of the endangered species habitat.

Newcastle Disease

Virulent Newcastle disease is a contagious and fatal viral disease of birds affecting respiratory, nervous, and digestive systems. The disease is so virulent that many birds die without showing any clinical signs. In Minnesota, it has occurred periodically in colonial nesting waterbirds (e.g., pelicans, cormorants, gulls, terns, and herons).

West Nile Virus and Eastern Equine Encephalitis

West Nile virus (WNV) and Eastern Equine Encephalitis are mosquito-borne viruses that can kill some birds (especially loons, ruffed grouse, crows, and jays) and mammals (including elk, moose, and horses). WNV exposure has been documented in fall-harvested ruffed grouse in Minnesota, indicating that some birds do survive WNV infection and live to the fall. Currently, the best option for managing ruffed grouse where WNV is present is to provide quality forest habitat that produces birds in good condition that can survive infection and other challenges.

Bovine Tuberculosis

Bovine tuberculosis is an infectious disease caused by the bacterium *Mycobacterium bovis* that is transmitted by the exchange of respiratory secretions between infected and uninfected animals. Thus, transmission is a function of inter-deer-proximity which is a function of deer density. Transmission is also a function of interactions with domestic cattle. Although bovine tuberculosis transmission to humans is rare, in Michigan it has been transmitted to omnivores and carnivores such as black bear, raccoon, coyote, bobcat and red fox. Bovine Tuberculosis was found near Skime, 40 miles southeast of Roseau River WMA, in 2005 in white-tailed deer and was eradicated in 2011.

Tularemia

Tularemia is a naturally occurring disease caused by the bacterium *Francisella tularensis*. The disease is primarily associated with rabbits and other rodents and leads to high mortality rates. Tularemia is transmitted through tick or fly bites or the ingestion or inhalation of the bacteria and is capable of surviving in the environment for long periods. Humans can be infected through contact with sick animals or through tick or fly bites; however, cases are rare.

Blastomycosis

Blastomycosis is a fungal infection that affects people, dogs and occasionally cats. It is caused by a fungal organism known as Blastomyces dermatitidis. The fungus is commonly found near waterways in acidic soils that are rich in decaying vegetation. In Minnesota, blastomycosis is most common in St. Louis, Itasca, and Beltrami counties but is present in Washington and Chisago counties. People or animals become infected with blastomycosis by inhaling airborne spores from the mold form of the organism found in the soil or decaying vegetation. The disease is not transmitted directly between animals or people.

Toxoplasmosis

Toxoplasma gondii is a protozoan parasite and is the responsible agent for toxoplasmosis, which is considered a major food borne illness in the U.S. according to the Center for Disease Control. The parasite can be transmitted to humans by consuming undercooked meat of domestic and wild species (cattle, poultry, bears, waterfowl, etc.).

Ranavirus, Chytridomycosis, and Ophidiomycosis

There are several diseases that have the potential to have widespread effects on amphibian and reptile populations: Ranavirus and Chytridiomycosis in amphibians and Ophidiomycosis in snakes. These diseases are mostly related to or transmitted through the exotic pet trade and have no viable control or treatment methods beyond preventing further spread. Typical responses to the diseases are to prevent the spread by disinfecting footwear, field clothes, and field equipment after use.

Neascus

Neascus (*Uvulifer* spp., *Neascus* spp.), commonly called black grub, can be found in all species of fish in Minnesota lakes and rivers. Fish that inhabit shallow areas are most affected. These parasites are small and produce black pigmentation that resembles black pepper sprinkled on fins or flesh (fillets) of fish. The life cycle of Neascus begins with eggs being released by fish-eating birds into the water. Eggs develop into intermediate stages of the parasite in snails. These free-swimming parasites penetrate the muscles of fish and encyst. Black pigmentation is deposited onto these cysts. Infected fish are then consumed by birds. Adult worms are seen in fish-eating birds. Affected fillets are safe to eat if well cooked.

Yellow/White Grub

Yellow grub (*Clinostomum*) and white grub (*Posthodiplostomum minimum*) can be found in all species of fish in Minnesota lakes and rivers. Fish that inhabit shallow areas are most affected. These parasites are small and cause yellow or white cysts (spots) that resemble coarse salt sprinkles in fish skin, muscle tissues, and in most internal organs. The life cycle begins with eggs being released by fish-eating birds into the water. Eggs develop into intermediate stages of the parasite in snails. These free-swimming parasites penetrate the muscles of fish and encyst, taking on the form of the yellow or white grub. Infected fish are then consumed by birds. Adult worms are seen in fish-eating birds. Affected fillets are safe to eat if well cooked.

Lymphosarcoma

Lymphosarcoma is commonly found in both northern pike and muskies in Minnesota. It is a cauliflower-like tumor on the skin. Tumors range from pea-size to several inches depending on water temperature. Tumors are more prominent in cooler water temperatures in fall and winter. Tumors may spread to inner organs. It is believed to be a viral disease that may be transmitted by close physical contact, such as spawning. Transmission of the virus may be possible by physical contact during spawning and other close contacts. Due to a lack of concrete scientific knowledge about the disease, consumption of affected fish is not advised.

Bass Tapeworm

Bass tapeworm is found in both largemouth and smallmouth bass throughout Minnesota. It is a coiled, long flat worm intertwined in the fish's digestive tract or abdomen. Bass tapeworm is sometimes found as a single worm, but often several are found coiled in a ball. It may occur with other parasitic worms as well. The tapeworm matures in affected bass. Segments of the worm and eggs are passed from the fish to the body of water. When they reach water, they swell, rupture, and release large numbers of eggs, which are then eaten by invertebrates or fish. A larval stage is formed in the invertebrate or fish. Adult tapeworms develop if bass consumes either the invertebrate host or the fish with the intermediate stages. The quality of fish with bass tapeworm is not affected and there is no human danger if the fillets are cooked thoroughly.

Dermal Sarcoma

Dermal Sarcoma is a disease observed in walleye through Minnesota. It is a virus that forms a grape-cluster-like tumor. Walleye dermal sarcoma produces warty growths commonly seen on the fish's skin and fins. Growths are usually gray-white or pinkish in color. Infections occur throughout the year but are more common during the walleye's spring spawning season. Walleyes congregate on their spawning grounds and the virus spreads from fish to fish through physical contact. The disease is not known to infect humans; however, always cook fish thoroughly.

Lymphocystis

Lymphocystis is a disease usually observed in walleye throughout Minnesota; however, it has been documented on several other species. Lymphocystis is a virus that infects the skin of fish. Although the virus occurs naturally in the environment, infections occur at a much higher rate during cold periods in late winter and early spring. The symptoms of this disease are usually described as "warts" or tumors and are commonly seen on the skin

and/or fins of adult fish. The virus spreads from fish to fish through physical contact or water transmission. Lymphocystis infections are usually not fatal to fish, although very severe infections can cause damage to vital organs and possibly death. In addition, secondary bacterial or fungal infections can develop at sites of dislodged growths. This disease is not known to infect humans.

Heterosporis

Heterosporis is a parasite predominantly seen in yellow perch throughout Minnesota. However, this disease has also been detected in walleye, northern pike, burbot, pumpkinseed, and rock bass. It presents as white or opaque areas in the uncooked fish fillet that resemble cooked meat. Heterosporis spreads when fish pick up spores from the water or eat infected fish or carcasses. Little is known about the life cycle. This parasite may spread by infected fathead minnows sold as bait. Based on studies by the Center for Disease Control and Prevention, there is no evidence that heterosporis can infect people. It is thought, but not proven, that thorough cooking infected fish will destroy spores. Recommendations include either cooking the fish thoroughly or discard the flesh by burying it; however, do not discard by throwing the flesh back into the lake.

Myofibrogranuloma

Myofibrogranuloma is a virus only seen in walleye throughout Minnesota. Fish look normal on the outside but certain areas of the fillet look semi-translucent, or yellowish brown with knotted muscle fibers. The tissue has a very dry, freezer-burn-like appearance. Other areas of the fillet may be even granular with mineral deposits or opaque. The condition is not infectious. Genetic and environmental stressors may play a role in the development of the disease. Due to a lack of concrete scientific knowledge about the spread of the disease, consumption is not recommended.

Viral Hemorrhagic Septicemia

Viral Hemorrhagic Septicemia (VHS) is a virus which is only found in Minnesota in the Lake Superior watershed. Symptoms of VHS include internal and external hemorrhaging; pale gills; listlessness; and swimming in circles. This virus can infect a broad range of species, including popular game species in the Roseau River such as walleye and northern pike. Annual monitoring is conducted for VHS at a watershed scale, and restrictions on the harvest and transport of bait from areas that have tested positive have been implemented to reduce the risk of spread.

Columnaris

Columnaris is a bacterial infection caused by several different bacteria that are naturally found in fish populations. A range of species, including popular game species in the Roseau River such as channel catfish and northern pike, are susceptible to outbreaks. Columnaris outbreaks tend to occur when warming water temperatures lead to stress in fish populations and have led to fish kills in multiple locations in Minnesota. Common symptoms include lesions, discoloration near the dorsal fin and gill rot.

Threats to Forest Tree Health

The largest threats to forest health on Roseau River WMA are driven by weather and climate, and there are several immediate and future threats to Roseau River WMA's forests on the horizon. Some disturbances related to forest health may provide important habitat benefits to wildlife; however, effects to Roseau River WMA and the landscape, including other ownerships and land administrations, will be carefully considered when making management decisions.

On an individual scale, trees have a finite age limit. As many trees grow older, environmental and biotic stressors can combine to reduce the fitness of individual trees. This decline in health can be associated with a variety of opportunistic insect species and diseases but can also provide habitat benefits to many wildlife species.

Aspen Health

Aspen and mixed deciduous forest provides valuable habitat for a variety of species on Roseau River WMA. A variety of stem canker diseases can kill aspen, the most common one being hypoxylon canker. Hypoxylon canker can reduce the number of stems in younger aspen forests. In rare circumstances, an aspen forest can be extremely susceptible to hypoxylon canker and tree density diminishes considerably.

Forest tent caterpillar (FTC) is a native defoliator of a wide variety of deciduous trees and shrubs and can be found throughout most deciduous forests in North America. FTCs are native insects and play critical roles in structuring aspen mixed-wood forests and can change forest stand dynamics, which can potentially benefit certain wildlife species.

Ash Health

Emerald ash borer (EAB) is a non-native cambium feeder of ash trees. Once EAB has been discovered in a new location in Minnesota, it moves outward at a relatively moderate pace. As of December 2024, EAB was about 68 miles from Roseau River WMA. As ash stands die, it will create significant changes in habitat as there are few native species to replace ash and it will produce increased heavy fuel loads on Roseau River WMA with dead and down trees.

Oak Health

Bur oak blight is a leaf disease of bur oak caused by the native fungus *Tubakia iowensis*. The disease creates wedge-shaped dead zones on leaves in late summer, particularly in the lower canopy, sometimes resulting in premature leaf drop and heavy defoliation. Bur oak blight becomes more abundant across the landscape as more early growing seasons with high levels of precipitation occur. Fortunately, bur oaks almost always recover the following spring from this leaf disease, and there is no evidence as of 2024 that bur oak blight is a significant threat to healthy bur oaks.

Twolined chestnut borer (*Agrilus bilineatus*) is a native cambium-feeding beetle that only causes significant tree loss after severe stresses, such as serious drought, flooding, or consecutive years of heavy leaf feeding. *Armillaria* root disease is a native fungal root pathogen that attacks stressed trees. Both pests frequently attack

stressed oaks simultaneously. Older tree age and higher tree densities can be correlated with more damage from twolined chestnut borer and *Armillaria*. More frequent and severe droughts from climate change are likely to increase outbreaks of both twolined chestnut borer and root disease from *Armillaria*.

Losses from such outbreaks are rare and can be lessened by lowering tree density, controlling timing of thinnings, promoting more long-lived oak species, and in some instances, reducing stand rotation ages. To reduce risk, oak stands can be thinned, when they are not stressed, to reduce tree density. Lower tree densities allow forests to be more resilient to drought and therefore less susceptible to twolined outbreaks. At the same time, thinning within a few years after a significant drought stresses residual trees by mimicking drought conditions for a short period.

Tamarack Health

Since 2001, at least 60% of Minnesota's tamarack forest has been affected by eastern larch beetle (ELB), a native bark beetle. Historically, ELB operated in periodic cyclical outbreaks; however, the current outbreak is mediated by longer growing seasons, which have increased reproductive success and allowed populations to increase more quickly than in the past. It shows no signs of abating. At some point, most of Roseau River WMA's mature tamarack will likely be affected by ELB. Some stands that were severely affected have naturally regenerated, and recent research by the DNR and University of Minnesota indicate that many tamarack stands affected by ELB are capable of natural regeneration with tamarack as well as other tree species (Shaunette, 2022).

Spruce Health

Eastern spruce dwarf mistletoe (*Arceuthobium pusillum*, ESDM) is a native plant that is an obligate parasite of black spruce throughout its range. It causes large witches' brooms and kills spruce, often within 20 years of infection. ESDM most commonly infects black spruce stands, but white spruce and balsam fir are also highly susceptible and other conifers can host ESDM. ESDM is common in Minnesota – evidence of ESDM infection was found in 56% of 196 stands surveyed in Minnesota (Hanks et al., 2011).

Mistletoe seeds are sticky and disperse in August and September through explosive discharge as well as wildlife. New infections can be undetectable for two or more years before visible symptoms form and tend to spread radially, forming circular pockets that influence habitat in spruce stands (Gray et al., 2022). Research has suggested that mistletoe infections affect nesting rates of native birds (Watson, 2001) and serve as important thermal refugia and resting sites (Joyce, 2013).

Eastern spruce budworm is a native caterpillar and is the most destructive pest of spruce-fir forests in eastern North America. Caterpillars prefer to feed on balsam fir and white spruce, but minimal feeding damage can occur on black spruce, tamarack, hemlock, and various pines. Budworm feeding typically starts at the tops of trees and affected spruce and fir often look scorched from budworm feeding in late June through July.

Pine Health

Pine bark beetles (Ips genus) are native to Minnesota and occur naturally throughout the state. These beetles are attracted to areas of stressed pines, as these trees provide ideal habitat for larvae. Dense, single-species stands tend to be more susceptible to the effects of outbreaks. Evidence of beetle exit holes are evident on

almost every mature red pine tree within Roseau River WMA. Beetle larvae provide an excellent food source for many woodpecker species. Black-backed and three-toed woodpeckers, among other species, are well documented to utilize pine stands that are infected with beetle larvae.

Diplodia is a genus of fungal diseases that occurs on Roseau River WMA. The fungus causes shoot blight, stem cankers, and collar rot that affects red pines and other pines to a lesser extent. On Roseau River WMA, *Diplodia* shoot blight has been observed on individual trees, and can cause reduced growth and tree mortality. In red pine stands infected with *Diplodia*, natural regeneration is possible; however, recruitment of seedlings infected with *Diplodia* is lower than in stands without *Diplodia*.

Jack pine budworm (*Choristoneura pinus pinus*) is a native insect to Minnesota. Its preferred host species is jack pine but will feed on other pine species when present in jack pine stands. The first noticeable sign of attack is the browning of jack pine needles in early July. Budworms defoliate shoots and buds, which leads to twig mortality, and caterpillars feed on needles. Tree growth is reduced in light outbreaks and top-kill is common after an outbreak (O'Neil, 2020).

Human Activities

Roseau River WMA is the second largest WMA in Minnesota and is part of one of the largest blocks of contiguous public land units in northwestern Minnesota. Based on the public scoping questionnaire completed in the fall of 2024 (Appendix B), most WMA users are from northwestern Minnesota or the Twin Cities metro area.

Roseau River WMA will continue to support its mission of protecting and managing the land for wildlife production and for hunting, fishing, and trapping opportunities. However, other recreational activities and interests are pursued on WMAs and may benefit from specific management or enhancement to the area. These will be allowed or implemented when determined to be compatible with the primary purpose of Roseau River WMA.

Other nearby public lands may have the facilities or capacity to address these interests. Roseau County lands, Lake Bronson State Park, Hayes Lake State Park, and the Lost River and Beltrami State Forests are all nearby public lands that offer a wide array of public uses, including off-highway vehicle (OHV) and horseback trail riding, camping, and swimming.

OHV access and use is prohibited on the Roseau River WMA, including WMA roads. This includes but is not limited to vehicles such as all-terrain vehicles (ATVs), dirt bikes, golf carts, and utility terrain vehicles (UTVs). Extensive trails systems that are locally maintained for OHV use including the Great Northern Connection Veterans Memorial Trail, Bemis Hill Trails, Warroad/Roseau Trails, and the Fourtown-Gryla Trails. Recreationists are encouraged to review trail regulations and local conditions to ensure they are knowledgeable of trail specific regulations or seasonal closures.

Snowmobiling is popular in northwest Minnesota and an extensive network of trails, maintained by local clubs through grant-in-aid funds, connects communities. Beltrami State Forest, Hayes Lake State Park, and Lake Bronson State Park also contain miles of managed trails. Roseau River WMA permits snowmobiling outside of designated sanctuaries, including on hunter walking trails; however, no trails are maintained on the WMA.

Though the WMA offers limited motorized off-road opportunities for recreationists, there are vast trail networks close by for individuals to explore.

Roseau River WMA offers 18 year-round primitive campsites across the WMA, which allow hunters and recreationists an opportunity to stay on the WMA for free in a secluded environment. Sites are only mowed seasonally. Visitors who prefer campsites with more amenities may be interested in neighboring state parks, like Hayes Lake and Lake Bronson. They offer other types of camping amenities like cabin rentals, RV hookups, showers, and electricity within a reasonable distance of the WMA.

Horseback trail riding is prohibited on Roseau River WMA and all WMAs. The WMA has restricted the use of trails and access roads to vehicles and pedestrians. Beltrami State Forest, Lake Bronson State Park, and Hayes Lake State Park all offer horseback riding trails, each with around seven to eight miles of trails. In addition to trail riding, Bemis Hill Campground offers some equestrian camping sites with equine-specific amenities.

While swimming is not prohibited on WMAs, more traditional and accessible swimming opportunities can be found at nearby state parks. Hayes Lake State Park, Lake Bronson, and Zippel Bay State Park offer swimming beaches open for recreational use.

Shed hunting is permitted on Roseau River WMA except in the sanctuaries. The activity can place extra stress on deer populations during a stressful time of year. Shed hunting has been regulated where pressure is high and suspected to be detrimentally affecting wildlife resources; however, no effects have been observed to date.

Hunting, fishing, and trapping are regulated activities that do not threaten habitat or wildlife populations when done in accordance with regulations. Taking animals or plants beyond the legal allowances could threaten habitat and wildlife. Other compatible and non-compatible uses and activities at Roseau River WMA are regulated by Minnesota statute or administrative rule and generally do not threaten Roseau River WMA. WMA staff will continually assess incorporation of new and potential human-related activities on the WMA and their effect on fish, wildlife, and other natural resources to meet goals for both sustaining species and providing recreational opportunities.

Neighboring Land Use

Public land ownership in northwestern Minnesota is greater than in other parts of the state. The continued development (agricultural and recreational) of lands adjacent to Roseau River WMA will challenge management activities, recreational use, and access. These challenges include water quality effects, the introduction of invasive species, land use disturbances, pesticide and herbicide drift, and human and wildlife conflicts. Changes in the use of private lands may present challenges to existing land, resources, and infrastructure management activities within Roseau River WMA.

Water quality challenges can arise from neighboring agricultural and farmland use. Excess chemicals, nitrogen, and phosphates from nearby applications of pesticides, herbicides, and other chemical treatments can drift into waterways and have a negative effect on water quality. Roseau River WMA staff will be attentive to potential impacts to the WMA occurring on neighboring lands and will seek to address these challenges by working with adjacent landowners. Roseau River WMA staff may also promote and educate neighboring landowners about pesticide and herbicide best use practices; water quality initiatives; and conservation practices to incorporate on their land that will also help protect the natural resources at the WMA.

Invasive species can pose unplanned and detrimental challenges to Roseau River WMA. Movement of invasives from adjacent and nearby lands can pose threats to native wildlife and vegetation. There are many types of invasive species that already occur on the WMA (see the Invasive Species section for more information), and they have differing management risks and removal methods. It is a high priority for WMA staff now and in the future to find, control and remove, and monitor for invasives species on Roseau River WMA. WMA staff will need to remain aware of potential spread of invasives from neighboring land. Invasive species spread from neighboring lands to the WMA from wind, water, animal, or human dispersion. WMA staff will continue to require contract and shared equipment be cleaned before entering Roseau River WMA and provide informal communication and education for neighboring landowners on minimizing spread and risk of invasives species.

Land use disturbances from neighboring lands are another concern for the Roseau River WMA. Proximity of the WMA to private and public lands means that their management can have both direct and indirect effects on the WMA. Land use disturbances can cause detrimental shifts in the wildlife and plant community and alter the ecological dynamic of the landscape. Building and construction on neighboring land can also have negative effects. Construction could cause issues with soil compaction, erosion, invasives, and hydrology on site and lead to more widespread complications. Staff will continue to communicate and collaborate with neighboring landowners on land use disturbances that could affect the WMA. WMA staff will also communicate with neighboring landowners about management activities that could affect neighboring land and landowners.

Other neighboring land use conflicts arise from Roseau River WMA's proximity to other private or public lands with different regulations. These differences can cause confusion and accidental or intentional rule breaking; and can threaten Roseau River WMA's resources. For example, ATVs are prohibited on Roseau River WMA but can be used on private lands and on other public lands. When individuals cross WMA boundaries, intentionally or unintentionally, it can lead to misconceptions about WMA rules or allowances. It can also lead to degradation or potentially detrimental use of public resources. WMA staff will need to ensure WMA regulations are clearly communicated and understood; address grievances immediately; and involve enforcement when necessary. WMA staff may consider increased enforcement presence and involvement if needed. Neighboring landowner issues like this can further restrict and limit WMA staff time and resources. It is important for DNR and local WMA staff to develop clear rules and maintain good working relationships with neighboring landowners.

Remote areas like the WMA can create human and wildlife conflicts. Neighboring landowners to the WMA could face conflicts from wildlife coming off the WMA onto their property. Roseau River WMA has both sanctuary and large swaths of connected acreage, which can hold many species of wildlife in high numbers. WMA staff can address potential issues of human-wildlife conflicts through management, Cooperative Damage Management Agreements, and communication.

Neighboring land use concerns can be viewed as an opportunity for more coordinated land and management planning efforts to ensure farming, natural resources, and other public objectives are addressed. WMA staff efforts should identify areas where development would have the greatest effect and coordinate tools to address or limit this effect. Local communication and coordination are vital to working with other private and public land managers in the area to manage across larger, continuous tracts of land. One example includes the Roseau River WMA's management coordination and communication within the Aspen Parkland system, which is a system that crosses international borders in Canada. WMA partnership, participation, and co-management with other local land managers and organizations allows for large-scale conservation efforts of wildlife and natural resources. Proper land planning broadly and locally will enhance the value of these lands for wildlife, plants, residents, and

visitors. Land planning tools are specified methods for WMA staff to achieve land management goals. Land planning tools are varied and should be balanced to achieve multi-use objectives.

Encroachment

Roseau River WMA has many adjoining borders with both private and public lands with differing regulations. Encroachment may or may not be intentional but can have a negative impact on the public resource for the area users and wildlife. Roseau River WMA staff will resolve all encroachment cases through personal and professional communication; boundary surveys; or, if necessary, the involvement of enforcement.

Unit Access Limitations

The Roseau River WMA covers a large stretch of state-owned, continuous and non-continuous land. The WMA encompasses both state-owned and publicly owned roads that provide various types of access and varying levels of maintenance. Roseau River WMA staff have strived to maintain and improve access to hunters, recreationists, and visitors alike across the WMA. Local staff frequently adapt and provide regular updates to the WMA webpage regarding conditions that threaten access.

Several stretches of roads leading to and surrounding the WMA are publicly maintained for access. Public roads are maintained by local county governments and the Minnesota Department of Transportation (MnDOT). Maintenance can vary depending on the type of road, weather, funding, and number of residences in an area, leading to some unreliability that is common in rural areas.

Roseau River WMA's coordination with local units of government on road and infrastructure projects will improve access opportunities for the public. Roseau River WMA will continue to work with these organizations to maintain and improve accessibility to the WMA for all users.

Roseau River WMA has a network of internal WMA roads to facilitate management activities and provide public access. WMA staff maintain the internal road network, and maintenance needs are prioritized with consistent sources of funding to ensure access is maintained for management and public use. The Roseau River WMA dikes are used by WMA staff for maintenance and management access needs; however, they are generally not open to the public to minimize disturbance to wildlife. The dike is seasonally opened for hunter and trapper access to the pools and ditches as well as for the wildlife drive, as conditions allow. Public access may be closed to certain stretches of road for maintenance, management, construction or structural integrity. Expected closures for maintenance or projects will include public notice and alternative access routes when possible.

User access can be immediately affected by roads or road conditions, but other factors can impede access over time. Vegetation encroachment can cause long-term effects to public access along WMA roads and trails and within wetlands. Roadsides are often suitable sites for brush and trees establishment. Through phototropism, which is the tendency of plants to grow toward light, brush and trees encroach on roads and trails throughout the WMA. Periodic maintenance is required to set it back and maintain unimpeded access.

Cattail growth in wetlands also cause access and habitat management issues. Cattails grow prolifically in wet areas and form dense, monotypic stands that can take over and outcompete other species in an area. This can make wetland access by foot or boat more difficult. They encroach upon boat ramps and can also spread through rhizomes without rooting in the sediment. These cattail mats can tear loose through high wind or water

events and drift impeding water control structures, boat launches, and channels within the pool. This requires their expedient removal by WMA staff to restore flow or access. Removal of cattail and other vegetation material is time sensitive, costly, and unpredictable.

WMA staff improve water access by mulching or using excavators for mechanical removal of cattails in channels and pools. Aerial cattail management employed for habitat enhancement can also benefit access by setting back cattail encroachment along navigation channels and restoring open water channels between bays.

Figure 43. Photo of the dragline excavator removing cattails

Flooding can also hinder access to the WMA. The Roseau River flows through the WMA and has an extensive floodplain due to the limited topography of the WMA and surrounding landscape (see Hydrology section for more information). This can cause overtopped or washed-out roads during flood events and greatly limit access to large portions of the WMA. Roseau River WMA staff monitor weather, river levels and discharge from the pools and adapt water management and access management to changing conditions while maintaining communication channels.

Roseau River WMA will continue to evaluate the needs of its users along with available resources to improve and maintain access and opportunity for visitors in the future.

Technology

Advancements in technology can occur rapidly, and these changes can alter how the public will use Roseau River WMA. It is important the DNR and Roseau River WMA stay updated and adapt to new technologies, especially as

they are used in natural resources. Remote cameras, cell phones, drones, social media, portable structures, and other online information can affect resources and WMA users' experiences. All area users are required to comply with the DNR's regulations on compatible use of personal technological equipment on WMAs. Cell phone coverage has improved steadily; however, there are still remote portions of the WMA that have limited or no cell coverage depending on carrier. Cellular mapping applications can serve as a useful tool for navigation but should not be solely relied upon. Other technologies are prohibited on Roseau River WMA. Trail cameras and drones are not legal to use. These and other technologies may improve users' experiences in some regards but can lead to perceived individual rights to public resources; present opportunities for unethical chase or disturbance and stress to wildlife; or increase harvest of fish and wildlife. It is and will be important for Roseau River WMA to consider and integrate positive technological advances and, at the same time, assess any added effects to fish and wildlife to ensure safe and sustainable take of species at the WMA.

Bait Harvest

Bait harvest for noncommercial purposes is an allowable and compatible use of WMAs. This includes leaving minnow traps in place over night. To harvest bait to sell, a minnow dealer license is required. Commercial harvesting of baitfish may be a compatible use on Roseau River WMA. To harvest bait, commercially or noncommercially, on Roseau River WMA a permit is required from the area wildlife supervisor that may include restrictions. Additionally, if a water is listed as infested (i.e., it contains an aquatic invasive species that could spread to other waters), additional requirements may be applicable even for noncommercial harvest of bait. Though commercial bait harvest with restrictions is a compatible use of Roseau River WMA, rearing of baitfish in WMA-managed wetlands and waterways is not a compatible use. Permits will not be issued to allow for the stocking and rearing of baitfish on Roseau River WMA.

Enforcement

Roseau River WMA faces a variety of enforcement issues, which are addressed in coordination with DNR Enforcement Division personnel. Roseau River WMA lies within the Roseau Conservation Officer patrol area and borders the Karlstad patrol area to the west. Roseau River WMA is patrolled off and on throughout the year by DNR Enforcement Division, especially from the start of bear hunting season in late August through the latest deer hunting season; this period also includes the waterfowl and upland game hunting seasons. Anglers are also checked on the Roseau River within the boundary of Roseau River WMA and on the pools and spillways, primarily on Pool 2, which is often used for pike and walleye fishing. Besides hunting and fishing violations that occur on the WMA, enforcement officers deal with many violations of WMA rule, including but not limited to:

- Boundary trespass issues.
- After-hours trespass issues.
- Theft and damage to public property.
- Litter and dumping.
- Release of domestic and wild animals.
- ATV use on the WMA and operating highway licensed vehicles off trail.
- Hunting stands, trail cameras, trapping equipment left on the WMA.
- Operating motorboats in restricted areas, duck boat motors exceeding the 10-horsepower limit.

Conservation Officers are familiar with WMA-specific enforcement issues and issue several citations and warnings to the public each year for violations occurring on Roseau River WMA. WMA staff work to ensure enforcement is aware of all suspect activity on the WMA and address the issue. Boundary trespass issues require a considerable time commitment from WMA staff and often involve the Enforcement Division, survey efforts, and coordination with private landowners.

U.S. – Canada Border

Roseau River WMA is one of two WMAs in the state of Minnesota that shares an international border. The shared border with Manitoba, Canada is 16 miles long and presents added management challenges and opportunities. Collaboration and communication are fundamental to successfully ensuring the goals of Roseau River WMA and U.S. Border Patrol are met.

Invasive species from Canada including insects, plants, and wildlife, are of high concern for Roseau River WMA and pose serious management threats due in part to a lack of warning or a buffer (see Invasive Species section for more information). The Roseau River flows southeast to northwest, but generally surface and subsurface water on the WMA flows northeast to southwest. The watershed for the pools is north of the border, which brings concern for direct spread of aquatic invasive species. Similarly, there is concern for the terrestrial movement of feral swine, genus *Sus scrofa*, into Minnesota because of their ability to destroy vegetation and spread disease (see Terrestrial Animals under the Invasives Species section for more information). Numerous other invasive species from Canada are potential threats to the WMA, and proximity and natural movement corridors spanning Manitoba and Roseau River WMA has the potential to facilitate the introduction and establishment of invasives.

In addition to the shared border, the Roseau River watershed spans the international border and much of the subwatershed that feeds Roseau River WMA is in Canada. Thus, Roseau River WMA seeks to maintain communication with partners north of the border. This includes participating in the Roseau River International Watershed. Staying informed on developments within the watershed in Canada assists Roseau River WMA staff in adapting water management to changing conditions.

U.S. Border Patrol has always had a presence on Roseau River WMA due to miles of shared border. However, over the last decade, U.S. Border Patrol activity on the WMA has increased. Although technological advances have lessened effects on the WMA, increased presence and patrolling may affect WMA road infrastructure and habitat, including rutting of roads, dikes and trails; damage to rare and sensitive habitats; and invasive species introduction. WMA staff coordinate with U.S. Border Patrol on access and set expectations to limit the effects on the WMA while meeting border security demands.

Operational Context

Administrative and Fiscal

Roseau River WMA is managed by the Section of Wildlife within FAW, and is in the DNR's northwestern region, Region 1. WMA operations are funded primarily through the GFF, supported by the sale of hunting, fishing, and trapping licenses and federal aid from surcharges on hunting and fishing equipment. GFF funding primarily

covers salary and operational costs, such as maintenance. Some wildlife management projects at Roseau River WMA are funded through dedicated wildlife accounts (e.g., Deer, Reinvest in Minnesota, Heritage Enhancement, Duck Stamp, Climate Resiliency, Natural Resources Asset Preservation), and other sources project of funding are through the OHF, or other grant funding, such as the Competitive State Wildlife Grant, LCCMR, Inflation Reduction Act, Prairie Pothole Joint Venture, and North American Wetland Conservation Act. Additional project funding is brought to Roseau River WMA through partnerships with non-governmental organizations such as The Nature Conservancy (TNC), Pheasants Forever, and the Minnesota Sharp-tailed Grouse Society. These organizations apply for grants and help administer habitat projects on Roseau River WMA to achieve combined organizational and resource goals.

Staffing

The Roseau River WMA staffing plan consists of one area wildlife manager/supervisor; one assistant area wildlife manager (intermediate); one heavy equipment operator; one general repair worker; one seasonal staff classified as laborer trades and equipment (LTE); and one office and administrative specialist intermediate (OAS) shared with the Thief Lake WMA, Karlstad, and Thief River Falls offices. In addition, one seasonal intern is hosted as FAW funding allows.

Staffing levels are an important factor in implementing plan strategies and priority work. The area supervisor is responsible for supervision, work planning, habitat development and maintenance planning, budgets and administrative tasks, and assists with habitat and facility projects as needed. The assistant area wildlife manager is responsible for implementing day to day operations and field project work. The heavy equipment operator is responsible for operation of all heavy equipment for access and habitat maintenance and enhancement. The general repair worker is responsible for the maintenance of area equipment and facilities and assists with equipment operation as needed. The LTE carries out various habitat, access, and facility project work and assists other staff and in equipment maintenance as needed. The OAS provides administrative support and allows all staff to stay engaged in high-priority habitat, access, and facility activities.

DNR staff manage Roseau River WMA and coordinates work planning with five area offices to complete critical habitat and facility work across three counties. This work is supplemented by the Northwest Roving Crew (funded by the OHF) in Mentor. The Roving Crew works across 14 of the 22 counties that comprise Region 1.

Partnerships

Partnerships with outside groups are important for Roseau River WMA and will continue to be into the future. Non-profit groups and local governments have assisted with everything from habitat improvement projects to infrastructure improvements and additions. TNC has been critical to area success in the application of prescribed fire at an effective scale. In addition, the RRWD has partnered with Roseau River WMA on two water control structures (one replacement and one addition) for the benefit of area water management and local flood damage reduction. Operations and Maintenance for the structures are governed by a co-signed plan and Joint Powers Agreement. The RRWD is also a DNR project partner on three landscape scale habitat improvement projects on or upstream of Roseau River WMA. Partnerships are critical and help the DNR leverage resources to achieve outcomes that would not otherwise be possible.

Operational Orders, Policies, Guidelines, and Directives

The DNR has Operational Orders, which direct the internal management of the department. Policies, guidelines, and directives are the divisions' way of further defining the ways that specific work is undertaken on state lands. Periodic review and updating of existing guidance documents occur and new documents are developed as new policy needs are identified.

Interdepartmental Coordination

The FAW Roseau River WMA staff participate in coordination meetings with the DNR's Forestry Division (FOR), and the DNR's Ecological and Water Resources Division (EWR). In addition to these meetings, Roseau River WMA staff work in coordination with other divisions and conservation partners continuously throughout the year. Roseau River WMA staff also communicate with the DNR Regional Management Team on ongoing or emerging WMA issues.

Capital Improvements

The 16 buildings on Roseau River WMA (Table 18) were built for the unit or salvaged from land acquisitions. Buildings at the headquarters include the manager's residence; assistant manager's residence; two utility buildings, one of which houses the office, garages, and shop supplies, and the other building houses the barracks and maintenance facilities; two large equipment storage buildings; three small storage buildings, and a pumphouse. In addition, there are six grain bins on site, one of which is located at the Noracres site on the west end of the WMA. Most of the buildings were constructed between 1950 and 1975 and are in fair to good condition. The double quonset equipment storage building, one pumphouse, one shed, and one granary are in poor condition.

Table 18. Buildings on Roseau River WMA

Building Name	Building Classification	Building Number	Date Built	Building Condition	Gross Square Feet
Manager Residence	HOUSING	0560	1956	Fair	3672
Assistant Manager Residence	HOUSING	3800	1968	Fair	2912
Office	OFFICE	0540	1956	Good	2392
Shop	MAINTENANCE	0550	1956/65	Good	2800
Office Pump House	MAINTENANCE	4460	1969	Fair	42
Tool Shed	MAINTENANCE	5200	1969	Poor	80
Double Quonset	STORAGE	0520	1935	Poor	3296
Metal Storage Shed	STORAGE	0530	1974	Good	4000

Building Name	Building Classification	Building Number	Date Built	Building Condition	Gross Square Feet
Banding Shed	STORAGE	0080	1949	Poor	140
HQ Granary Storage	STORAGE	0470	1968	Fair	254
Granary Storage	STORAGE	0570	1968	Fair	254
Supply Shed	STORAGE	1100	1941	Fair	152
Granary Storage	STORAGE	5300	1991	Fair	176
Granary Storage	STORAGE	5310	1991	Fair	122
Granary Storage	STORAGE	5320	1991	Fair	706
Granary Storage	STORAGE	7670	1969	Poor	143

Equipment

Twenty-one fleet equipment items are maintained on the WMA along with a Lorraine Dragline, a Duetz Engine, and an additional 20 agricultural implements (Table 19). Equipment is used almost exclusively on Roseau River WMA but shared with other area offices in Region 1 when there are project needs. Thief Lake WMA's semi and lowboy are typically housed at Roseau River WMA and among the most frequently shared pieces of equipment. Equipment is used for everything from transportation and agricultural operations to construction and repair of dike infrastructure and habitat improvement projects.

Table 19. Equipment present on Roseau River WMA

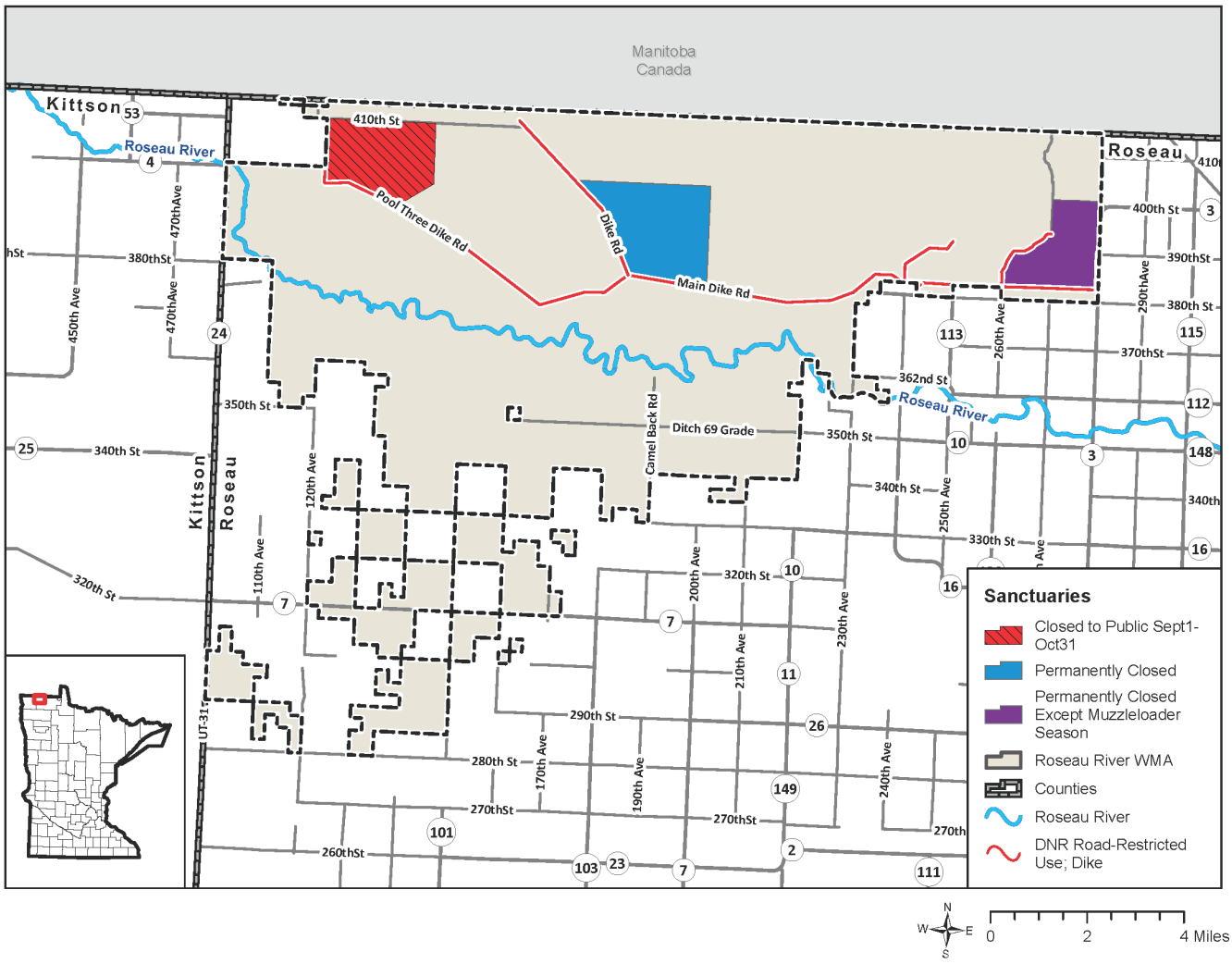
Equipment	Make/Model	Year
Truck	Ford F350	2023
Truck	Ford F350	2022
Truck	Ford F350	2015
Dump Truck	Freightliner 114SD	2016
Tractor	John Deere 7630	2009
Tractor	John Deere 6430	2011
Grader	John Deere 670CH	2002
Skid Steer	Cat 299D2XHP	2019
Dozer	D6K CAT	2010
ATV	Polaris Sportsman 570EPS	2017
UTV	Bobcat UV34	2020
Snowmobile	Polaris 550VOY 155	2024

Equipment	Make/Model	Year
Lawn Mower	Toro ZMaster50	2016
12' Trailer	Aluma 6812 H	2020
16' Trailer	Felling FT10 ITE	2020
ATV Mower	Acrease MR55KE	2015
Rotary Mower Attachment	Cat BRX 418	2019
20' Trailer	Towmaster T40LP	2024
Boat Trailer	Yacht Club 169B	2003
Belly Dump Trailer	R WAY T4221TRI	2010
Ag. Rotary Mower	Schulte XH1000	2021

WMA Wildlife Sanctuaries

WMA Wildlife Sanctuaries may be established under 97A.137 Subd. 2 by the commissioner of the DNR. Roseau River WMA has three sanctuaries, one in each of the impoundments, each with different exceptions (Figure 44). The Pool 1 East sanctuary is 1,682 acres encompassing Pool 1 East, six MSUs, area residences, and the WMA headquarters. The Pool 1 East sanctuary remains closed to the public except during muzzleloader season. The Pool 2 sanctuary is 2,671 acres in the southwest corner of Pool 2 and is permanently closed. The Pool 3 sanctuary is 2,120 acres on the west end of Pool 3 and is closed to the public from Sept. 1 to Oct. 31.

Figure 44. Wildlife sanctuaries on Roseau River WMA



Water Control Structures

Water control structures are important infrastructure and resource management components of Roseau River WMA. Periodic maintenance, repair, or replacement of water control structures is needed to prevent costly infrastructure damage, emergency repairs, and effects to private lands while ensuring that water management is effective and resilient. The water control structures present on Roseau River WMA that are managed by the DNR are described in Table 20. One major update that is unaccounted for in the table is that over at least seven years in the 1980s the entire dike system was reinforced and raised 1 foot.

Table 20. Water control structures managed by the DNR on Roseau River WMA

Name	Date Built	Updated	Length of Dikes (ft)	Type of Control Structure	Acres of Wetland
Pool 1 East	1970s	2003	15,600	Stem Gate	1,150
Subdivision	1970s	2009	9,025	Stem Gate	2,300

Name	Date Built	Updated	Length of Dikes (ft)	Type of Control Structure	Acres of Wetland
Pool 1 West	Mid 2008	2016	18,210	Drop Inlets and Gate	1,150
Pool 1 West Emergency Spillway			400	Sheet piling	
Pool 2	1983		31,150	Drop Inlets and Gate	4,600
Pool 2 Emergency Spillway	1987		350	Sheet Piling	
Y Gate	1987	2001		Center Riser	
Stub Dike 2	1952	2016	26,110	Drop Inlets and Gate	4,600
Stub Dike 2 Emergency Spillway	1987		350	Sheet Piling	
Pool 3	1986		37,765	Drop Inlets and Gate	3,700
Pool 3 Emergency Spillway	1987		250	Sheet Piling	
Pool 3 Ogorek	2016			Drop Inlets and Gate	3,700
Stub Dike 2 North	2010		1,530	Half Riser	2
County Line Outlet	2024		670	Half Riser	36
County Line Secondary	2024			Flap Gate	
Pool 1 Sanctuary MSU; Cell A	2005		3,000	Half Riser	14
Pool 1 Sanctuary MSU; Cell B	2005		3,045	Half Riser	21
Pool 1 Sanctuary MSU; Cell B Secondary	2005			Screw Gate	
Pool 1 Sanctuary MSU; Cell C	2009		2,720	Half Riser	20
Pool 1 Sanctuary MSU; Cell C Secondary	2009			Half Riser	
Pool 1 Sanctuary MSU; Cell D	2009		3,210	Half Riser	21
Pool 1 Sanctuary MSU; Cell D Secondary	2009			Half Riser	
Pool 1 Sanctuary MSU; Cell E	2009		3,085	Half Riser	20
Pool 1 Sanctuary MSU; Cell F	2009		3,590	Half Riser	31
Olson MSU	2012		655	Drop Inlet	7
Berry MSU	2014		2,465	Drop Inlet	12

Other WMA Infrastructure

In addition to public highways and roads that border the unit, Roseau River WMA uses a network of WMA roads to maintain the unit, facilitate management activities, and provide public access. WMA staff maintain this internal road network. Over time, it will be imperative to prioritize maintenance needs and identify consistent sources of funding to ensure good access is maintained for ongoing management and public recreation activities.

Roseau River WMA maintains a vast array of infrastructure requiring continued and ongoing maintenance, including:

Roads and trails

- 129 miles of WMA boundary
- Two miles of interior management trails and roads
- 21 miles of public vehicle accessible roads
- 52 miles of interior dikes
- 21 miles of HWTs

Facilities

- 174 informational signs and kiosks
- 13 parking lots
- Six gates
- 13 parking lots
- 13 water accesses

Desired Conditions

Goal 1: Enhance fish and wildlife habitat and biodiversity

All Habitat Types

All habitats on the Roseau River WMA are important for sustaining wildlife populations and biological diversity in northern Minnesota. Each habitat requires active attention and management to maintain an appropriate distribution of various successional stages of cover types and to sustain them in a healthy condition. Treatments require an adaptive management approach as WMA staff develop and implement prescriptions; evaluate results; and design follow-up treatments.

Grazing as a management tool

The diversity, productivity, and character of grasslands are shaped by three factors: climate (especially periodic droughts), fire, and grazing. Historically, bison and other large grazers and browsers were found largely to the west of Roseau River WMA. Today, wildlife managers try to replicate the large grazer disturbance with cattle by varying grazing pressure, timing and rest each year. Grazing increases plant diversity, especially wildflower (forb) diversity and abundance. Additionally, European settlement introduced exotic cool-season grasses that choke out native species. Grazers focus on grass, and with less competition from grasses, there is more room for wildflowers. This creates pollen and nectar for insects in the summer, and fruits and seeds for wildlife in the late summer and fall. Grazing also increases the structural diversity of the habitat, since areas are grazed to different heights. Several species of wildlife will use cattle paths through the grass to travel from one area to another, especially young birds. The shorter, open canopy makes it easier for birds to move around and forage while there is some taller vegetation nearby for cover. Finally, many species of birds prefer to nest in shorter grasses, including blue-winged teal, pintails, sharp-tailed grouse, upland sandpipers, marbled godwits, meadowlarks and longspurs. Cattle only graze a small percentage of the Roseau River WMA yearly.

Haying as a management tool

Haying is a tool used within the Roseau River WMA to affect the structure and diversity of grasslands. It is a flexible tool where managers can work with cooperators to hay specific areas at precise times to meet management objectives. Cooperators cut hay outside the primary nesting season (May 15 to Aug. 1) unless there is a specific, short-term management objective for haying a particular location during the nesting season. Sharp-tailed grouse use hayed areas for their spring leks. Additionally, the green-up of the ground after haying will attract grazing and browsing animals such as deer. Haying also lowers the vegetation height and allows for easier movement and foraging by wildlife, especially young birds.

Prescribed fire as a management tool

Prairie and shrubland habitats are shaped by moisture regime, fire, and grazing. In areas of higher precipitation, these systems are under constant tension with tree and shrub encroachment. When fire is removed from the ecosystem, these habitats can lose their open characteristics and succeed to shrubs and trees. Fire can reset any successional advances and benefit herbaceous species. The timing of fire can also have very different effects

upon the landscape and wildlife use. Even before an area begins to revegetate following a burn, wildlife including sharp-tailed grouse, northern harriers, and meadowlarks use the area for foraging and displaying. The initial regrowth of both herbaceous and woody vegetation is highly palatable to browsers. Native Americans applied fire to attract ungulates to certain areas to improve hunting. Since European colonization, fire has been suppressed across the US, which has resulted in the degradation or loss of prairie and shrubland habitats. Prescribed fire is a critical tool to restore and maintain these habitats for the wildlife that depend on them.

Forest habitat management

Forest stands are included in the DNR's forest modeling and planning processes so that timber harvest can be used as a tool to advance wildlife habitat goals that include sustaining diverse age classes and habitat types across the landscape. Timber harvest can be used to advance stand-level wildlife management objectives, not precluding alternate mechanical treatments, such as increasing the amount of mast-producing oak or maintaining high-quality ruffed grouse and woodcock habitat. Other site level interventions may include invasive species treatments with herbicides, mechanical cutting, and prescribed burning. Prescribed fire and mowing may be used to maintain open habitats, manipulate habitats, or to reduce invasive species presence and prevalence.

The desired conditions for Roseau River WMA are presented with the knowledge that 12,435 of the WMA's 75,163 acres are DNR Section of Wildlife administered School Trust Lands, which carry additional statutory management responsibilities. On School Trust Lands, ". . . the department (DNR) must manage the lands to maximize long-term economic return to the Permanent School Fund, 'while maintaining sound natural resource conservation and management principles.'" Forested habitats on Roseau River WMA are managed for wildlife benefit in accordance with the responsibilities of both State Wildlife Management Areas and School Trust Lands – as outlined in their respective Habitat Value Forms completed by area wildlife supervisors for timber sales.

It is important to note that this plan uses both stand and NPC growth stage to describe forested habitats. It is also important to note that stand age and NPC growth stage are not necessarily equivalent. The annual stand list will identify, for example, a 65-year-old aspen stand for field review. Field review will identify NPC type (or types) and growth stage (or growth stages) present in that stand.

Upon field examination, management actions selected to meet the goals and objectives of this plan may include timber harvest, no treatment, mechanical treatment, prescribed burning, understory planting, thinning, seeding, or scarification. In selecting among potential management actions, considerations will include effectiveness in achieving goals, available resources, local conditions, and spatial considerations.

Management Objective 1.1: Provide a range of high-quality habitats for wildlife in a variety of successional stages across Roseau River WMA.

- Pursue funding, contracting, and completion of NPC mapping of Roseau River WMA by 2029.
    - Incorporate NPC-informed habitat management objectives and strategies when evaluating all habitats, including (but not limited to) forest stands on Roseau River's 10-year Stand Exam List, landscape and stand-scale habitat goals. Verify accuracy of mapped NPC classifications prior to initiating treatments.

- Maintain and enhance species-specific habitat, establishing a range of age classes and successional stages capable of sustaining diversity within all habitats over time where a sufficient acreage or number of stands of a cover type exist, adapting to changing climate, and treating invasive species.
- Support rare species and habitats in all management decisions affecting these species and habitats.
- Avoid compaction of hydric and sensitive soils.
- Maintain or increase current staff and equipment levels to ensure enduring habitat management efforts occur at current levels or greater in all habitats at all scales: landscape, stand, and patch.
- Pursue acquisition of specialized equipment for the efficacy, and cost effectiveness and efficiency scaling of successional management across Roseau River WMA and adjacent DNR work areas with consideration given to a forestry mulching tractor and shear blade.
- Work with partners and contractors to develop creative strategies to meet habitat successional goals with increasingly challenging climatic conditions.

Management Objective 1.2: Maintain diversity in native plant communities at multiple spatial scales to increase resistance and resilience to current and potential environmental stressors. Apply resilience, resistance, and facilitation strategies from sources including the Northern Institute of Applied Climate Science (NIACS) and the Aspen Parklands Section Forest Resource Management Plan to address current and future habitat effects from climate change.

- Evaluate and consider diversification of appropriate existing habitats to enhance their resistance and resilience to potential forest health issues before an infestation occurs (e.g., planting new species in ash stands).
- Consult the DNR NPC tree suitability table and NIACS Climate Change Projections when planning habitat projects.
- Maintain current full-time staffing levels and increase seasonal staffing levels to maintain focus on early detection and eradication of invasive species including purple loosestrife, leafy spurge, European buckthorn, common tansy, and common burdock.
- Monitor and contain spread of established invasive species, including narrow-leaf cattail, hybrid cattail and reed canary grass, through remote sensing or ground-based monitoring techniques.
- Coordinate with MnDOT, Roseau/Kittson County, and RRWD to control purple loosestrife expansion along roadways and ditch systems.
- Procure gravel from clean sources to avoid invasive species introduction.
- Work with agency partners to find new and creative strategies for invasive species control.
- Report any new infestations to EDDMapS.
- Work with FAW leadership to quickly secure internal funding to effectively address new invasive species detections or expansion.

Management Objective 1.3: Preserve and perpetuate the rare plant and animal species known to occur on Roseau River WMA.

- Conduct Natural Heritage Information Systems (NHIS) review before implementing any projects or operational actions
- Verify NHIS rare species locations are accurate. Coordinate with EWR partners for surveys and management guidance.

- Document new findings of rare species and coordinate with EWR partners for surveys and management guidance.
- Work with FAW research units and EWR to develop monitoring protocols for priority species.
- Support wetland restoration monitoring, including hydrologic monitoring wells by EWR and project partners.

Management Objective 1.4: Provide both summer and winter habitat needs by increasing the amount of conifers and mast-producing species within forest stands.

- Increase the amount of spruce, fir and oak within stands, where appropriate, through planting or leave tree selection. Work with FOR as needed.
- Increase the amount of mast producing midstory and understory species such as American plum, cherry species and blueberry, where appropriate, through overstory management, prescribed fire or planting. Work with FOR as needed.
- Consider maintaining conifer and deciduous species, where appropriate, in proximity, both within stands and between stands, through management timing, including early harvest or alternate treatments, use of reserve islands, harvest design, underplanting and seeding.

Management Objective 1.5: Control runoff for water quality management

- Coordinate with local partners on stream restoration and stabilization projects, specifically those identified in the applicable local comprehensive watershed management plan, One Watershed One Plan. In addition, work with other organizations to improve surface water quality by reducing runoff and erosion and implementing best management practices (BMPs) in the contributing watersheds.
- Protect existing hydrology and, where possible, manage for a more dynamic flow regime to support resilient wetland and aquatic habitats and to help protect the watersheds.
- Collaborate with local partners on continued enhancement of wetlands in the Roseau River watershed and the WMA boundary.
- Promote native plant species in new constructions, restorations, or enhancement projects to maximize habitat benefits for area wildlife while increasing soil stabilization, lessening erosion, and slowing water in both wetland and riparian areas.

Management Objective 1.6: In response to Minnesota's changing climate, develop strategies to enhance ecosystem resiliency, protect species, and mitigate effects to WMA resources and infrastructure.

- Maintain and improve infrastructure resiliency.
    - Monitor structural integrity of roads, water control structures, and other structures that could be affected by flooding or other high water and precipitation events.
        - Keep up with maintenance and repairs to avoid larger damages or losses to WMA infrastructure.
    - Secure funding to maintain, improve, repair, or replace existing infrastructure.
    - Proactively design and invest in new infrastructure to add to or replace existing infrastructure where inadequacies exist.

    - Replace aging equipment as needed to quickly and effectively address infrastructure issues (e.g., floating cattail mats, ice, beaver activity) to prevent costly damages. Maintain and preserve existing equipment until replacement occurs.
- Increase carbon sequestration and storage in peatlands by protecting, maintaining and restoring high-quality peatlands (see Objective 1.13 and Juneberry Project Priority Area for more details).
- Routinely evaluate new land management and planning tools that could mitigate climate effects.
    - Coordinate with other staff, departments, and organizations on new climate resilient practices being tested and used.
    - Review new research, studies, and the best available science related to management practices addressing climate change effects.
- Work with partners to provide informational materials or signage about the effects of climate change on the TAP Province.
- Require planting and management of native species on WMA project sites.
- Continue to record temperature and precipitation from the office weather station for future assessment and monitoring of climatic and weather trends.
- Keep up to date with the spread of potential, new wildlife diseases on or near the WMA.
    - Coordinate with DNR Wildlife Health to eliminate potential spread of wildlife diseases.
- When replacing culverts or other existing stream crossings, work with DNR Fisheries and EWR to ensure culverts are replaced with appropriate sizes, slopes, and elevations to provide connectivity for fish and wildlife passage, support stream stability and climate change resilience.
- Adapt and modify annual and long-term management goals to account for climate change.

Wetlands

Management Objective 1.7: Manage and restore a range of wetland types critical for wetland-dependent wildlife species.

- Maintain and enhance all existing wetlands with a variety of management techniques including prescribed burning, grazing, woody removal (shearing/brushing), and others.
- Restore wetland/peatland complexes through ditch plugs and hydrologic connectivity in the Juneberry Project Area.
    - Monitor and maintain wetlands/peatland complexes at least two years pre- and five years post-Juneberry Project completion.
- Investigate and map areas for wetland/peatland restorations and design by 2028. Complete the highest priority restorations.
    - Develop restoration plans for drained or degraded wetlands adjacent to the Roseau River and pursue restorations as resources allow.
- Manage cattails and reed canary grass yearly using techniques such as prescribed burning, herbicide treatment and mechanical removal to ensure basins stay open for waterfowl and other open-water wetland species.

Management Objective 1.8: Manage MSUs to produce high-energy food for waterfowl and waterbirds and provide a secure staging location for migratory waterfowl.

- Develop annual plans for MSU management.
- Maintain staffing and maintain or increase equipment and resources to ensure quality moist soil habitat for waterfowl and waterbirds.
    - Acquire a 3-point broadcast spin spreader implement to Roseau River WMA's equipment.
    - Develop a replacement plan for Roseau River WMA's diesel engine for pumping.
    - Maintain essential equipment including a diesel engine, high-capacity pumps and hose.
- Control cattail and reed canary grass and restrict it to less than or equal to 20% of the acres.
- Plant crops or integrate disturbance to encourage germination of native annual plant species according to annual MSU management plan targeting a minimum of one-third of the MSUs annually, as conditions allow.
- Actively manage water levels through flooding and draining according to plan on a minimum of one-third of the MSUs, as conditions allow, to make food resources available to waterfowl and other waterbirds.
- Inspect and maintain associated MSU management infrastructure annually, including dikes and water control structures.
- Check progress of flooding of units daily when pumping to monitor water levels and to keep intakes free of debris.
- Adapt MSU management activities, including disturbance and water management, to changing seasonal temperatures and migration patterns.

Management Objective 1.9: Manage impoundments and open water habitats to provide quality habitat for diverse aquatic plant and invertebrate communities for ducks, geese, swans, shorebirds, and other open-water dependent species.

- Develop annual water level management plans for each pool to benefit nesting waterfowl and submergent and emergent vegetation.
- Develop a comprehensive monitoring plan for the Roseau River WMA impoundments involving the DNR Shallow Lakes Program by 2030.
    - Consider submerged aquatic vegetation, emergent vegetation, aquatic invertebrate and water chemistry monitoring.
- Maintain staffing and maintain or increase equipment and resources.
    - Maintain essential equipment including the dragline, grader, mowers, belly dump and airboat.
    - Continue to maintain nest boxes along the impoundment embankments. Replace failing nest boxes as necessary.
- Actively monitor and manage water levels to achieve a clear water state within the impoundments and ensure abundant submersed vegetation for waterfowl use.
- Continue to monitor waterfowl production and other wildlife use of the impoundments through annual brood and breeding pair surveys, waterfowl surveys, muskrat surveys, and beaver colony surveys.
- Manage cattails within the impoundments using techniques such as prescribed burning, herbicide treatment and mechanical removal to ensure basins retain approximately 50% open water for waterfowl and other wetland-dependent species.
    - Inspect and maintain associated impoundment infrastructure including dikes, water control structures and emergency spillways.

    - Remove floating cattail mats from structures and accesses in a timely manner to facilitate water level manipulation and recreational access.
    - Develop a replacement plan for Roseau River WMA's dragline for removing floating cattail mats and other obstructions quickly and cost-effectively from water control structures.
- Manage wild rice within the WMA impoundments to benefit waterfowl and other wildlife.
- Coordinate with DNR Wildlife Health to review where areas of concern for Highly Pathogenic Avian Influenza (HPAI) outbreaks are occurring.
- Facilitate waterfowl banding and waterfowl, waterbird, and wetland research compatible, complementary, and informative to Roseau River WMA management by providing equipment, facilities, and resources to DNR Wetlands Research Program and university researchers.
- Check water control structure gages weekly at a minimum to monitor water levels and to keep intakes free of debris.
- Complete a partial drawdown on the impoundments each winter to provide spring flood storage, as per agreement with RRWD.

Management Objective 1.10: Protect, maintain, manage, enhance, and restore lowland shrublands, marshes and sedge meadows to provide quality habitat for moose, sharp-tailed grouse, sandhill cranes, yellow rails, Nelson's sparrows and other grass and shrub wetland dependent species.

- Identify and protect rare wetland features, including calcareous fens, rich prairie fens and known springs.
    - Continue to identify and map the locations of these rare resources. Consult with EWR regional ecologists before management in high potential areas.
- Maintain staffing and maintain or increase equipment to maintain and enhance lowland shrubland, marsh, and sedge meadow habitats for wildlife.
    - Maintain essential equipment including the low ground pressure dozer, tracked skidsteer and attachments, and tracked UTV, ATV, Marshmaster (Within Region 1) and trucks with slip-ons.
    - Pursue acquisition of specialized forestry mulching equipment for increased efficacy, cost-effectiveness and expanded treatment opportunity in lowland successional management as climate change is reducing treatment windows and traditional tools.
- Maintain or increased age class diversity and heterogeneity, with an emphasis on early successional stages, through brush mowing, mulching and shearing, herbicide applications, and prescribed fire.
    - Plan and enhance a minimum of 500 acres per year of brush mowing, mulching and shearing as conditions allow.
    - Plan and enhance approximately 5,000 acres per year through prescribed fire as conditions allow.
- Work with Audubon, USFWS, other partners and volunteers to continue monitoring for yellow rails and Nelson's sparrows within the WMA.

Riparian and Aquatic Habitat

Management Objective 1.11: Manage riparian and aquatic habitat to improve the health and resiliency of the rivers and streams within the WMA.

- Retain trees along the river large enough to support cavities according to the Riparian Management Zone (RMZ) guidelines.
- Maintain and enhance bank stabilization by retaining dead and down woody material.
- Restore floodplain connectivity and historic oxbows on the Roseau River.
    - Work with DNR Fisheries to monitor for fish use and, if staffing allows, monitor wildlife use of the oxbows and other newly connected areas of the Roseau River following the Roseau River Restoration Project.
- Coordinate with EWR on monitoring the Roseau River for aquatic invasive species and DNR Fisheries on monitoring fish communities.
- Increase the diversity and abundance of native fish by maintaining or improving in-channel stream and floodplain connectivity through the Roseau River Restoration Project and coordination with local ditch authorities.
- Maintain and protect Roseau River and its tributaries for quality fish habitat following the DNR Fisheries Management Plan.

Peatlands

Management Objective 1.12: in Open Rich Peatlands (OPn91; Northern Rich Fen-Water Track), protect and restore sensitive open peatland communities and surface and groundwater resources for moose, short-eared owls, yellow rails, Nelson's sparrows and other open peatland dependent species

- Protect and maintain open rich peatlands to sustain habitat for yellow rails and Nelson's sparrow.
- Maintain natural hydrology whenever possible.
- Work with partners to identify and implement opportunities to restore hydrology, restore peatland habitats, and improve water quality.
- Avoid new impoundments and structures that alter hydrology or impede overland flow.
- Avoid or minimize all effects (e.g., soil disturbance and compaction) from vehicular access.
- Avoid construction of new access routes.
- Seek to minimize or eliminate access trails on sensitive habitat by seeking alternative routes through less sensitive habitats wherever possible.
- Where appropriate, reset succession for openland species through mowing, mulching, shearing and prescribed burning.
- Use BMPs to restore degraded peatlands (see Juneberry Project Priority Area for more details).

Management Objective 1.13: in FPn81 (Northern Rich Tamarack Swamp) manage to provide thermal and nesting cover for wildlife species including black bear, wolves, fisher, American marten, snowshoe hare, northern bog lemmings, Connecticut warblers, boreal chickadees, olive-sided flycatchers, great gray owls, northern hawk-owls, spruce grouse (if present), gray jays, and for rare orchids.

- Consolidate delineated tamarack stands by dissolving shared stand boundaries, especially in the complex west of the diversion channel.
    - Coordinate with FOR to consolidate as many tamarack stands as possible based on reinventory, remote sensing, or current inventory by 2028

- Manage tamarack complex along Canadian border and west of diversion ditch as a large tract of mature closed canopy coniferous forest for thermal cover and for black bear, wolves, fisher and marten with the goal of eventual addition to lowland conifer old-growth network.
    - In the interim, implement the Sundown-Boroos West Lowland Conifer Patch MOA. Review and update MOA guidance prior to the next round of sustainable timber harvest planning.
    - If MOA review recommends a need for management (e.g., based on changes in stand condition brought about by climate change), base management on target wildlife species presence and abundance. Consider narrow strip cuts for owl foraging areas and Connecticut warbler nesting. Consider focusing harvest on tamarack, reserving black spruce and cedar for winter cover for large carnivore and ungulates and boreal chickadee nesting.
    - Work with FOR to monitor beetle-infestation of tamarack stands and regeneration in the understory.
- Work with FOR to monitor primary tamarack and spruce stand for forest health condition and for potential future lowland conifer old growth designation.
- Work with FOR to include Roseau River WMA in the annual forest health aerial surveys.
- If management is needed because of forest health issues, consider alternatives to even-aged harvest techniques, such as strip harvest or group selection, to benefit great gray owls, spruce grouse, Connecticut warblers or boreal chickadees if they are present.
- Implement strategies for great gray owl habitat enhancement as outlined in the Northern Forest Owl MOA.
    - Allow stands to increase in age/size structure for nesting trees to have greater than 10 inches diameter breast height and closed canopy.
    - Clear portions of brushland areas within the peripheral area to provide openings less than 5 acres or narrow corridors with maximum width of 200 meters (656 feet).
    - Consider including irregular edges in cuts and clearings to allow for perch sites.
    - Reserve clusters of trees that include snags, broken-topped dead trees, deformed trees, and seed trees.
- Seek opportunities through EWR, partners and volunteers to survey and monitor great gray owls, spruce grouse, Connecticut warblers, and boreal chickadees on Roseau River WMA.
    - Consider Automatic Recording Units.
    - Consider using Cantu playback call recordings for spruce grouse.
    - Consider establishing grit stations along roads in winter for spruce grouse.
- Facilitate re-inventory of tamarack stands with FOR when they reach age 150, or earlier if they come up on a re-inventory list.

Wetland Forests

Management Objective 1.14: in WFw54 (Northwestern Wet Aspen Forest), WFn55 (Northern Wet Ash Swamp), and WFn74 (Northern Wet Alder Swamp) maintain biodiversity and provide thermal cover for wildlife species including fisher, wood ducks, common goldeneyes, hooded mergansers, pileated woodpeckers, American woodcock, ruffed grouse.

- Work with FOR to monitor the health of all accessible stands and identify and implement FAW ash management strategies to ensure the persistence of wet forests.

- Pursue partnerships (e.g., NRCS) to monitor hydrology to assess any short-term or long-term changes at the WMA.
- Work with FOR to develop and maintain resilience to tree health threats.
    - Continuously monitor WMA for potential invasive species and implement appropriate management strategies for all infestations. Report sightings to EDDMapS
    - Consult FOR regarding insect and disease management options.
    - Work with FOR to plant seedlings for stand diversification.
        - Consider species, like American elm, red maple, silver maple, swamp white oak and other suitable species to replace ash, that could be successful under changing climate conditions. Box elder and balsam poplar are inferior choices for wildlife and whip survival. If using whips, consider planting in fall for increased survival.
    - Avoid overstory harvest where underplanting, unless necessary for sapling or seedling release.
    - Coordinate for planting, contracts and grants with FOR.

Management Objective 1.15: in FFn67 (Northern Floodplain Forest) maintain biodiversity and provide nesting cover and shelter for wildlife species including fisher, wood ducks, common goldeneyes, hooded mergansers, and pileated woodpeckers.

- Work with FOR to monitor the health of floodplain forests, including EAB monitoring.
- Work with FOR to implement management strategies to ensure the persistence and resiliency of riparian forests.
    - Consider diverse planting species suitable for this NPC.
    - Monitor hydrology through river gages to assess any short- or long-term changes at the WMA.
- Meet or exceed RMZ guidelines to maintain large diameter nesting trees.

Upland Forests

Management Objective 1.16: in MHn44 (Northern Wet-Mesic Boreal Forest), manage for early successional wildlife species including white-tailed deer, ruffed grouse, American woodcock, while maintaining some older aspen for cavity-dependent birds and waterfowl, bats, fishers, and pine marten by increasing under-represented habitat components characteristics (often those associated with later-successional growth stages).

- Manage for a relatively even age distribution of aspen across 7 decades, or about 1,100 acres per decade age class, with some aspen in the oldest group reserved past 70 years, where appropriate.
    - If stands are converting to other forest types or harvest (treatments) are not at the frequency to sustain an even age distribution, manage for an early successional weighted distribution of aspen.
    - Manage aspen (e.g., allow trees to get to 12 inches in diameter) in riparian areas for the benefit of cavity-nesting waterfowl.
- Manage aspen in accessible concentrated clusters for upland game species. Increase conifer coverage through leave tree selection, partial harvest followed by seeding or planting, or other means.
- Maintain large cavity trees for waterfowl nesting near watercourses.

- Maintain a component of large diameter cavity trees, as aspen is shown to be a preferred cavity tree for multiple game and non-game species alike.
- Where appropriate, increase the coverage of mixed aspen/spruce/fir stands where they do not currently exist through early harvest, harvest design, underplanting, and seeding.
- Consider early harvest of aspen with a goal of reducing age class imbalances and re-establishing diverse forest stands.
- Coordinate with FOR to develop marketable timber sales. Focus aspen harvests into two large harvests per decade to make sales economically feasible, as necessary. Use alternate tools if unsuccessful in selling a merchantable stand, including fire and mechanical treatments.
- Seek opportunities through EWR, partners and volunteers to monitor for golden-winged warblers and their responses to aspen regeneration harvests.
- Maintain or increase the bur oak component in stands that are not typed as oak to provide oak mast for wildlife including turkeys.
- Consider swapping balsam poplar for other aspen stands to meet wildlife objectives when aggregating stands into a timber harvest permit, as it is of lower value for wildlife than other tree species present on the WMA.

Management Objective 1.17: in FDn12 (Northern Dry-Sand Pine Woodland), manage for wildlife species including white-tailed deer, black bear, American marten, fisher, snowshoe hare, spruce grouse (if present), ruffed grouse, turkeys, black-backed woodpeckers and boreal songbirds by managing and diversifying conifer and oak stands.

- Maintain diverse jack pine age classes, including some well beyond rotation ages (there is insufficient acreage of jack pine on Roseau River WMA to have a meaningful even age class distribution; see Table 8 in the Habitat and Plant Communities section for more information).
- Employ harvest methods to naturally regenerate jack pine to avoid importing non-local genomes.
- Manage oaks to retain them on the landscape in relation to climate change; to maximize long-term acorn production; and to maximize recruitment (there is insufficient acreage of oaks on Roseau River WMA to have a meaningful even age class distribution).
- Look for opportunities to increase age and species diversity within monotypic stands through a variety of methods, including timber harvest, prescribed fire, timber stand improvement, retaining late successional species for seed sources after harvest.
- Reintroduce fire as a management tool in upland forests to restore ecological processes, increase site heterogeneity and diversify growth stages.
    - Use prescribed burns and mechanical treatments to manage existing early successional and open areas for berry production to benefit black bear and ruffed grouse.
    - Maintain or restore a diverse ground layer; employ prescribed fire and mechanical treatments as appropriate for white tailed deer and turkeys.
- Retain and increase fruit and nut-bearing understory trees and shrubs where they occur to provide mast for wildlife.
- Create some gaps in oak stands to maintain woodland openings.
- Manage the small acreage of red pine, white pine and white spruce opportunistically in conjunction with surrounding stands; allow to naturally regenerate.

- Seek opportunities through EWR, partners and volunteers to monitor for use by spruce grouse and adapt management accordingly to provide breeding and winter cover in stands where they are found.

Prairies, Upland Shrublands, and Dry Open Areas

Management Objective 1.18: Maintain and protect prairies, upland shrublands, and dry open areas across Roseau River WMA to provide habitat for wildlife species including deer, black bear, sharptailed grouse, bobolink, meadowlark, short-eared owl and northern harrier.

- Rotate management techniques at different temporal and spatial scales across Roseau River WMA to maintain habitat and provide refugia for invertebrates and other species.
- Assess management needs for each area yearly or biannually dependent on WMA resources.
- Maintain diversity of prairie and grassland species.
    - Control cool-season and invasive species encroachment using se herbicide applications, prescribed fire, mowing or mulching and other treatments for removal and disturbance.
- Actively manage restored prairie areas through techniques such as prescribed fire and mechanical brush control to enhance rare plant communities.
- Implement the Pool 3 North Young Forest MOA guidance.
    - Participate in the next MOA review and update process to ensure MOAs within the WMA boundaries complement and/or are compatible with the management goals and objectives of this plan.
- Maintain or increase staffing, equipment and resources to efficiently, cost effectively, and flexibly manage and enhance prairie and brushland habitats.

Management Objective 1.19: Increase landscape heterogeneity and patchiness to drive biodiversity and provide the range of habitats required by most wildlife species, including game animals, by using targeted mowing, spraying, and prescribed burning.

- Seek to increase prescribed fire staff and equipment capacity at Roseau River WMA and FAW Region 1.
- Expand the operational window for prescribed burning.
    - Incorporate spring, late summer, and early fall fires to maximize diversity, when feasible.
- Utilize summer brush mowing and grazing in combination with other techniques; target 100 acres annually.
- Focus efforts and stack multiple treatment methods sequentially to reduce brush coverage.
- Leave areas that do not burn during prescribed burns as reserve areas within the burn unit to provide patchiness.
- Use a variety of grazing techniques, including patch-burn grazing and seeding-grazing to create diversity of vegetation structures (e.g., short, mid, and tall plant heights).

Management Objective 1.20: Sustain and promote populations of wildlife, such as pollinators, sharp-tailed grouse, grassland songbirds and other prairie-dependent species, through prairie and grassland management.

- Provide pollen and nectar resources through techniques such as prescribed fire, grazing, and seed selection for pollinators throughout the growing season to increase numbers of insects.

    - Develop seed mixes that will provide for seasonal variation in blooming times from early spring through late fall.
- Seek opportunities with EWR and partners to monitor changes in wildlife and insects/pollinator populations and use.

Management Objective 1.21: Construct, reconstruct, and expand new prairie on the WMA to promote and enhance native species, wildlife use, and wildlife habitat.

- Assess and target conversion of 360 acres of degraded grassland and agricultural areas to diverse native plant communities.
- Plant native species seed mixes characteristic of local remnant prairie that provide the necessary root and mycorrhizal growth, as well as desired structure, forage, and diversity.
- Control and remove invasives and cool season species before and after construction.
    - Use spraying, burning, mowing for vegetative removal and disturbance.
- Work with EWR to monitor establishment using the Prairie Reconstruction Initiative protocols.
- Work with EWR to survey the remnant prairie and create a benchmark for restorations.
    - Inventory plants and available seed sources to diversify WMA restorations including the Berry, Olson, and Headquarters Northwest restorations.
- Find seed sources from other remnant prairies nearby for native species plantings.
    - Work with the seed harvest consortium between the DNR, USFWS, and TNC to harvest native seeds for prairie restorations.
    - Develop relationships with neighboring landowners.

Management Objective 1.22: Manage invasive and native tree and shrub encroachment to maintain open grassland habitat.

- Reduce woody encroachment through prescribed burning, especially in the fall, and mechanical control in prairies to maintain unique habitats.
- Remove shrub species from open and prairie environment though brushing, burning, spraying, and manual removal as disturbance.
- Monitor for invasive species and prioritize removal of any invasion, such as Siberian peashrub and European buckthorn, to maintain open prairie areas required by prairie wildlife species.
    - Work with EWR to monitor changes in plant species.

Management Objective 1.23: Incorporate grazing where applicable on upland shrub grassland to benefit openland-dependent species such as sharp-tailed grouse, meadowlarks, and ground squirrels.

- Assess utility and feasibility of grazing as a management tool on approximately 1,000 acres.
- Develop relationships with the grazing community and identify interested cooperators by 2030.
- Develop grazing plans and infrastructure for the suitable areas.
- Monitor grazing pressures and environmental effects on soil and plant health; adapt grazing techniques as necessary.

Agricultural Areas

Food plots, planted fields generally less than 20 acres, cannot replace or compete with natural foods produced by well-managed native habitats in quantity or quality; however, food plots can be an effective wildlife management tool to supplement natural food sources, mitigate depredation, and improve wildlife visibility for area users. Larger agricultural fields are generally managed through CFAs and often serve the added purpose of site preparation for future habitat development projects. Food plots may be managed by area staff or through CFAs. This management tool supports wildlife when other resources are limited, in lower quality, or under stressful environmental conditions. Agricultural areas can vary in size, plant species, and complexity, and can be used to positively affect wildlife species through variation in timeframes and with plant species to promote consistent availability of resources, cover, and open areas throughout the year in addition to maintaining soil fertility. Though there are many benefits of agricultural areas and food plots, they also have limitations and are not the only method to provide open spaces, cover, winter food, and hunting and wildlife viewing opportunities. A diversity of land types and ecological systems will provide a variety of resources and opportunities for wildlife. Roseau River WMA will implement food plots in portions of the WMA, in conjunction with other land management practices, to support wildlife species including white-tailed deer, black bear, mourning doves, sharp-tailed grouse, and sandhill cranes. Food plots will be evaluated for their efficacy in meeting wildlife management objectives. Food plots that are not meeting the criteria should be moved or eliminated and plans developed to restore the plot to the native habitat best suited for the site. Alternatively, food plots should be considered for development where they are identified as the best tool to meet the WMA's management goal for a site if is practical given area staffing and funding.

Management Objective 1.24: Maintain agricultural lands and food plots to increase the carrying capacity of resident wildlife, to provide a supplemental food source for migratory waterfowl, to keep wildlife in or near secure winter cover, to reduce animal depredations on adjacent private lands, and to provide outdoor recreation and wildlife viewing.

- Maintain or increase staffing, equipment and resources to effectively manage Roseau River WMA's agricultural habitats for wildlife.
    - Support populations of wildlife species over winter by planting high-quality, high-energy food.
    - Plant a diversity of crop species to increase soil health, productivity, and season-long forage and cover to benefit of mammals and birds.
    - Maintain a minimum of 60 acres of annual crops for wildlife use unless objectives are not met.
        - Monitor and evaluate wildlife use and adjust management and/or location of food plots to meet management objectives.
- Maintain CFAs to provide food and open areas for deer, bear, sharp-tailed grouse, sandhill cranes and meadowlarks.
    - Implement CFAs as a management tool wherever applicable to meet management or restoration goals.
- Maintain MAWQCP certification and implement best practices for soil health and water quality.
    - Utilize conservation farming practices including no till, integrated pest management, and best nutrient management practices to promote microbe, water quality, and pollinator friendly management.

    - Conduct soil tests of macronutrients and organic matter every three years; Soil Health Tests every six years.
- Continue to seek ways to improve soil quality, structure, and health, or features related to the biological, physical, and chemical properties of soil through plantings.
    - Utilize cover crops to protect soil health and water quality using the five principles of soil health.
    - Minimize soil disturbance by incorporating conservation tillage methods to limit soil erosion and disturbance.
    - Maximize crop diversity by rotating crops annually and use diverse crop mixes as time and resources allow.
    - Maintain soil cover by planting cover crops to limit soil erosion and add organic matter and leave crops standing overwinter.
    - Maintain living roots by incorporating perennial and/or cool season crops as winter cover crops for maintained root development.
    - Integrate livestock by attracting ungulate use for nutrient cycling and consider incorporating grazers where appropriate.
- Seek ways to enhance the productivity of hay CFAs for wildlife.

Priority Areas

Priority areas describe locations or projects having a particular management or restoration focus. Four priority areas are identified in this plan and described below.

Roseau River Restoration Project

The Roseau River was channelized in the early 1900s by the State with the establishment of State Ditch 51. The Roseau River Restoration Project, in a joint project with the RRWD, seeks to reconnect and restore the river to its historic river channel and the surrounding floodplain habitats. This will result in the restoration of 13.6 miles of river and river habitats for native fish, mammals, and birds.

Management Objectives

- Restore two oxbows by 2035.
- Secure funding for additional phases of restoration
- Develop surveys and monitor habitat changes pre and post construction in coordination with the RRWD, DNR Fisheries, MPCA, and EWR.
    - Starting in 2025, monitor substrate and bathymetry.
    - Prior to project construction, begin ground monitoring cattail and reed canary grass in the Roseau River Restoration Project area floodplain.
    - Work with partners to analyze landscape changes in floodplain cover using infrared imagery such as produced by the National Agriculture Imagery Program.
- Develop surveys and monitor wildlife use pre and post construction in coordination with DNR Fisheries and MPCA.
    - Starting in 2025, monitor species occurrence of channel catfish, northern pike, and walleye.
    - Continue monitoring waterfowl use through waterfowl surveys.

    - Consider mussel surveys.
- Develop management plans to enhance riparian habitats and express native plant communities based on monitoring results.

Juneberry Project

The Big Swamp peatland/wetland complex is a vast area south of the Roseau River that was ditched in the 1900s to encourage settlement and agricultural production. The efforts were unsuccessful in the Big Swamp but the effects on the habitat complexes from the ditch network have persisted. The ditches directly drain surface water and disrupt surface flows altering plant communities and accelerating peat degradation through groundwater drawdown. This also negatively affects drainage to private land, crossover between watersheds. The Juneberry Project, in partnership with the RRWD, Two Rivers Watershed District (TRWD), Roseau County and Kittson County, seeks to eliminate the ditch effects by leveling or plugging the ditches within the project area restoring above and below ground pre-settlement hydrologic conditions within the Big Swamp. This will restore degraded habitats and benefit wildlife.

Management Objectives

- Legally abandon 25 miles of ditch by 2030
- Level or plug 15 miles of ditch.
- Restore three public water basins.
- Develop surveys and monitor hydrologic and habitat changes pre and post construction in coordination with the RRWD and the TRWD.
- Develop surveys and monitor wildlife use pre and post construction.
- Develop management plan to further suppress cattail and persistent reed canary grass.

Badger Creek Restoration Project

Badger Creek was straightened and channelized in the early 1900s. The RRWD, in partnership with the DNR seeks to provide an adequate outlet for Flood Damage Reduction projects upstream by re-meandering the outlet of Badger Creek within the bounds of Roseau River WMA.

Management Objectives

- Develop natural stream channel designs with the EWR River Ecology Unit
- Ensure design is guided by NPC classification and desired future conditions enhancing both in-stream and terrestrial habitat for wildlife.
- Ensure all damaging ecological effects are avoided.
- Develop surveys and monitor hydrologic and habitat changes pre and post construction.

Grazing and Prairie Restoration Priority Area

This area contains extensive mesic upland habitats of varying quality with a history of haying or cropping. The area could enhance wildlife habitat value through restoration and herbivory increasing habitat diversity and heterogeneity both in species and structure.

Management Objectives

- Develop grazing infrastructure (i.e., perimeter fences, gates, cattleguards, and wells) on 650 acres.
- Determine the restoration needs across the area.
- Secure funding for the prairie restoration.
- Develop surveys and monitor vegetation change pre and post development.
    - Monitor annually through photo points in each proposed paddock.
- Develop surveys and monitor changes in wildlife use over time.

Goal 2: Enhance public user facilities to deliver outdoor recreation opportunities to promote usage, to welcome new users, to maintain traditional users, and to increase user satisfaction.

Minnesota's WMAs are used for public hunting, trapping, fishing, and other activities compatible with wildlife and fisheries management. Hunting has always accounted for the largest share of public use on the Roseau River WMA, but Roseau River WMA is also used for non-hunting or fishing activities such as wildlife viewing, foraging, nature photography, winter sports, and hiking.

Roseau River WMA is managed for quality wildlife habitat to provide quality hunting, trapping, fishing and other compatible fish- and wildlife-related recreation. Dispersed recreation with minimal developed facilities will be provided as part of the outdoor recreation system in northwestern Minnesota, which, when combined with more structured recreational opportunities on other state land in the area, provides for diverse recreational opportunities.

Management Objective 2.1 Maintain, increase, and promote recreational opportunities including hunting, trapping, and dispersed camping.

- Ensure active habitat management around roads and trails to provide mixed-age class habitats in locations accessible to hunters.
- Partner with accessibility groups to identify potential accessibility projects on Roseau River WMA, as time allows.
- Upgrade one deer blind and one waterfowl blind to meet Americans with Disabilities Act standards; consider upgrades to adjacent parking lots to current ADA standards.
- Promote the Adopt-A-WMA Program in Roseau County, as time allows.
- Build and strengthen partnerships with conservation organizations and local and tribal governments.
- By 2027, replace or repair all current weathered WMA entrance signs.
- Improve MnDOT informational signs demarking the WMA boundaries.
- Maintain and improve foot access in and around Roseau River WMA.
- Improve signage for HWTs to aid hunters in navigation around Roseau River WMA.
    - Seek partnerships with other groups to maintain and improve signage for HWTs and other trails that aid hunters in navigation.
    - Consider and evaluate addition of new HWT routes.
    - Evaluate existing HWTs and identify where re-routes could improve access.

    - Consider closing HWTs that present regular maintenance issues, for example, because they are too wet.
- Continue to provide undeveloped camping opportunities.
    - Maintain and improve signage for campsite designations, rules, and notices.
- Continue to provide restrooms and increase frequency of maintenance.
    - Seek funding for restroom improvements at campsites including, but not limited to, ADA accessible pit toilets at high use areas.
- Consider addition of modest amenities at popular sites, (e.g., fire rings, picnic tables).
- Maintain and consider improvements to existing fishing opportunities.
    - Work with DNR Fisheries staff to improve shore fishing opportunities around water control structures.
    - Consider benches at popular shore fishing locations on the dike.
- Maintain and improve accesses and WMA roads.
    - Consider improvements to signage consistency and clarity at WMA access points.
- Consider additional boat ramps and improvements to existing boat ramps.
    - Design and develop the Pool 2 Second Spillway ramp.
    - Evaluate feasibility of a river access ramp off the No Name Road.
    - Evaluate improvement options for the grade of the Stub Dike 2, Pool 3, Pool 1 West, and Pool 1 East ramps.
- Repair or replace the Pool 1 Subdivision structure.
- Annually prioritize road maintenance projects and identify and improve reliability of high use roads for public access.
    - Consider closing access roads that present regular maintenance issues or negatively affect habitat or hydrology.
- Seek funding to improve the Pool 3 dike road to the Pool 3 Spillway ramp for reliable hunter access.
- Seek funding to improve the Johnson property, No Name, Clay Field and Olson's access roads.
- Seek funding to repair and improve dike infrastructure ensuring the reliability of access during hunting seasons and public events.
- Encourage township and county road authorities to submit projects for State Park Road Account consideration for the roads that provide access to Roseau River WMA.
- Develop and evaluate an access plan for the Juneberry Project.
- Improve waterfowl hunter harvest drop boxes.
- Reinstate fall waterfowl flights to improve migration reports for waterfowl hunters.

Management Objective 2.2 Maintain, increase, and promote other compatible recreational opportunities including bird watching, berry picking, and wildland solitude.

- By 2026, update Roseau River WMA brochure with area uses, regulations and maps.
    - Update Roseau River WMA public use map to include current property and sanctuary lines as well as accesses and trails in coordination with FAW Information Technology. This is a critical step toward making data public and accessible.
- Improve infrastructure around gates to facilitate access by permitted modes of transportation, for example, gravel shoulders and bollards to allow bicyclists to navigate around gates where permitted.
- Consider HWT maintenance around high use foraging times as funding and staff allow.

- Provide and updated printable bird checklist for Roseau River WMA available on the DNR webpage.
- Partner with groups like Audubon, Master Naturalists, local birders, and eBird users to promote and enhance birding opportunities and involve in surveys efforts.
    - Highlight the Pine to Prairie Birding Trail, Roseau River Water Trail and other similar opportunities through current and improved signage and outreach events such as the Roseau County Fair.
    - Surveys may include Christmas Bird Counts, Breeding Bird Surveys, and species-specific surveys on Roseau River WMA.
- Maintain the Wildlife Drive.
    - Continue to offer public dike access to the dike through seasonal wildlife drives as conditions allow.
- Assess current use and evaluate opportunities to improve public participation and experience.
    - Consider replicating historic Roseau River WMA user survey
    - Consider surveying local constituents through online and informal public interactions.
    - Collect additional data during hunter harvest reports
    - Consult with local government units on methods to reach local constituencies.
- Explore partnering with other DNR divisions and groups to create an interpretive displays and maps to compliment the wildlife drive.
    - Consider self-guided maps and brochures.

Management Objective 2.3 Continue and improve communication, coordination, and relationships with local communities, surrounding landowners, and other agencies, and develop new partnerships and collaborate with partners to expand outreach efforts.

- Continue to produce yearly reports for partners on wildlife surveys and hunting seasons.
- Maintain or expand relationships with local school districts and historical societies, as time allows.
- Continue field and career days with the Roseau Community School District.
- Seek opportunities to engage the Badger and Greenbush schools.
- Continue collaboration with local watershed districts and counties on intersecting projects or where WMA input is needed.

Management Objective 2.4 Use existing tools and identify new opportunities to engage the public, including new and diverse user groups, and encourage recreational opportunities that may be unique to Roseau River WMA (e.g., remote hunting and camping experiences, observing rare species).

- Consider addition of interpretive displays around Roseau River WMA that educate and inform area users.
- Consider partnerships with other organizations and groups for funding and development of displays.
- Work with FAW Information and Outreach to highlight and promote WMA activities, natural history observations, outdoor events, and recreational opportunities using a variety of tools including videos, social media posts, webinars, and traditional media.
- Routinely update DNR WMA website for accurate and up-to-date information.

- Continue to provide school programs, presentations, and workshops and engage new local school districts.
- Consider development and presentation of management work, progress, or research findings where applicable to local or broader professional meetings such as the Minnesota Wildlife Society, Minnesota Ornithologists' Union, or other local and regional meetings, as time allows.
- Work with local chamber of commerce, Explore Minnesota vacation and travel guide, hunting groups, local non-profits, and other local organizations to promote Roseau River WMA.

Implementation Process

Operational Overview

The management objectives and strategies laid out in this plan describe the "what" and "why" for management intended to occur on Roseau River WMA in the next 10 years, but specific operations at Roseau River WMA are dependent on several factors, including weather conditions, funding, and changing priorities. To allow flexibility in the operational plan, the "who," "when," and "how" of specific work activities will be determined annually by unit staff in conjunction with division-wide annual work planning. Table 21 shows an overview of ongoing annual work activities that are performed at Roseau River WMA in a typical year. The table reflects the month(s) when the workload for each activity is the highest; most activities also occur outside of the listed months.

Table 21. Overview of ongoing annual work activities performed at Roseau River WMA in a typical year

Activity/Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rx burning				X	X	X		X	X	X		
Brush spraying							X	X	X	X		
Brush mowing	X	X	X			X	X	X	X	X	X	X
Brush shearing	X	X	X									
Food plot spraying				X	X	X	X	X				
Food plot development				X	X	X	X	X				
Boundary posting	X									X	X	X
Farming agreement administration	X	X										X
Grazing agreement administration	X	X										X
Deer goal setting	x				x							x
Deer season									x	x	x	x
Small game season									x	x	x	x
Furbearer registration	x				x							x
Gate and Sign Repair	x	x	x	x	x	x	x	x	x	x	x	x
Invasive species control				x	x	x	x	x	x	x		
Mow Trails, Campgrounds, and Parking Lots						x	x	x				
Install firebreaks	x									x	x	x
Nuisance animal management	x	x			x					x		
Project proposals	x	x										

Activity/Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scent post survey									x			
Prairie planting			x	x					x	x		
Grazing management						x	x	x	x			
Road Repair and Maintenance					x	x	x	x	x	x		
Rx burn plan development	x											X
Rx burn equipment prep			x	x								
Site emergency plan – review & update	x											
Timber harvest	x	x	x									x
Timber sale supervision	x	x	x	x							x	X
Timber stand exam reviews									x	x		
Trapping season	x	x	x	x	x					x	x	x
Waterfowl banding								x	x			
Water level monitoring and management			x	x	x	x	x	x	x	x	x	X
Dike monitoring and repair				x	x	x	x	x	x	x	x	
Mow dikes							x		x			
Cattail spraying							x	x				
Physical inventory	x											x
Professional training/development	x	X	x	x	x	x	x	x	x	x	x	x
Headquarters operations	x	x	x	x	x	x	x	x	x	x	x	x
Public Information and Outreach	x	x	x	x	x	x	x	x	x	x	x	x
Wildlife drives					x		x	x				x
County fair outreach							x					
Water Control Structure Maintenance and Monitoring			x	x	x	x	x	x	x	x	x	x
OHF – project proposals				x	x							
Waterfowl bag counts									X	X	X	

Activity/Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beaver colony surveys											X	
Ruffed grouse surveys					X							
Waterfowl brood counts						X	X					
Waterfowl breeding pair survey					x							
August roadside surveys								X				
Winter track surveys	X											X
Owl survey			X	X								
Muskrat house survey			X									
Wood cock singing survey					X							
Vegetation sampling							X	X				
Small mammal trapping									X			
Bear food survey						X	X	X	X			
Sharp tailed grouse dancing survey				X								
Dead deer survey				X								
Wood duck nest Box survey	X	X										

Adaptive Management

Adaptive management incorporates new or untried knowledge, techniques, or policy decisions into previously existing management actions. Many of these changes cannot be planned, but some can be anticipated. Adaptive management for Roseau River WMA will include:

- Continuously review, research, and monitoring results and build off the results to improve habitat restoration and management techniques, maximize wildlife benefit, and increase user satisfaction.
- Collaborate with other divisions and partners to continue, improve, and expand research and monitoring projects.
- Monitor advances in climate change predictions and mitigation and implement management directions accordingly. Examples of sources of climate change and habitat management information might come from NIACS, Minnesota Forest Resources Council and various state universities.
- Modify management activities if new species are listed as state or federally threatened or endangered.

The management objectives and strategies set forth in this document will be reviewed annually by regional and area staff and adjusted, as necessary. A revision of the master plan is recommended after 10 years.

Research and Monitoring

Current and future research and monitoring projects at Roseau River WMA involve intra-agency cooperation between WMA staff and other DNR staff including, but not limited to, FAW Research program staff, FAW Populations & Regulations program staff, and EWR Nongame program staff. The DNR also collaborates with various other governmental organizations, academic institutions, and non-governmental organization partners.

Current Research and Monitoring

Wildlife Monitoring

- 10-year fisheries stream surveys
- Ruffed grouse drumming surveys
- Woodcock singing grounds surveys
- Sharp-tailed grouse lek surveys
- Western great lakes owl surveys
- Predator scent post surveys
- Winter track count surveys
- Wood duck nest box surveys
- Waterfowl brood surveys
- Waterfowl breeding pair surveys
- Muskrat house surveys
- Beaver colony surveys
- Deer winter severity surveys
- Bear food surveys
- August Roadside Surveys
- Small mammal surveys

Public Use Monitoring

- Waterfowl hunter bag check surveys
- Furbearer Trapping permits
- Furbearer registration
- ADA blind permits

Vegetation/Habitat Monitoring

- Weekly invasive species surveys
- Annual submerged aquatic vegetation surveys
- Fisheries stream survey
- Forest inventory surveys

Hydrological Monitoring

- Weekly water level monitoring in impoundments
- Water level monitoring of MSUs
- Water level monitoring of shallow wetlands

Research

- Waterfowl banding
- Bat survey with University of Illinois
- HPAI research with University of Georgia
- Marsh tern research with NRRI

Potential Research and Monitoring

- Complete NPC surveys
- Waterfowl use and nest success of aerial cattail treatment areas – using IR-UAV technology to monitor sprayed vs untreated sites
- Effects of herbicide treatments on ecosystem health and invertebrates
- Is non-native cattail encroachment affected by soil and water chemistry
- Is water chemistry altered through large scale aerial cattail treatments
- Long-term effectiveness of different treatments in cattail-chocked wetlands
- Muskrat population dynamics and cause specific mortality in NW Minnesota
- Effects of non-native cattail encroachment on muskrat use and survival
- Survey for and monitor boreal chickadee, Connecticut warbler, and golden-winged warbler populations via point counts.
- Research and monitor spruce grouse occupancy through Cantu calls or roadside surveys during April. Consider putting out grit stations.
- Monitor for great gray owl occurrences via call stations.
- Periodic shallow lakes monitoring
- Survey for and monitor yellow rails and Nelson's sparrows.
- Trumpeter swan research – territoriality and conflict with Canada geese
- Trumpeter swan population growth and management opportunities
- Expand FOR's forest health aerial surveys into Roseau River WMA
- Hydrologic and vegetative monitoring of the Pool 2 spoil bank breaks
- Establish point counts for breeding birds in forested and wetland habitats
- Hydrologic and vegetative monitoring of the Juneberry restoration and other wetland/peatland restoration areas
- Establish a continuous monitoring weather station.
- Lynx tracking and genetics study with USFWS
- Conduct trap grid surveys for Northern Bog Lemmings.
- Erect a MOTUS tower for tracking tagged migratory birds.
- Monitor Moose populations through aerial surveys

- Monitoring fish population and fish habitat change over time from Roseau River Restoration Project
- Mussel survey of the Roseau River
- Songbird nest box surveys
- Assess public use through car counts of seasonal wildlife drives
- Camera trap monitoring of wildlife response to shrubland treatments

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Appendix A. Roseau River WMA Planning Team Members

Name	Division	Position
Dave Trauba	FAW	Wildlife Section Manager
Blane Klemek	FAW	Regional Wildlife Manager
Jesse Roberts	FAW	Assistant Regional Wildlife Manager
Kelly Wilder	FAW	Policy and Planning Supervisor
Greta Brandt	FAW	Policy and Planning Coordinator
Kerry Ross	OSD	Regional Planner
Tom Enright	FAW	Area Wildlife Manager
Evangelin Von Boeckman	FAW	Assistant Area Wildlife Manager
Nick Brown	FAW	Wildlife Lakes/Red River Basin Specialist
Michael North	FAW	Forest Wildlife Coordinator
Matt Skoog	FAW	Area Fisheries Supervisor
Chad Jacobson	FOR	Regional Timber Specialist
Rebecca Rickaby	FOR	Assistant Area Forestry Supervisor
Stephanie Klamm	EWR	Area Hydrologist
Adam Maleski	EWR	Regional Nongame Specialist
Becky Marty	EWR	Regional Ecologist
Cindy Lueth	PAT	Regional Resource Management Supervisor
Ben Huener	ENF	Roseau Conservation Officer
Kristi Coughlon	OSD	Regional Information Officer
Cheryl Kelley-Dobie	LAM	Assistant Director - Lands
Pam Arndt	LAM	Regional Realty Specialist – Lands

Appendix B. Summary of Public Responses Received During Early Public Scoping

The DNR conducted a public scoping questionnaire on Roseau River WMA from Sept. 30 to Nov. 15, 2024. The questionnaire was advertised via media, the DNR homepage, and printed flyers. It was voluntary, informal, and not randomized. There were 47 respondents.

Findings emerging from the survey included the following:

- 91% of respondents had used Roseau River WMA, and 68% had used it within the past two years.
- 91% of respondents who had used Roseau River WMA participated in hunting activities at the unit.
    - Waterfowl hunting, grouse hunting, and deer hunting were the most popular hunting activities reported.
- 21% of respondents who had used Roseau River WMA participated in trapping activities at the unit.
    - The October-November trapping period was the most reported period.
    - 78% of respondents who trapped at Roseau River WMA reported trapping 4 or more days per year.
    - Muskrat, beaver, coyote, skunk, bobcat, and mink were the most common species reported to be trapped.
- 53% of respondents who had used Roseau River WMA participated in fishing activities at the unit.
- 26% of respondents who had used Roseau River WMA participated in foraging activities at the unit.
    - 54% of respondents who foraged at Roseau River WMA reported foraging 4 or more days per year.
    - Mushrooms and berries were the most common foraged resources reported.
- Other popular activities enjoyed at Roseau River WMA include:
    - Enjoying solitude/relaxing in the outdoors
    - Viewing or photographing wildlife and/or nature
    - Bird watching
    - Hiking
    - Boating, canoeing, and/or kayaking
    - Outdoor cultural and/or spiritual activities
    - Deer shed hunting
    - Skiing/snowshoeing
- 65% of respondents who had used Roseau River WMA described the overall quality of their visit(s) as “good” or “very good”.
- When asked what they liked most about their visit(s) to Roseau River WMA, responses included:
    - Solitude
    - Wildlife abundance & diversity
    - Size
    - Waterfowl hunting
    - Quiet, free, and well-maintained campgrounds
    - Deer hunting

    - Access
    - Quality trails
    - Grouse hunting
    - Wildlife viewing
    - Extensive wetland system
    - New Pool 3 boat launch
    - No motorized areas
- When asked what could be done to improve the quality of their visits to Roseau River WMA, respondents mentioned the following themes:
    - Improved unit access
    - More trails and trail maintenance
    - Reduced cattail density and eliminate floating mats of cattails
    - More food plots
    - Increased prescribed burns
    - Reduced wild rice density in Pool 2 & 3
    - Enhanced facilities
    - More areas/opportunities for waterfowl hunting
    - More educational signage
    - More information on public involvement
- 81% of respondents reported they were “likely” or “very likely” to use Roseau River WMA in the next year.
- 6% of respondents reported they were “very unlikely” to use Roseau River WMA in the next year, with location and lack of wildlife as the main reasons.
- Respondents ranked game species abundance, wildlife health, water level management, invasive species management, and wildlife food plots as the top 5 priorities for natural resource management at Roseau River WMA.
- Respondents ranked climate change resilience, enforcement, and fish biodiversity as the bottom three priorities for natural resource management at Roseau River WMA.

Appendix C. Summary of Responses Received During Public Review

Appendix D. Acronyms Used in Roseau River WMA Plan

Acronym	Definition
ADA	Americans with Disabilities Act
ATV	All-terrain vehicle
BMP	Best management practices
CFA	Cooperative farming agreement
cfs	Cubic feet per second
CHZ	Controlled hunting zone
CWD	Chronic wasting disease
DNR	Minnesota Department of Natural Resources
DPA	Deer Permit Area
dps	Drums per stop
EAB	Emerald ash borer
ECS	Ecological Classification System
EDDMapS	Early Detection Distribution and Mapping System
EHD	Epizootic hemorrhagic disease
ELB	Eastern larch beetle
END	Endangered
ESDM	Eastern spruce dwarf mistletoe
EWR	Ecological and Water Resources Division
FAW	Fish and Wildlife Division
FOR	Forestry Division
FTC	Forest tent caterpillar
GFF	Game and Fish Fund
HPAI	Highly Pathogenic Avian Influenza
HWT	Hunter Walking Trails
LAP	Lake Agassiz Aspen Parklands

Acronym	Definition
LCCMR	Legislative-Citizen Commission on Minnesota Resources
LMF	Laurentian Mixed Forest
LTE	Laborer, Trades and Equipment
MAWQCP	Minnesota Agricultural Water Quality Certification Program
MBS	Minnesota Biological Survey
MnDOT	Minnesota Department of Transportation
MNWAP	Minnesota's Wildlife Action Plan
MOA	Management Opportunity Area
MPCA	Minnesota Pollution Control Agency
MSU	Moist soil unit
NHIS	Natural Heritage Information Systems
NIACS	Northern Institute of Applied Climate Science
NPC	Native Plant Community
NRRI	University of Minnesota Duluth Natural Resources Research Institute
OAS	Office and Administrative Specialist
OHF	Outdoor Heritage Fund
OHV	Off-highway vehicle
P-R	Pittman-Robertson Wildlife Restoration Act
PAT	Parks and Trails Division
RMZ	Riparian Management Zone
RRWD	Roseau River Watershed District
SGCN	Species of Greatest Conservation Need
SNA	Scientific and Natural Area
SPC	Species of Special Concern
SSURGO	Soil Survey Geographic Database
TAP	Tallgrass Aspen Parklands

Acronym	Definition
THR	Threatened
TNC	The Nature Conservancy
TRWD	Two Rivers Watershed District
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTV	Utility Terrain Vehicle
VHS	Viral Hemorrhagic Septicemia
WAHMA	Wildlife and Aquatic Habitat Management Application
WMA	Wildlife Management Area
WNS	White-nose syndrome
WNV	West Nile virus
WSI	Winter Severity Index

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Appendix E. Conservation Status Ranks

Rank Code	Rank Label	Rank Description
S1	Critically Imperiled	At very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.
S2	Imperiled	At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
S3	Vulnerable	At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
S4	Apparently Secure	Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure	Common; widespread and abundant.

Appendix F. Bird Species Known to Occur at Roseau River WMA

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Snow goose	*Anser caerulescens*	A		A		
Ross's goose	*Anser rossii*	R		R		
Greater White-fronted Goose	*Anser albifrons*	R		R		
Cackling goose	*Branta hutchinsii*	U		U		
Canada goose	*Branta canadensis*	A	A	A		*
Trumpeter swan	*Cygnus buccinator*	U	U	U		*
Tundra swan	*Cygnus columbianus*	C		C		
Wood duck	*Aix sponsa*	C	C	C		*
Blue-winged Teal	*Spatula discors*	A	A	A		*
Cinnamon teal	*Anas cyanoptera*	R				
Northern shoveler	*Spatula clypeata*	C	C	C		*
Gadwall	*Mareca strepera*	C	C	C		*
American wigeon	*Mareca amaericana*	C	C	C		*
Mallard	*Anas platyrhynchos*	A	A	A		*
American black duck	*Anas rubripes*	U	R	U		?
Northern pintail	*Anas acuta*	C	U	C		*
Green-winged Teal	*Anas carolinensis*	C	C	C		*
Canvasback	*Aythya valisineria*	C	C	C		*
Redhead	*Aythya americana*	C	C	C		*
Ring-necked duck	*Aythya collaris*	A	A	A		*
Greater scaup	*Aythya marila*	U		U		
Lesser scaup	*Aythya affinis*	C	R	C		*
White-winged scoter	*Melanitta deglandi*	R		R		
Bufflehead	*Bucephala albeola*	C	U	C		*
Common goldeneye	*Bucephala clangula*	C	U	C		*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Hooded merganser	*Lophodytes cucullatus*	C	C	C		*
Common merganser	*Mergus merganser*	C	R	C		
Red-breasted Merganser	*Mergus serrator*	U		U		
Ruddy duck	*Oxyura jamaicensis*	C	C	C		*
Wild turkey	*Meleagris gallopavo*	U	U	U	R	
Ruffed grouse	*Bonasa umbellus*	C	C	C	C	*
Spruce grouse	*Canachites canadensis*	R	R	R	R	
Sharp-tailed grouse	*Tympanuchus phasianellus*	C	C	C	C	*
Gray partridge (introduced)	*Perdix perdix*	U	U	U	U	*
Ring-necked pheasant (introduced)	*Phasianus colchicus*	R	R	R	R	
Pied-billed grebe	*Podilymbus podiceps*	A	A	A		*
Horned grebe	*Podiceps auritus*	U	U	U		*
Red-necked grebe	*Podiceps grisegena*	C	C	C		*
Eared grebe	*Podicps nigricollis*	C	C	C		*
Western grebe	*Aechmophorus occidentalis*	U	U	U		*
Rock pigeon (introduced)	*Columba livia*	C	C	C	C	*
Mourning dove	*Zenaida macroura*	C	C	C		*
Black-billed cuckoo	*Coccyzus erthropthalmus*	U	U	U		*
Common nighthawk	*Chordeiles minor*	C	C	C		*
Eastern whip-poor-will	*Antrostomus vociferus*	C	U	C		*
Chimney swift	*Chaetura pelagica*	U	U	U		
Ruby-throated hummingbird	*Archilocus colubris*	C	C	C		*
Virginia rail	*Rallus limicola*	C	C	C		*
Sora	*Porzana carolina*	C	C	C		*
American coot	*Fulica americana*	C	C	C		*
Yellow rail	*Coturnicops noveboracensis*	U	U	U		*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Sandhill crane	*Antigone canadensis*	C	C	C		*
American avocet	*Recurvirostra americana*	R	R	R		*
Black-bellied plover	*Pluvialis squatarola*	U	R	U		
American golden-plover	*Pluvialis dominica*	C	R	C		
Killdeer	*Charadrius vociferus*	A	A	A		*
Semipalmated plover	*Charadrius semipalmatus*	U	R	U		
Upland sandpiper	*Bartramia longicauda*	U	U	U		*
Whimbrel	*Numenius phaeopus*	R		R		
Hudsonian godwit	*Limosa haemastica*	R		R		
Marbled godwit	*Limosa fedoa*	C	C	C		*
Ruddy turnstone	*Arenaria interpres*	U		U		
Stilt sandpiper	*Calidris himantopus*	U	R	U		
Sanderling	*Calidris alba*	U		U		
Dunlin	*Calidris alpina*	U	R	U		
Baird's sandpiper	*Calidris bairdii*	U	R	U		
Least sandpiper	*Calidris minutilla*	C		C		
White-rumped sandpiper	*Calidris fuscicollis*	C	R	C		
Buff-breasted sandpiper	*Tryngites subruficollis*	R		R		
Pectoral sandpiper	*Calidris melanotos*	C		C		
Semipalmated sandpiper	*Calidris pusilla*	C	R	C		
Short-billed dowitcher	*Limnodromus griseus*	U		U		
Long-billed dowitcher	*Limnodromus scolopaceus*	U		U		
American woodcock	*Scolopax minor*	C	C	C		*
Wilson's snipe	*Gallinago delicata*	A	A	A		*
Spotted sandpiper	*Acctitis macularius*	U	U	U		*
Solitary sandpiper	*Tringa solitaria*	U		U		

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Lesser yellowlegs	*Tringa flavipes*	A	R	A		
Willet	*Tringa semipalmata*	R		R		
Greater yellowlegs	*Tringa melanoleuca*	U		U		
Wilson's phalarope	*Phalaropus tricolor*	U	U	U		*
Red-necked Phalarope	*Phalaropus lobatus*			R		
Bonaparte's gull	*Chroicocephalus philadelphia*	R		R		
Franklin's gull	*Leucophaeus pipixcan*	C	U	C		
Ring-billed gull	*Larus delawarensis*	C	U	C		
Herring gull	*Larus smithsonianus*	C	U	C		
Caspian tern	*Hydroprogne caspia*	U	R	U		
Black tern	*Chlidonias niger*	C	C	C		
Common tern	*Sterna hirundo*	U	U	U		
Forster's tern	*Sterna forsteri*	C	C	C		
Common loon	*Gavia immer*	C	C	C		*
Double-crested cormorant	*Nannopterum auritum*	C	C	C		*
American white pelican	*Pelecanus erythrorhynchos*	C	C	C		
Least bittern	*Ixobrychus exillis*	U	U	U		
American bittern	*Botaurus lentiginosus*	C	C	C		*
Black-crowned night heron	*Nycticorax nycticorax*	U	U	U		*
Green heron	*Butorides virescens*	U	U	U		
Great egret	*Ardea alba*	U	U	U		
Western cattle-egret	*Ardea ibis*	R	R	R		
Great blue heron	*Ardea herodias*	C	C	C		*
Turkey vulture	*Cathartes aura*	C	C	C		
Osprey	*Pandion haliaetus*	R	R	R		

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Golden eagle	*Aquila chrysaetos*	U	R	U	R	
Northern harrier	*Circus hudsonius*	A	A	A		*
Sharp-shinned hawk	*Accipiter striatus*	U	U	U		*
Cooper's hawk	*Astur cooperii*	U	U	U		*
American goshawk	*Accipiter gentilis*	R	R	R	R	*
Bald eagle	*Haliaeetus leucocephalus*	C	C	C		*
Broad-winged hawk	*Buteo platypterus*	C	C	C		*
Swainson's hawk	*Buteo swainsoni*	U		R		
Red-tailed hawk	*Buteo jamaicensis*	C	C	C		*
Rough-legged hawk	*Buteo lagopus*	A		A	U	
Great horned owl	*Bubo virginianus*	C	C	C	U	*
Snowy owl	*Bubo scandiacus*			U	U	
Northern hawk-owl	*Surnia ulula*	R		R	U	
Barred owl	*Strix varia*	C	C	C	C	*
Great gray owl	*Strix nebulosa*	U	U	U	U	*
Long-eared owl	*Asio otus*	U	R	U		
Short-eared owl	*Asio flammeus*	C	C	C		*
Boreal owl	*Aegolius funereus*			R	R	
Northern saw-whet owl	*Aegolius acadicus*	U	U	U		*
Belted kingfisher	*Megaceryle alcyon*	C	C	C		*
Red-headed woodpecker	*Melanerpes erythrocephalus*	U	U	U		
Red-bellied woodpecker	*Melanerpes carolinus*				R	
Yellow-bellied sapsucker	*Sphyrapicus varius*	C	C	U		*
Black-backed woodpecker	*Picoides arcticus*	R	R	R	R	
Downy woodpecker	*Dryobates pubescens*	U	U	U	U	*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Hairy woodpecker	*Picoides villosus*	C	C	C	C	*
Northern flicker	*Colaptes auratus*	C	C	C		*
Pileated woodpecker	*Dryocopus pileatus*	C	C	C	C	*
American kestrel	*Falco sparverius*	C	C	C		*
Merlin	*Falco columbarius*	C	C	C		*
Gyrfalcon	*Falco rusticolus*	R			R	
Peregrine falcon	*Falco peregrinus*	C		C		
Prairie falcon	*Falco mexicanus*	R				
Great crested flycatcher	*Myiarchus crinitus*	C	C	C		*
Western kingbird	*Tyrannus verticalis*	U	R	U		
Eastern kingbird	*Tyrannus tyrannus*	C	C	C		*
Olive-sided flycatcher	*Contopus cooperi*	U	U	U		*
Eastern wood-pewee	*Contopus virens*	C	C	C		*
Yellow-bellied flycatcher	*Empidonax flaviventris*	U	U	U		*
Alder flycatcher	*Empidonax alnorum*	C	C	C		*
Willow flycatcher	*Empidonax traillii*	U	U	U		
Least flycatcher	*Empidonax minimus*	C	C	C		*
Eastern phoebe	*Sayornis phoebe*	C	C	C		*
Yellow-throated vireo	*Vireo flavifrons*	C	C	C		*
Blue-headed vireo	*Vireo solitarius*	C	C	U		*
Philadelphia vireo	*Vireo philadelphicus*	U		U		
Warbling vireo	*Vireo gilvus*	U	U	U		*
Red-eyed vireo	*Vireo olivaceus*	C	C	C		*
Northern shrike	*Lanius excubitor*	U		U	U	
Canada jay	*Perisoreus canadensis*	U	U	U	U	*
Blue jay	*Cyanocitta cristata*	C	C	C	C	*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Black-billed magpie	*Pica hudsonia*	C	C	C	C	*
American crow	*Corvus brachyrhynchos*	A	A	A	R	*
Common raven	*Corvus corax*	C	C	C	C	*
Black-capped chickadee	*Poecile atricapillus*	C	C	C	C	*
Boreal chickadee	*Poecile hudsonicus*	U	U	U	U	*
Horned lark	*Eremophila alpestris practicola*	A	U	U		*
Bank swallow	*Riparia riparia*	U	U	U		*
Tree swallow	*Tachycineta bicolor*	A	A	C		*
No. rough-winged swallow	*Stelgidopteryx serripennis*	U	R	U		*
Purple martin	*Progne subis*	R	R	R		*
Barn swallow	*Hirundo rustica*	A	A	A		*
Cliff swallow	*Petrochelidon pyrrhonota*	A	A	A		*
Ruby-crowned kinglet	*Regulus calendula*	U	U	U		*
Golden-crowned kinglet	*Regulus satrapa*	C	C	C	U	*
Bohemian waxwing	*Bombycilla garrulus*			U	U	
Cedar waxwing	*Bombycilla cedrorum*	C	C	C	R	*
Red-breasted nuthatch	*Sitta canadensis*	U	U	U	U	*
White-breasted nuthatch	*Sitta carolinensis*	C	C	C	C	*
Brown creeper	*Certhia americana*	U	U	U		*
Northern house wren	*Troglodytes aedon*	U	C	U		*
Winter wren	*Troglodytes hiemalis*	U	U	U		*
Sedge wren	*Cistothorus platensis*	A	A	A		*
Marsh wren	*Cistothorus palustris*	A	A	A		*
Gray catbird	*Dumetella carolinensis*	C	C	C		*
Brown thrasher	*Toxostoma rufum*	C	C	C		*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
European starling (introduced)	*Sturnus vulgaris*	C	C	C	C	*
Eastern bluebird	*Sialia sialis*	U	U	C		*
Mountain bluebird	*Salia currucoides*	R		R		
Veery	*Catharus fuscescens*	C	C	C		*
Gray-cheeked thrush	*Catharus minimus*	U		U		
Swainson's thrush	*Catharus ustulatus*	U	U	U		*
Hermit thrush	*Catharus guttatus*	C	U	U		*
Wood thrush	*Hylocichla mustelina*	U	U	U		*
American robin	*Turdus migratorius*	A	A	A		*
House sparrow (introduced)	*Passer domesticus*		C	C	C	*
American pipit	*Anthus rubescens*	U		C		
Evening grosbeak	*Coccothraustes vespertinus*		R	R	R	
Pine grosbeak	*Pinicola enucleator*	R		U	U	
House finch (introduced)	*Haemorhous mexicanus*		R			
Purple finch	*Haemorhous purpureus*	C	U	U	C	*
Redpoll	*Acanthis flammea*	A		C	C	
Red crossbill	*Loxia curvirostra*	U		R	R	
White-winged crossbill	*Loxia leucoptera*	U		R	R	
Pine siskin	*Spinus pinus*	U	U	U	C	
American goldfinch	*Spinus tristis*	A	A	A	U	*
Lapland longspur	*Calcarius lapponicus*	C		C	U	
Snow bunting	*Plectrophenax nivalis*	A		A	A	
Grasshopper sparrow	*Ammodramus savannarum*	C	C	C		*
Lark sparrow	*Chondestes grammacus*	U	U			
Chipping sparrow	*Spizella passerina*	C	C	C		*
Clay-colored sparrow	*Spizella pallida*	A	A	A		*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Fox sparrow	*Passerella iliaca*	A		C		
American tree sparrow	*Spizelloides arborea*	C		R		
Dark-eyed junco	*Junco hyemalis*	A	R	A	R	*
White-crowned sparrow	*Zonotrichia leucophrys*	C		C		
Harris's sparrow	*Zonotrichia querula*	U		U		
White-throated sparrow	*Zonotrichia albicollis*	C	C	A		*
Vesper sparrow	*Pooecetes gramineus*	C	C	C		*
Leconte's sparrow	*Ammospiza leconteii*	A	C	C		*
Nelson's sparrow	*Ammospiza nelsoni*	U	C	U		*
Savannah sparrow	*Passerculus sandwichensis*	A	A	A		*
Song sparrow	*Melospiza melodia*	A	A	A		*
Lincoln's sparrow	*Melospiza lincolnii*	C	U	U		*
Swamp sparrow	*Melospiza georgiana*	U	C	C		*
Eastern towhee	*Pipilo erythrophthalmus*	U	U	U		*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	C	C	C		*
Bobolink	*Dolichonyx oryzivorus*	A	C	C		*
Eastern meadowlark	*Sturnella magna*	R	R	R		
Western meadowlark	*Sturnella neglecta*	C	C	C		*
Orchard oriole	*Icterus spurius*	R	R			
Baltimore oriole	*Icterus galbula*	C	C	C		*
Red-winged blackbird	*Agelaius phoeniceus*	A	A	A		*
Brown-headed cowbird	*Molothrus ater*	C	C	C		*
Rusty blackbird	*Euphagus carolinus*	U		U		
Brewer's blackbird	*Euphagus cyanocephalus*	C	C	C		*
Common grackle	*Quiscalus quiscula*	C	C	A		*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Ovenbird	*Seirus aurocapilla*	C	C	C		*
Northern waterthrush	*Parkesia noveboracensis*	U	U	U		*
Golden-winged warbler	*Vermivora chrysoptera*	R	R			*
Black-and-white warbler	*Mniotilta varia*	C	C	C		*
Tennessee warbler	*Leiothlypis peregrina*	U	U	U		*
Orange-crowned warbler	*Leiothlypis celata*	U		U		
Nashville warbler	*Leiothlypis ruficapilla*	C	C	C		*
Connecticut warbler	*Oporornis agilis*	U	U	U		*
Mourning warbler	*Geothlypis philadelphia*	U	U	U		*
Common yellowthroat	*Geothlypis trichas*	C	C	C		*
American redstart	*Setophaga ruticilla*	C	C	C		*
Cape may warbler	*Setophaga tigrina*	U	U	U		
Northern parula	*Setophaga americana*	U	R	U		*
Magnolia warbler	*Setophaga magnolia*	U	U	U		*
Bay-breasted warbler	*Setophaga castanea*	U	R	U		
Blackburnian warbler	*Setophaga fusca*	U	U	U		*
Yellow warbler	*Setophaga petechia*	A	A	A		*
Chestnut-sided warbler	*Setophaga pensylvanica*	C	C	C		*
Blackpoll warbler	*Setophaga striata*	R		R		
Palm warbler	*Setophaga palmarum*	U	U	U		*
Pine warbler	*Setophaga pinus*	R	R	R		
Yellow-rumped warbler	*Setophaga coronata*	A	C	A		*
Black-throated green warbler	*Setophaga virens*	U	U	U		*
Canada warbler	*Cardellina canadensis*	U	U	U		*
Wilson’s warbler	*Cardellina pusilla*	U		U		
Scarlet tanager	*Piranga oliveacea*	R	R	R		*

Common Name	Scientific Name	Spring	Summer	Fall	Winter	Nest
Rose-breasted grosbeak	*Pheucticus ludovicianus*	C	C	U		*
Indigo bunting	*Passerina cyanea*	R	R	R		*
Dickcissel	*Spiza americana*	R	R	R		*
Black-bellied whistling-duck	*Dendrocygna autumnalis*					
Eurasian collared dove	*Streptopelia decaocto*					
Black-necked stilt	*Himantopus mexicanus*					
Red phalarope	*Phalaropus fulicarius*					
Little blue heron	*Egretta caerulea*					
White-faced Ibis	*Pleagadis chihi*					
Red-shouldered hawk	*Buteo lineatus*					
Ferruginous hawk	*Buteo regalis*					
Eastern screech-owl	*Megascops asio*					
Burrowing owl	*Athene cunicularia*					
Loggerhead shrike	*Lanius ludovicianus*					
Spaque's pipit	*Anthus spragueii*					
Chestnut-collared longspur	*Calcarius ornatus*					
Field sparrow	*Spizella pusilla*					
Baird's sparrow	*Centronyx bairdii*					

Appendix G. Mammal Species Known to Occur at Roseau River WMA

Common Name	Scientific Name	Game Species	State Status	Federal Status
Masked shrew	*Sorex cinereus*			
American water shrew	*Sorex palustris*			
Arctic shrew	*Sorex arcticus*			
Eastern pygmy shrew	*Sorex hoyi*			
Northern short-tailed shrew	*Blarina brevicauda*			
Prairie shrew	*Sorex haydeni*			
Star-nosed Mole	*Condylura cristata*			
Little brown myotis	*Myotis lucifugus*		SPC	
Northern long-eared myotis	*Myotis septentrionalis*		SPC	END
Silver-haired bat	*Lasionycteris noctivigans*		SGCN	
Big brown bat	*Eptesicus fuscus*		SPC	
Eastern red bat	*Lasiurus borealis*		SGCN	
Northern hoary bat	*Lasiurus cinereus*		SGCN	
Snowshoe hare	*Lepus americanus*	X		
White-tailed jack rabbit	*Lepus townsendii*	X	SGCN	
Eastern cottontail	*Sylvilagus floridanus*	X		
Eastern chipmunk	*Tamias striatus*			
Woodchuck	*Marmota monax*			
Thirteen-lined ground squirrel	*Ictidomys tridecemlineatus*			
Franklin's ground squirrel	*Poliocitellus franklinii*		SGCN	
Eastern gray squirrel	*Sciurus carolinensis*	X		
North American red squirrel	*Tamiasciurus hudsonicus*			
Northern flying squirrel	*Glaucomys sabrinus*			
Plains pocket gopher	*Perognathus flavescens*		SPC	
North American beaver	*Castor canadensis*	X		

Common Name	Scientific Name	Game Species	State Status	Federal Status
Eastern deer mouse	*Peromyscus maniculatus*			
White-footed deer mouse	*Peromyscus leucopus*			
Southern red-backed vole	*Clethrionomys gapperi*			
Eastern meadow vole	*Microtus pennsylvanicus*			
Common muskrat	*Ondatra zibethicus*	X		
Southern bog lemming	*Synaptomys cooperi*			
Northern bog lemming	*Synaptomys borealis*		SPC	
Brown rat	*Rattus norvegicus*			
House mouse	*Mus musculus*			
Northern meadow jumping mouse	*Zapus hudsonius*			
North American porcupine	*Ererthizon dorsatum*			
Coyote	*Canis latrans*	X		
Gray wolf	*Canis lupus*			
Red fox	*Vulpes vulpes*	X		
Northern gray fox	*Urocyon cinereoargenteus*	X		
American black bear	*Ursus americanus*	X		
Northern raccoon	*Procyon lotor*	X		
Fisher	*Pekania pennanti*	X		
American ermine	*Mustela erminea*	X		
Least weasel	*Mustela nivalis*		SPC	
Long-tailed weasel	*Mustela frenata*	X		
American mink	*Neovision vision*	X		
American badger	*Taxidea taxus*	X	SGCN	
Striped skunk	*Mephitis mephitis*			
North American river otter	*Lantra canadensis*	X		
Canadian lynx	*Lynx canadensis*		SPC	THR

Common Name	Scientific Name	Game Species	State Status	Federal Status
Bobcat	*Lynx rufus*	X		
White-tailed deer	*Odocoileus virginianus*	X		
Moose	*Alces alces*		SPC	
Elk	*Cervus elaphus*	X	SPC	
Puma	*Felis concolor*		SPC	

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Appendix H. Fish Species Know to Occur at Roseau River WMA

Common Name	Scientific Name
Black crappie	*Poxomis nigromaculatus*
Blackside darter	*Percina maculata*
Bluegill	*Lepomis macrochirus*
Brook stickleback	*Culaea inconstans*
Burbot	*Lota lota*
Central mudminnow	*Umbra limi*
Channel catfish	*Ictalurus punctatus*
Chestnut lamprey	*Ichthyomyzon castaneus*
Common carp	*Cyprinus carpio*
Common shiner	*Luxilus cornutus*
Creek chub	*Semotilus atromaculatus*
Fathead minnow	*Pimephales promelas*
Freshwater drum	*Aplodinotus grunniens*
Golden redhorse	*Moxostoma erythrurum*
Goldeye	*Hiodon alosoides*
Johnny darter	*Etheostoma nigrum*
Lake sturgeon*	*Acipenser fulvescens*
Longnose dace	*Rhinichthys cataractae*
Northern pearl dace	*Margariscus nachtriebi*
Northern pike	*Esox lucius*
Northern redbelly dace	*Chrosomus eos*
Quillback	*Carpiodes cyprinus*
Rock bass	*Ambloplites rupestris*
Sand shiner	*Notropis stramineus*
Sauger	*Sander canadensis*

Common Name	Scientific Name
Shorthead redhorse	*Moxostoma macrolepidotum*
Spotfin shiner	*Cyprinella spiloptera*
Stonecat	*Noturus flavus*
Tadpole madtom	*Noturus gyrinus*
Trout perch	*Percopsis omiscomaycus*
Walleye	*Sander vitreus*
White sucker	*Catostomus comersonii*
Yellow perch	*Perca flavescens*

*Lake sturgeon is a Minnesota Species of Special Concern. No other fish species on the list are state listed.

Appendix I. Amphibian and Reptile Species Know to Occur at Roseau River WMA

Taxa	Common Name	Scientific Name	State Status
Reptile	Painted turtle	*Chrysemys picta*	
Reptile	Snapping turtle	*Chelydra serpentina*	
Reptile	Common garter snake	*Thamnophis sirtalis*	
Reptile	Plains garter snake	*Thamnophis radix*	
Reptile	Red-bellied snake	*Storeria occipitomaculata*	
Reptile	Smooth green snake	*Opheodrys vernalis*	SGCN
Reptile	Prairie skink	*Plestiodon septentriaonalis*	
Amphibian	American toad	*Anaxyrus americanus*	
Amphibian	Great plains toad	*Anaxyrus cognatus*	SGCN
Amphibian	Canadian toad	*Anaxyrus canadensis*	
Amphibian	Boreal chorus frog	*Pseudacris maculata*	
Amphibian	Spring peeper	*Pseudacris crucifer*	
Amphibian	Northern leopard frog	*Lithobates pipiens*	
Amphibian	Wood frog	*Lithobates sylvaticus*	
Amphibian	Gray treefrog	*Hyla versicolor*	
Amphibian	Copes gray tree frog	*Hyla chrysoscelis*	
Amphibian	Eastern tiger salamander	*Ambystoma tigrinum*	
Amphibian	Blue-spotted salamander	*Ambystoma laterale*	