DEPARTMENT OF NATURAL RESOURCES

DRAFT FOR REVIEW

Mille Lacs Wildlife Management Area Master Plan 2023-2033

September 18, 2023

I. 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 the backbone of the DNR's wildlife management efforts and are key to protecting 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.

Mille Lacs WMA Vision Statement

Mille Lacs WMA will be managed to provide quality hunting, trapping, foraging, and wildlife viewing, as well as other outdoor recreational experiences compatible with the statutory purpose of WMAs. Mille Lacs WMA is the largest WMA in central Minnesota and comprises the headwaters of six small rivers. With a size of approximately 39,000 acres, the Mille Lacs WMA has the capacity to be managed as a large, intact ecosystem that significantly contributes to the wildlife habitat on both a landscape and regional scale. Management priority will be given to providing a balanced range of wildlife habitat conditions by promoting a diversity of forest and wetland habitats and successional stages. Plant communities and habitats will be managed to sustain ecological health and provide for the production of species sought by hunters, trappers, foragers, wildlife viewers, and those exercising reserved treaty rights.

Mille Lacs WMA Master Plan Summary

This plan summarizes management activities for Mille Lacs WMA, an approximately 39,000-acre WMA in east central Minnesota. The last master plan for Mille Lacs WMA was written in 1977 and was intended to cover a 10-year period. This is the first formal updating of the master plan since

1977. Significant changes in this plan reflect: a greater emphasis on enhancing native plant communities, increased knowledge of the habitat needs of flora and fauna in the Mille Lacs WMA, changing wildlife and human use of the area, and new challenges like invasive species and climate change. Planned management actions will benefit a variety of wildlife species and improve human use, as described below.

White-tailed deer, ruffed grouse, woodcock, and hunters will benefit by the creation of early-successional aspen habitat, and by managing oak for maximizing acorn production.

Black bear and bear hunters will benefit by increasing the production of raspberries, acorns, and other foods through appropriate thinning of hardwood stands to increase sunlight penetration to the forest floor.

Waterfowl and waterfowl hunters will benefit by the production of ground nesting and cavity nesting species including Canada geese, mallards, blue-winged teal, wood ducks, ring-necked ducks, common goldeneyes, and mergansers on impoundments managed for a mix of open water and emergent vegetation conditions (i.e., hemi-marsh conditions). Waterfowl hunters who take snipe, sora, and other rails will also benefit from the production of these species in the grassed wetland fringes and wild rice prevalent on Mille Lacs WMA.

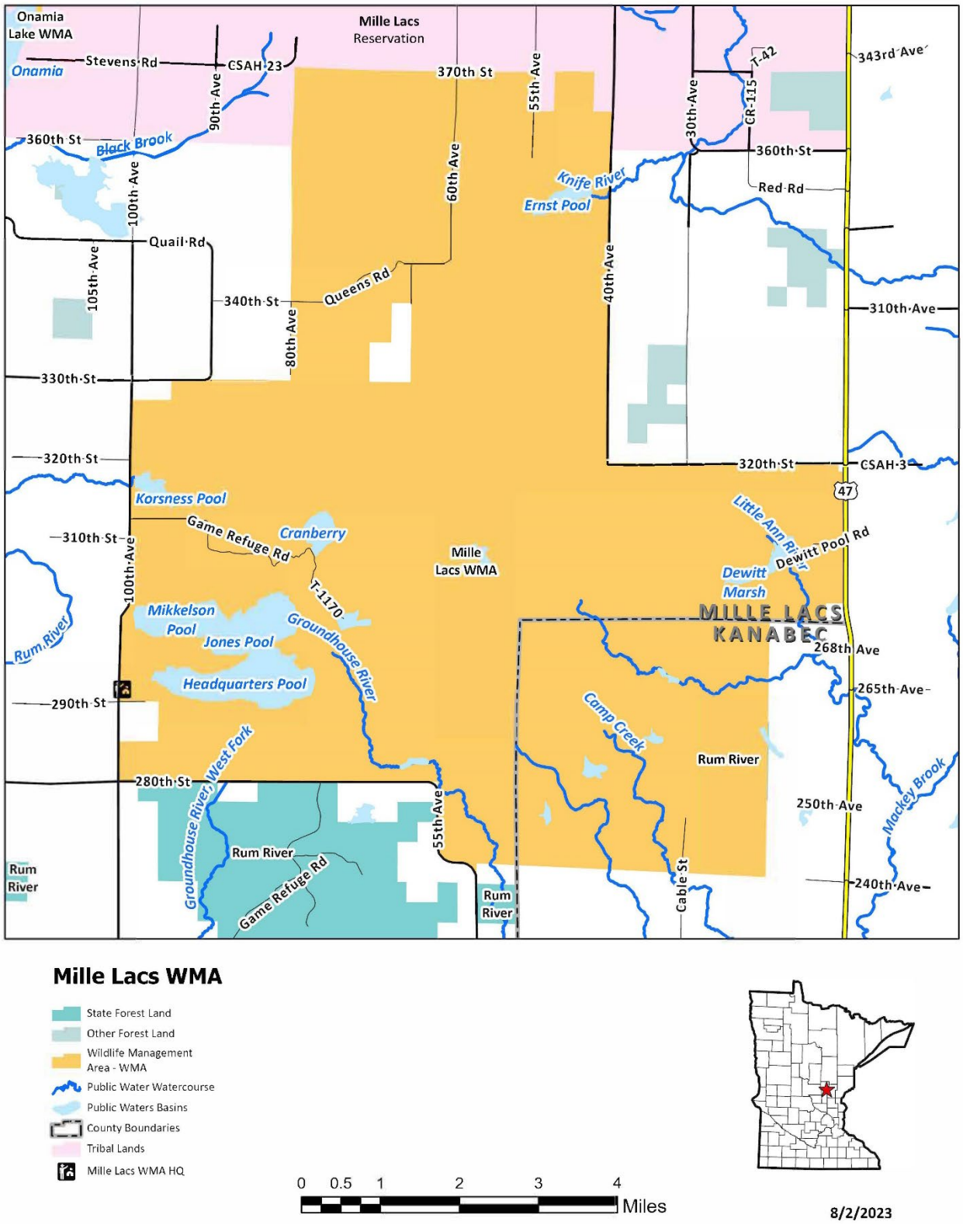
Gray squirrel, turkey, and rabbit hunters will benefit by the management of upland forest habitat and brush management.

Trappers will benefit from ensuring there is quality wetland habitat (hemi-marsh) for aquatic furbearers.

Wildlife viewers will benefit from the maintenance of roads and trails and habitats that support access to a rich diversity of birds and mammals and reptiles and amphibians.

Those exercising reserved treaty rights will benefit from the above actions as well as from managing to increase the acreage of wild rice, managing forests to provide for an increased number of large diameter birch trees, and verifying, locating, and protecting cultural sites within the Mille Lacs WMA.

The plan spells out desired conditions and management goals, objectives, and strategies needed to achieve them. Techniques are presented for management of the different habitat types, including prescribed fire, brush treatments, forest habitat enhancement through targeted timber harvest, and riparian and wetland protection and restoration. An annual calendar of management activities is included, as is a discussion of current and potential research and monitoring activities.



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III. Introduction

Major Unit Definition

Minnesota currently has 1541 Wildlife Management Areas (WMAs) totaling over 1.3 million acres distributed across the state. These WMAs are managed out of 37 local offices. Of the 37 local offices, eight have the distinction of being "Major Units": Carlos Avery (24,133 acres), Lac qui Parle (32,981 acres), Mille Lacs (38,729 acres), Red Lake (324,699 Acres), Roseau River (75,206 acres), Thief Lake (54,957 acres), Vermillion Highlands (2838 acres) and Whitewater (27,403 acres). Each of these major units manages a major WMA but may also manage other units within their work area. Major Units are typically distinguished by having resident staff (Wildlife Area Supervisor and Assistant Wildlife Area Supervisor), although not all have resident staff. They also typically have greater than average WMA acreage that is more intensely managed than most WMAs, larger fleet asset lists including heavy equipment (such as dozers, tractors, graders, etc.), larger staff complements, and more capital improvements, including resident housing, office and barracks, shops with higher capabilities for repair, maintenance, fabrication, visitor infrastructure amenities, a complement of other buildings or facilities, and unit roadways for public and operational use.

Purpose of Plan

This master plan outlines the management of Mille Lacs WMA through 2033 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 master plan was prepared in 1977, and many environmental and social changes have occurred since then. Minnesota's population has grown, scientific knowledge has advanced, 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 for these changing conditions. The plan update process also provides an opportunity to engage with a wide variety of Minnesotans using modern engagement tools and techniques. This plan is among six other comprehensive management plans the Department of Natural Resources is updating for the state's WMA major units. They are 10-year management plans, which will continue to be revised as new management practices develop, resource philosophies evolve, and new challenges are encountered.

Figure 2: Photograph of Townhall pool on the Mille Lacs WMA.

Long-range Goals

For Mille Lacs WMA, the overarching long-range goals outlined in this plan are:

1. Maintain or enhance a diverse mosaic of forest and wetland habitats at various successional stages for the benefit of native wildlife species.
2. Maintain or enhance sustainable human use including compatible recreational opportunities and the exercise of reserved treaty rights.

Planning Process

The planning process used to develop this plan involved an interdisciplinary DNR project team made up of staff from multiple DNR divisions (Appendix A) and insights provided by tribal partners, external stakeholders, and members of the public.

As a scoping activity, in 2019 DNR staff were encouraged to provide feedback via an online questionnaire on what they perceived as the most important issues, opportunities, successes and challenges related to the management of the Mille Lacs WMA. Also in 2019, an online questionnaire was provided to stakeholders and the public that asked about their use of, desires for, and concerns about the Mille Lacs WMA. This questionnaire was announced via a DNR news release, open to anyone who wanted to take it, and available from August 26th to September 15th, 2019. The findings from both these questionnaires helped inform the scope of the Mille Lacs WMA plan. The project was then delayed for several years due to staff turnover and temporary shifts in departmental and divisional priorities related to the COVID-19 pandemic.

In August 2022, a DNR project team (Appendix A) started meeting to begin the work of drafting the Mille Lacs WMA plan. As part of this, tribal coordination was conducted with representatives of both the Mille Lacs Band of Ojibwe and the Great Lakes Indian Fish and Wildlife Commission to provide Tribal Nations with treaty rights on the WMA the opportunity to influence the scope of the WMA plan.

In May 2023, the DNR hosted a hybrid (in-person and online) meeting for stakeholders and an online public input webinar to receive additional input from stakeholders and the public on the Mille Lacs WMA plan.

In July 2023, the first complete draft of the plan was distributed for internal DNR staff review and comments. Internal comments were incorporated into the plan.

In September and October 2023, a public comment period was held allowing stakeholders and the public to provide comments online and in two meetings that were held.

Guiding Documents

Management at Mille Lacs WMA is informed and guided by an array of statutes, rules, directives, and plans that do not have a strict hierarchy. 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 close and consistent coordination beginning at the local level and attention to multiple applicable guidance documents. When appropriate and relevant, the DNR considers plans developed by other agencies and organizations. This coordination helps ensure that all management decisions and actions taken within Mille Lacs WMA will be made to the benefit of wildlife, wildlife habitats, and compatible outdoor recreation.

Select WMA Rules and Statutes

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 state WMA 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 states that WMAs need to 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 Statute Section 86A.09 Development and Establishment of Units describes the requirements that apply to the development of the master plan.

Minnesota Statute 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 wildlife management area for the purposes of the outdoor recreation system.

Minnesota Rule Chapter 6230 Wildlife Management has general and specific rules that apply to wildlife management areas.

Mille Lacs WMA habitat management and operations are typically funded through Pittman-Robertson Wildlife Restoration Act grants (16 U.S.C. 669 et seq.). Wildlife Restoration grants require that habitat management and operation activities serve wildlife management purposes (50 CFR 80.50). Part of Mille Lacs WMA was acquired with Wildlife Restoration grant funds so 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 USFWS approval.

Additional Documents

There are several existing federal, state, and local documents that guide or complement the management objectives and strategies outlined in this plan. A list of these plans can be found in Table 1.

Table 1. Additional documents used to guide the development of the Mille Lacs WMA Master Plan. All acronyms used in this plan are listed in Appendix G.

Plan Name	Plan Year	Plan Owner
American Woodcock Conservation Plan	2008	Multiple
Audubon Minnesota Blueprints for Bird Conservation	2014	Audubon Minnesota
Conservation Agenda	2015-2025	DNR
Deer Plan	2019-2028	DNR
Deer Population Goal Setting	2023	DNR
Executive Order 11990, Protection of Wetlands	1977	Federal Executive Order

FAW Directive No. 070605: Outdoor Recreation Area Unit Administrative Handbook	2010	DNR
Duck Action Plan	2020-2023	DNR
Forest Resource Management Plan • Sustainable timber harvest analysis, decisions, and planning • Current 10-Year Stand Exam List • Mille Lacs Uplands Subsection Forest Resource Management Plan	2018	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 Wolf Management Plan	2023	DNR
Minnesota's Endangered Species Statute	2022	Minnesota Statute
Minnesota's Wildlife Management Area Acquisition	2002	The Citizens' Advisory Committee
Rum River One Watershed One Plan	2022	Mille Lacs SWCD
Mille Lacs Wildlife Management Area Master Plan	1977-1986	DNR
Ruffed Grouse in Minnesota: A Long-Range Plan for Management	2012	DNR
Surveillance and Management Plan for Chronic Wasting Disease	2019	DNR
Sustainable Timber Harvest Analysis	2019	DNR
Wetland Conservation Act	1991	BWSR
Working with Partners for Wildlife Conservation: Minnesota's Wildlife Action Plan	2015-2025	DNR

IV. History

Area History

The Mille Lacs Lake area is rich in natural resources, with a long history of different communities using these resources for socially, culturally, and economically important reasons. The area has undergone a variety of human and ecological changes since European American settlement. The Mille Lacs Lake region has been home to indigenous communities for many hundreds of years. Long before Europeans arrived, the Dakota and, shortly thereafter, the Ojibwe (Anishinaabe) lived here. Despite initial peace and cooperation between the Dakota and the Ojibwe, competition for resources led to decades of conflict that gradually displaced the Dakota from the region.

In 1837, before Minnesota was a state, the Mille Lacs Band of Ojibwe, the Fond du Lac Band of Lake Superior Chippewa, and six Ojibwe tribes from Wisconsin[1] signed a treaty that ceded lands, including a large section of east-central Minnesota that contains the Mille Lacs WMA, to the United States government and opened the area to European American immigration and economic development. The tribes signed the Treaty of 1837 on the condition that they would still have the right to hunt, fish, and gather in the ceded territory — rights that have been upheld by the U.S. Supreme Court. In Minnesota vs. Mille Lacs Band of Chippewa Indians et al., 526 U.S. 172 (1999), the Supreme Court affirmed that the Mille Lacs Band, Fond du Lac Band, and the six Ojibwe tribes from Wisconsin retained their off-reservation treaty rights to hunt, fish, and gather throughout the 1837 ceded territory. Exercising these rights remains important to the Ojibwe people as they pass these traditions on to future generations. In the late 1800s, many Ojibwe in Minnesota were forcibly moved by the U.S. government to the White Earth reservation. But some, including the Non-Removable Mille Lacs Band of Ojibwe, resisted relocation and remained. Today, the Mille Lacs Band of Ojibwe have a reservation on the south end of Mille Lacs Lake of approximately 61,000 acres, including a tribal headquarters near Onamia, Minnesota. The Mille Lacs reservation shares a border with the northern edge of the Mille Lacs WMA. As outlined in the Current Use section (Section 5.3), tribal members continue to use the Mille Lacs WMA for hunting, fishing, and gathering.

When the 1837 Treaty opened the area to non-Indians, logging began that depleted millions of acres of white pine forests. The first major logging operations of white pine in the Mille Lacs WMA were carried out around 1880, with a narrow-gauge railroad spur being constructed in what is presently the Olson and Kientop Management Units within the WMA. After the initial wave of white pine logging, the lumber industry moved on to secondary species. A spur of the Soo Line Railroad was constructed in 1915 from Mille Lacs Lake at Wahkon through what are now the Ernst and DeWitt Units within the WMA. Although these tracks were pulled up by the 1930s, remnants of the old grade can still be traced through the WMA. From the time of logging up to the mid-1930's fires over most of the area kept

[1] These include the Bad River Band of Lake Superior Chippewa, Lac Courte Oreilles Band of Lake Superior Ojibwe, Lac du Flambeau Band of Lake Superior Chippewa Indians, Mole Lake Band of Lake Superior Chippewa, Red Cliff Band of Lake Superior Chippewa, and St. Croix Chippewa Indians of Wisconsin.

reforestation to a minimum. The logging and subsequent replacement of white pine forests by mixed hardwoods significantly changed the plant and animal communities of the WMA.

After this second cutting of timber was completed, the land was sold to settlers for as little as six dollars per acre. Homesteading began in the Mille Lacs WMA in the early twentieth century, with maps and early aerial photographs indicating that farmsteads were largely limited to the periphery of the management area. Farming was difficult because large numbers of stones and stumps had to be removed by hand. Potatoes were the most popular crop during the early 1900s, and Mille Lacs and Kanabec counties became Minnesota's potato center. Most of the management area was never farmed because the soils were too rocky or poorly drained. At the time the management area was established, large blocks of land were tax forfeited because of their unsuitability for agriculture, and only 18 families owned land within the WMA boundaries.

Mille Lacs WMA History

The Mille Lacs WMA was established in 1949 following approval by the Mille Lacs and Kanabec County Commissioners acting on Division of Game and Fish (now Division of Fish and Wildlife) recommendations. In 1950, the project was approved for federal funding by the U.S. Bureau of Sport Fisheries and Wildlife (now the U.S. Fish and Wildlife Service) under the Pittman-Robertson Federal Aid in Wildlife Restoration Act. Land acquisition began in 1950, with most of the acquisition completed by the end of 1955.

Previous Mille Lacs WMA Management Plans were written in 1966 and 1977. By the 1966 plan, a headquarters building on the WMA and a four person staff had been established. The evolving management goals for the WMA can be seen across these plans. The 1966 Mille Lacs WMA plan, for example, states that the WMA is managed “primarily for intensive management of white-tailed deer and ruffed grouse and for public hunting. A significant secondary management objective is “the creation and development of waterfowl and furbearer habitat” (Minnesota Division of Game and Fish, 1966). The 1977 plan highlights a broader set of long-range goals for the WMA including to manage forest habitats for white-tailed deer, ruffed grouse, and other forest wildlife, to manage existing wetlands, bogs, and openings to enhance habitat and wildlife diversity, and to accommodate public use of the WMA that is compatible with the preservation and management of wildlife habitats (MNDNR 1977).

Archaeological and Other Historic Aspects

Very little systematic cultural resource survey has occurred within the management area. Archaeological investigations near the confluence of the Rum River and Bradbury Brook, located two miles west of the WMA, uncovered evidence of stone tool making that was radiocarbon dated to more than 9,000 years ago (Mather 2000).

The state archaeological database lists two Native American cultural heritage sites within the WMA, both of which are described as burial grounds located on upland ‘islands’ surrounded by wetland. These cultural sites have not been field verified by an archaeologist.

The State Historic Preservation Office has not inventoried historically significant buildings or other constructions within the WMA. In addition, no historic properties eligible for inclusion on the National Register of Historic Places have been identified within or adjacent to the Mille Lacs WMA.

V. Existing Conditions

Figure 3: Photograph of a mature mesic hardwood forest in the Mille Lacs WMA.

Land Ownership

The type of land ownership and associated policies strongly influence natural resource management on state-owned lands. The management goals and designation type are affected by the acquisition history, present land ownership patterns, the sources of acquisition funds, and state and county policies.

Acquisition of Wildlife Lands

The Commissioner of Natural Resources, or their designee, such as the Director of the Fish and Wildlife Division, 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, the Division of Fish and Wildlife may attempt to acquire lands from willing sellers. The division 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 notified through the State Register.

Multiple funding sources are used for wildlife land acquisition, including the Game and Fish Fund, which is funded by proceeds of hunting and fishing licenses, and federal matching funds from the Pittman-Robertson Wildlife Restoration Act. In addition, wildlife land acquisition has been 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). Since 2011, wildlife land acquisitions have also been funded through a Legislative appropriation known as the Outdoor Heritage Fund, through its administrative body, the Lessard-Sams Outdoor Heritage Council (LSOHC).

Lands purchased with federal dollars and most purchased with state dollars have use restrictions. The land must be bought for a wildlife conservation purpose and continue to be used for a wildlife conservation purpose. Examples of such programs include the federal Pittman-Robertson Fund (50CFR Part 80.134), the Outdoor Heritage Fund, and the state Game and Fish Fund. It is important these lands are not used for a non-conservation purpose, since doing so could put these funds at risk statewide. Any necessary, non-conservation uses of wildlife lands, for example, a road-widening easement through a WMA must be approved by the funding organization through an extensive divestiture process. Generally, approved wildlife conservation activities in the Mille Lacs WMA include the operation of public hunting grounds and the improvement of wildlife habitats.

Acquisition of the Present Mille Lacs WMA

The Mille Lacs WMA was established in 1949 and land acquisition for the Mille Lacs WMA began in 1950 with most of the acquisition completed by 1955. A 1962 acquisition plan map identified an overall acquisition goal of almost 51,200 acres. Tax forfeited lands comprised the bulk of the acquisitions (27,341 acres), with the remainder of the acquisitions coming from private landowners (9,772 acres). From 1949 to 1977, $138,640 was spent on land acquisition in the Mille Lacs WMA by the DNR. Of the 37,113 acres purchased, 36,569 acres were purchased using Pittman-Robertson Wildlife Restoration grant funding and have the accompanying grant use restrictions. School trust fund lands (1,616 acres) make up the remainder of the WMA. There have been no successful acquisitions since the completion of the 1977 plan although several attempts have been made. Today, the Mille Lacs WMA encompasses approximately 38,729 acres out of the 51,200-acre initial goal.

The highest priority acquisitions for the Mille Lacs WMA include purchasing inholdings and round-outs along the existing WMA boundary. An equally important priority is buying school trust lands within the WMA from the Permanent School Fund to broaden the range of management activities that can take place on them. To manage for purposes other than maximizing long-term revenue, state law requires

the DNR to compensate the Permanent School Fund by purchasing or leasing school trust lands. Priority for future acquisitions will be given to lands resolving boundary issues or containing rare habitats, plants, or animal species. The purchase of additional lands is only completed with willing sellers.

Area Description

Landscape Context

Mille Lacs WMA is located within the Western Superior Uplands Ecological Subsection of the Laurentian Mixed Forest Province. Mille Lacs WMA is less than 2.5 miles from Mille Lacs Lake at its closest point. Mille Lacs WMA is relatively unique in that no watercourses flow into the WMA; they all flow out. The northern edge of the WMA drains into Mille Lacs Lake and then into the Rum River. The western edge of the WMA drains into the Rum River, which drains into the Mississippi River in Anoka County. The majority of the Mille Lacs WMA, however, drains into the St. Croix River. The WMA is the headwaters for the Groundhouse River, Little Ann River, and Camp Creek, and the northeast corner is within the headwaters area of the Knife River. The irony of being on the highpoint of the landscape is that drainage systems are typically poorly developed, so water is retained on the landscape. This allows the WMA to store water on the landscape without flooding neighboring property owners. Water storage bodies at the top of watersheds are usually shallow marshes and wetlands rather than deep water bodies. Mille Lacs Lake is also at the head of its watershed and is unique in terms of a high waterbody area to watershed ratio, but it is also a shallow waterbody.

Several public lands are located in close proximity to Mille Lacs WMA, including the Fourbrooks WMA, Rum River State Forest, Mille Lacs Kathio State Park, and Father Hennepin State Park. These large tracts of public land provide important habitat for rare features in this unique landscape. Mille Lacs Lake and the uplands to its west haves been recognized in several planning initiatives including Audubon Minnesota's Important Bird Areas (IBA) and Minnesota's Wildlife Action Plan (MNWAP).

Nearly all the Mille Lacs WMA has been identified as an area of Outstanding, High, or Moderate biodiversity significance by the Minnesota Biological Survey (Figure 4). Within the area of Outstanding Biodiversity Significance is an isolated northern hardwoods designated old growth stand of nearly 100 acres that had trees over 160 years old when evaluated in 2000. The area of Outstanding Biodiversity Significance in Figure 4 is referred to as the Dinosaur Island Natural Areas Registry Site. The MOU that outlines management restrictions for this site is included in Appendix B.

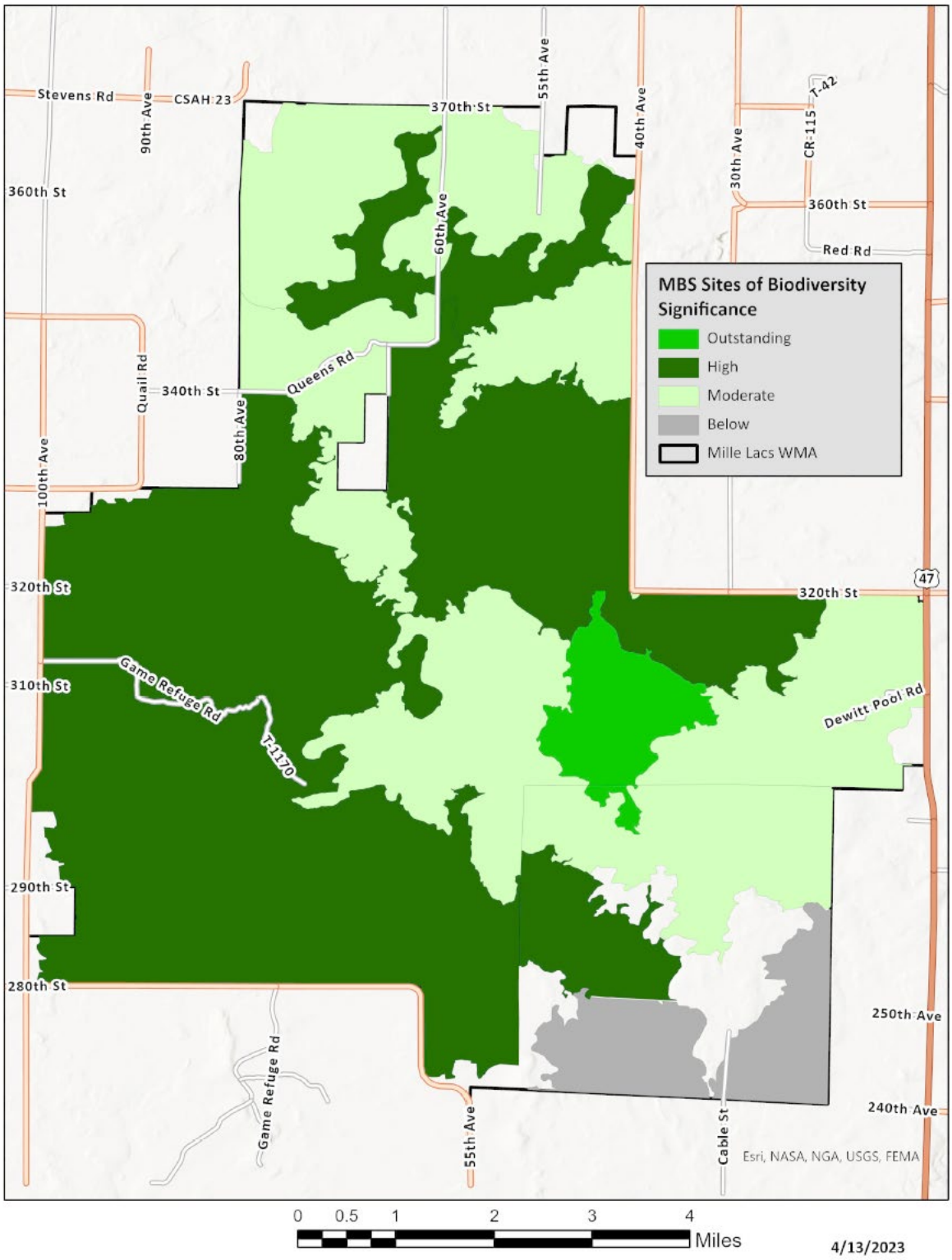

Figure 4: Mille Lacs WMA MBS Sites of Biodiversity Significance.

MNWAP identifies this area as having high quality habitats and species presence in the Wildlife Action Network, which indicates that this area provides important habitats for Species of Greatest Conservation Need (SGCN). MNWAP identified the entire Mille Lacs WMA and much of its surrounding landscape as a Conservation Focus Area. Conservation Focus Areas are places with the need and/or opportunity to focus conservation activities on habitat restoration or enhancement for SGCN. Conservation Focus Areas are based on mutual priorities of both the DNR and conservation partners active within them.

The northern 15% of the Mille Lacs WMA is in the Kathio Moraine Ecological Classification System (ECS) Land Type Association (LTA). The remaining 85% of the WMA is in the Ann Lake Drumlin LTA.

- The Kathio Moraine is an end moraine formed by the Superior Lobe glacier and has rolling terrain. The soils of this LTA tend to have hardpans in the subsoil horizons. The majority of the upland pre-European settlement vegetation was wet-mesic hardwood-conifer (white pine), mixed white pine-red pine, and mesic northern hardwoods (Shadis 1999, Marschner 1974). Lowland pre-European settlement vegetation was commonly conifer bog and swamp (Marschner 1974). About 14.6% of the Kathio Moraine LTA is within Mille Lacs WMA.
- The Ann Lake Drumlin LTA has rolling hills formed by the Superior Lobe glacier. Drumlin landforms are common and are oriented in an east to west pattern. Uplands are more common than wetlands in this LTA (71% to 28%, respectively). Much of the soil has hardpans in the subsoil. The majority of the upland pre-European settlement vegetation was mesic northern hardwoods in the southern three quarters, dry-mesic pine-hardwood in the north central part, and wet-mesic hardwood-conifer (white pine) in the northeast portion (Shadis 1999, Marschner 1974). Lowland pre-European settlement vegetation was commonly conifer bog and swamp (Marschner 1974). About 8.8% of the Ann Lake Drumlin LTA is within Mille Lacs WMA.

Certain wildlife species are considered Ecosystem Engineers or Ecological Keystone Species because of the role they play in shaping the landscape, vegetation, and/or influencing other species' ranges. Mille Lacs WMA is within the range of several of these species, including gray wolf, white-tailed deer, beaver, and woodpeckers (especially pileated woodpecker). These species are widespread and abundant, except for the gray wolf, which is near the southern periphery of its continental range. Climate change is expected to shift some species ranges farther north, while other species from the south have already moved north and others will likely as well. These northward migrators include wild turkey, red-bellied woodpecker, northern cardinal, and Virginia opossum.

Socioeconomic Context

Mille Lacs WMA is located within the central Minnesota counties of Kanabec and Mille Lacs. The population of these two counties is approximately 42,000 people, with nearby cities being Isle (pop. 818), Milaca (pop. 3,057), Mora (pop. 3,617), Ogilvie (pop. 393), and Onamia (pop. 800). In 2020, the median household incomes for Kanabec and Mille Lacs County were $57,877 and $57,173, respectively (US Census Bureau, 2020). The largest industries in Kanabec and Mille Lacs Counties are: health care & social assistance (3,428 people), manufacturing (2,993 people), and construction (2,371 people). Due to the Mille Lacs WMA's relative proximity to the Minneapolis-St. Paul metropolitan area, it is estimated that over 3 million Minnesotans reside within a two-hour drive of the Mille Lacs WMA. The

Mille Lacs WMA's proximity to US Highway 169 and other large tracts of public land add to its appeal as a tourism destination.

Public land and waters around the Mille Lacs WMA are important source of tourism revenue for the local economy. Mille Lacs Lake is especially important to the area. The economic impact of tourism to Kanabec and Mille Lacs counties in 2020 was estimated to be $66,382,530 (MN Department of Revenue, 2020). In Mille Lacs County, which contains the majority of the Mille Lacs WMA, over 21% of the land is public. This large of a percentage is unique, especially within a short drive of the Minneapolis-St. Paul metropolitan area. As such, the importance of the Mille Lacs WMA is anticipated to increase as it is one of the largest blocks of public recreational land in the area.

Geology and Soils

The landscape of the Mille Lacs WMA was shaped by glacial activity more than 16,000 years ago. The area encompasses a mostly flat, glacial till plain with several east-west morainal belts. The hills and ridges formed by the morainal belts are primarily forested while wetlands predominate in the glacial till plain. Underneath these glacial sediments is bedrock. Bedrock is the large mass of rocks that form the Earth's surface. In the Rum River Watershed bedrock depth varies, with some areas exhibiting exposed bedrock while others have bedrock that is buried 400 feet deep or more under glacial till. According to the Minnesota Geological Survey (MGS) the bedrock geology of the watershed includes Precambrian crystalline rocks in the north and Precambrian and Paleozoic sedimentary rocks in the south. Paleozoic bedrock formed more recently, approximately 545 to 245 million years ago. This geologic era saw the development of the first land plants and animals. The Precambrian era, immediately preceding the Paleozoic era, began with the formation of earth approximately 4,500 million years ago. This geologic era saw the development of the first multicellular organisms, bacteria, algae, and some invertebrates.

Surficial sediments in the watershed consist mostly of sand, gravel, and glacial till. Sediments are generally 150-300 feet deep with up to 95 feet of silt and clay underneath. This dense glacial till underlies most soils in the watershed, limiting water movement through the soil profile. Soils are described as acid, stony, reddish sandy loams, silt loams, and loamy sands. Soil formations in the Mille Lacs WMA were compiled from Mille Lacs County and Kanebec County soil surveys. Numerous soil types have been identified on the WMA, and much of the variability comes from differences in such factors as vegetation, topography, and parent materials influencing soil development in the region. The primary soil formations in the WMA are the Brennyville-Freer Complex, Seelyeville and Cathro-Twig. These soil formations are generally poorly drained with ponding and low slope gradients. The main soil types are described in Table 2 and a map providing the drain classes of soil types is provided in Figure 5.

1 Table 2. Soil types found at the Mille Lacs WMA.

Soil Type	Slope	Soil Type	Drainage	Depth To Water Table	Ecological Site	Ponding
Brennyville-Freer	1-4%	Silt Loam-Sandy Loam	Somewhat poorly drained	16-24 inches	Moist Loamy Lowland	None
Seelyeville	0-1%	Muck0Silt Loam	Very Poorly Drained	0 inches	Mucky Swamp	Occasional
Cathro-Twig	0-1%	Muck-Loam	Very Poorly Drained	0 inches	Poor Fen	Frequent

2

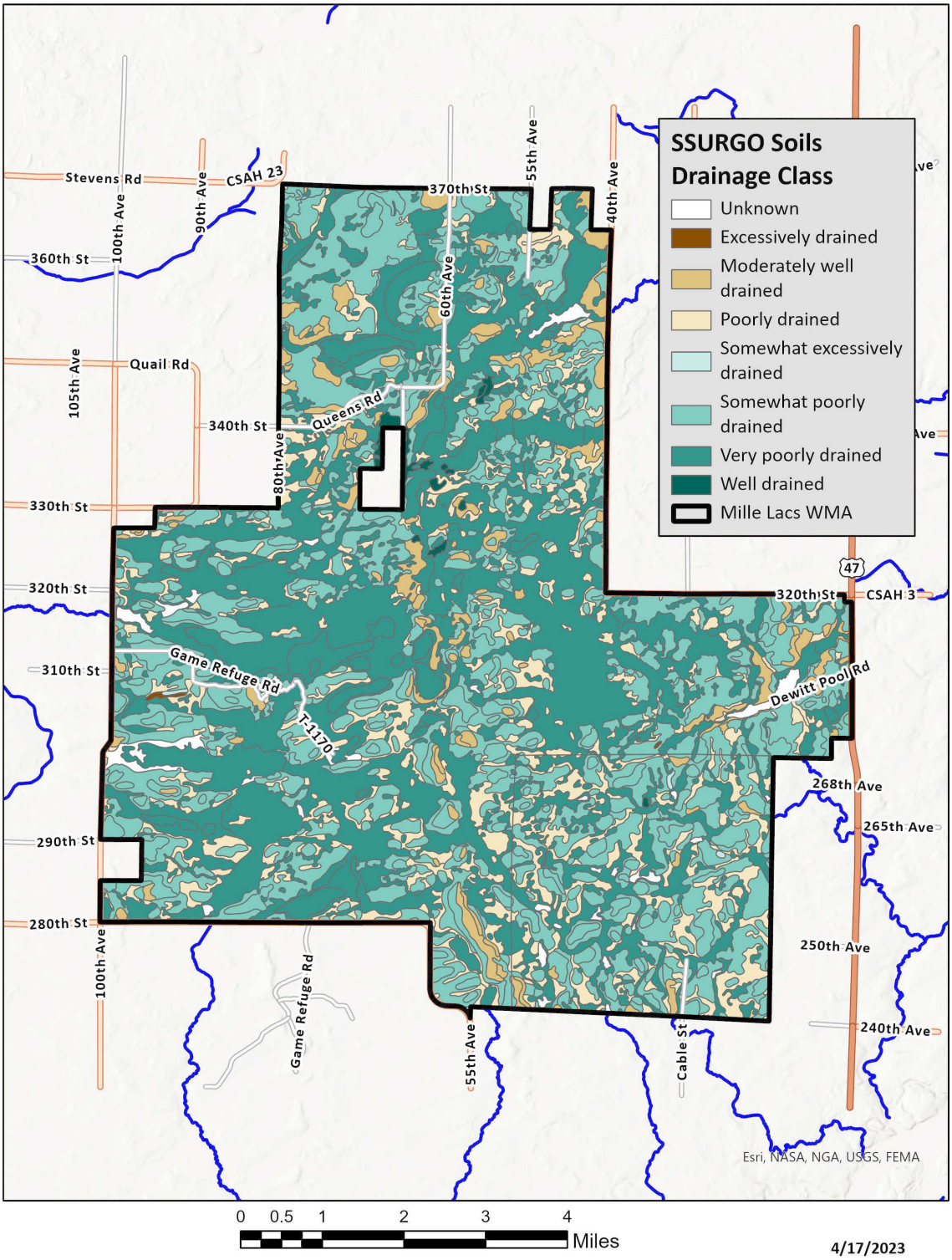

Figure 5: Drain classes of Mille Lacs WMA soil types. These drain classes are from the Soil Survey Geographic Database (SSURGO).

Underground and Surface Hydrology

There are two major watersheds and nine minor watersheds that encompass the Mille Lacs WMA (Figure 6). The Snake River Watershed drains an area of 1,022 square miles, including 70% of the WMA. The other main watershed that drains the WMA is the Rum River Watershed. This watershed drains the remaining 30% of the WMA, and the Rum River Watershed is approximately 1,500 square miles. Base flow for the rivers in the management area is less than 0.5 cubic feet per second in the summer and fall and often intermittent during drought years. Spring discharge rates are extremely variable depending on the winter snowfall and rapidity of snow melt.

Both major watersheds have completed a holistic One Watershed One Plan. Mille Lacs WMA staff ensure that management actions on the WMA contribute to improving downstream water quality. The following is a description of the two major watersheds.

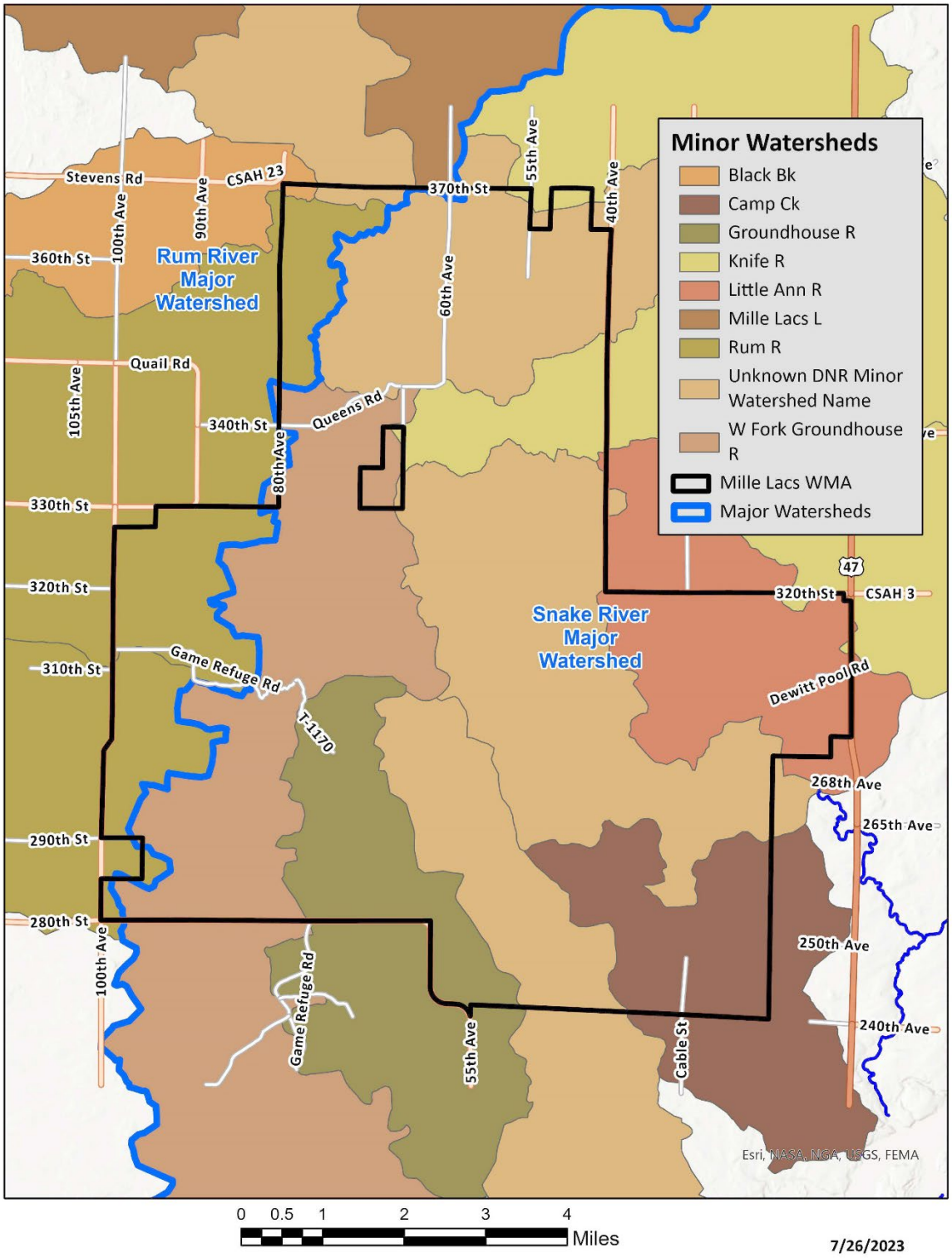

Figure 6: Mille Lacs WMA major and minor watersheds.

Snake River

The Snake River Watershed is in east-central Minnesota within the St. Croix River Basin. Often referred to as "the Gateway to the North," the watershed straddles the Northern Lakes and Forest Ecoregion to the north and the North Central Hardwood Forest Ecoregion to the south. The watershed covers 1,006 square miles and drains portions of Kanabec, Pine, Mille Lacs, Aitkin, and small portions of Chisago and Isanti counties.

The Snake River meanders over 100 miles from its headwaters in southeast Aitkin County through Kanabec County and east through Pine County to its confluence with the St. Croix River. From north to south the watershed transitions from forested areas with abundant wetlands through interspersed haylands to more developed and agricultural lands (i.e., cropland and pasture). The Snake River Watershed is home to outstanding quality forest, lake, wetland, and river resources that offer many opportunities for enjoyment and appreciation.

Rum River

The Watershed is 1,584 square miles in size, and stretches from Mille Lacs Lake in the north, the headwaters of the Rum River, to the City of Anoka in the south, the location of the confluence of the Rum and Mississippi Rivers. The Watershed covers portions of ten (10) counties.

Wetlands account for approximately 24% of the total land area. Nearly one-half of these wetlands are classified as emergent wetlands, dominated by herbaceous perennial plants (e.g., grasses, sedges). The remainder are scrub shrub or forested wetlands, with a small percentage of deep-water habitats. There are approximately 240,438 acres of wetland in the Rum River Watershed, which represent a 30% loss from the estimated historical wetland acreage of 345,032 (BWSR 2020).

Minor Watershed

Within the WMA the North, South and West branches of the Groundhouse, Knife and Little Ann rivers originate in the area, which are all located in the Snake River Watershed. Within the Groundhouse River system, annual runoff is approximately 7.46 inches. The Groundhouse subwatershed contains approximately 56% wetland or open water storage area.

The Little Ann River has an annual runoff of approximately 7.93 inches. This minor watershed is comprised of 38.4% wetlands or open water storage. The Little Ann River watershed is relatively flat, with a mean slope of 2%. The Knife River watershed also shows similar annual runoff of 7.96 inches and has a mean slope of 1.7%. The Knife River watershed is comprised of approximately 42% of wetlands, or open water storage.

Flow in the watershed within the Mille Lacs WMA can be generalized as low gradient flow, with significant wetland and open water storage. Flow in the headwaters of these rivers is derived primarily from runoff during the spring and groundwater discharge directly into the stream channels during the summer.

Impoundments

Since 1962, 14 dikes have been constructed, retaining water in 8 impoundments (Table 3). Dikes constructed on the Little Ann and Knife rivers form the DeWitt and Ernst pools. Since impounding, mats of sedges and lowland shrubs growing on floating peat have overgrown many open water areas. Because floating mats of vegetation occur adjacent to non-floating lowland and bog vegetation, actual sizes of the impoundments are difficult to determine and fluctuate over time. Acreages can fluctuate from year to year depending on precipitation levels, beaver activity, and management activities for waterfowl.

Figure 7: Photograph of Jones pool on the Mille Lacs WMA.

Impoundment water is derived from spring runoff and from groundwater discharging directly into low-lying areas and bogs on the Mille Lacs WMA. Water levels are maintained by water control structures in each impoundment, many of which have been updated since 2000.

To provide habitat for waterfowl production, 5 ponds have been constructed since 1966. These ponds, located in lowlands, were constructed with a bulldozer or dragline, hold open water during most of the summer, and impound 72 acres of open water pools. Other dikes were constructed across low areas, intermittent drainages, and the headwaters of the Groundhouse River.

Table 3. Impoundments and ponds constructed on the Mille Lacs WMA.

	Total Area	Open Water (acres)	Number of Dikes	Date Constructed
Impoundments				
DeWitt	189	43	1	1962
Ernst	510	50	1	1963
Cranberry	1,925	20	3	1965-68
Mikkelson	520	33	1	1968-69
Section 3	282	5	2	1969
Headquarters	581	14	3	1971
Jones	474	14	2	1966
Townhall	247	20	1	1974
Total	4,728	199	14	
Ponds				
Olson	92	40	1	1966
Albrecht	23	2	1	1970
Korsnes No. 1	353	13	1	1975
Korsnes No. 2	31	7	2	1975
Korsnes No. 3	622	10	1	1975
Total	1,121	72	6	

Habitats and Plant Communities

Introduction

Wildlife habitat can be defined as the totality of an animal's abiotic (e.g., water, mineral, thermal, solar) and biotic (typically plant) environmental components that allow for it to reproduce and survive interim periods to reproduce. For some animals (e.g., small mammals, reptiles, amphibians) one habitat provides for both needs; however, most animals (e.g., migratory mammals and birds) require different habitats, often vastly different and far apart, to optimize reproduction and survival. Mille Lacs WMA is a diverse site that provides many different habitat types for wildlife.

Native Plant Communities

Native plant communities (NPC) provide habitat that support fish and wildlife populations on the Mille Lacs WMA. These plant communities have been formed and shaped by climate, hydrology, geology, topography, fire, other physical aspects, and anthropomorphic changes. The information and data available on Mille Lacs WMA native plant communities has grown substantially since the last management plan was developed 45 years ago, with approximately 86% of the unit mapped for native plant communities.

Mille Lacs WMA is a diverse site with several high-quality NPCs throughout the unit. Mille Lacs WMA contains seven NPCs: (1) Acid Peatland System; (2) Forested Rich Peatland System; (3) Marsh System; (4) Mesic Hardwood Forest System; (5) Open Rich Peatland System; (6) Wet Forest System; (7) Wet Meadow/Carr System (Figure 8). Table 4 shows the relative percentage of NPCs found at Mille Lacs WMA.

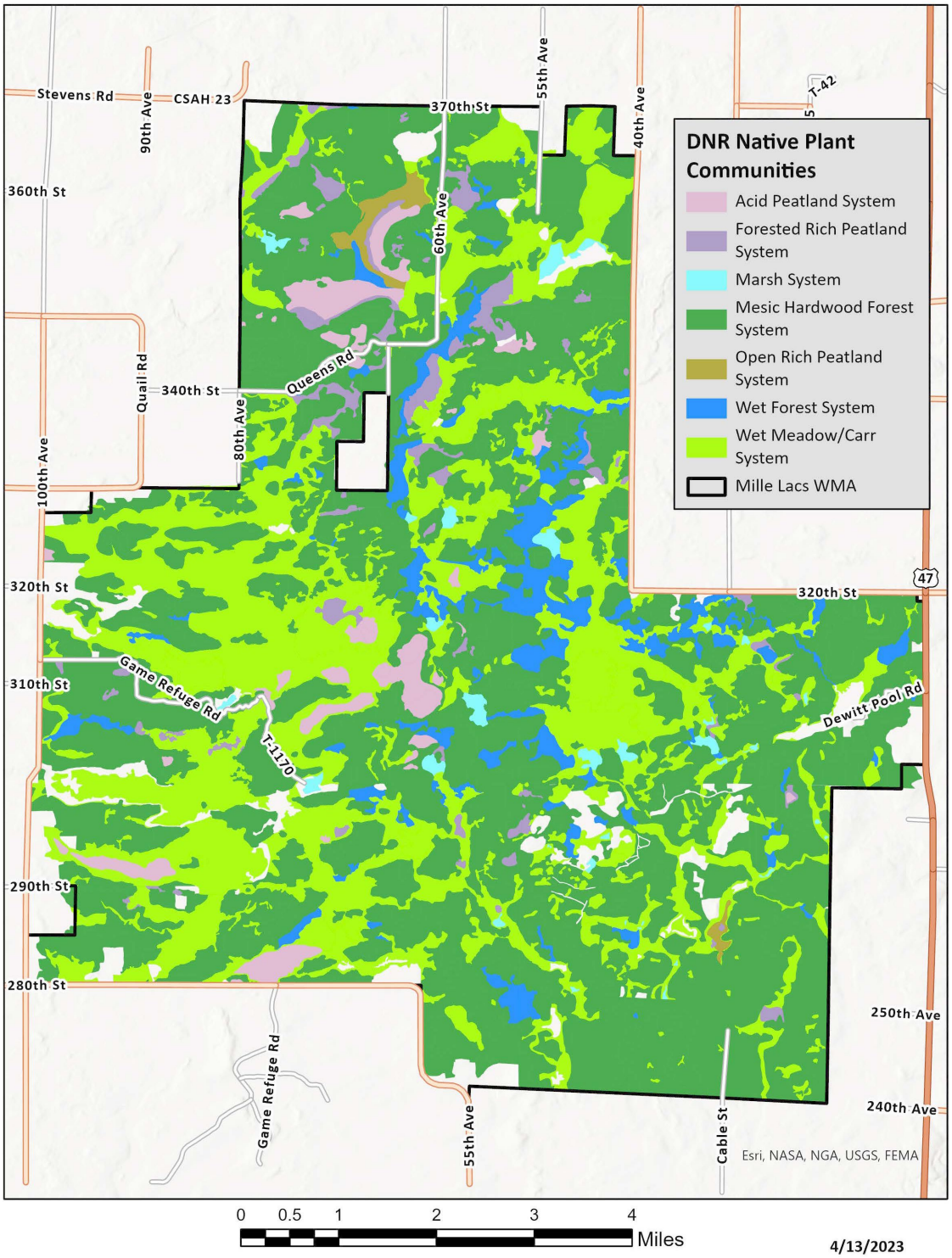

Figure 8: Mille Lacs WMA native plant communities.

Table 4. Relative percentage of native plant communities (NPCs) found at Mille Lacs WMA.

NPCs	Acres	Percentage of WMA
Acid Peatland System	1,012	3%
Forested Rich Peatland System	869	2%
Marsh System	318	1%
Mesic Hardwood Forest System	21,472	55%
Open Rich Peatland System	195	< 1%
Wet Forest System	1842	5%
Wet Meadow/Carr System	11,022	28%
Not inventoried	1,985	5%
Total	38,716	100%

The following sections provide an overview of the native plant communities found in the Mille Lacs WMA.

Mesic Hardwood Forest

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 sugar maple, basswood, paper birch, and northern red oak, and understories with shade-adapted shrubs and herbs. Focal wildlife species for management purposes will include white-tailed deer, black bear, fisher, gray squirrel, bats, ruffed grouse, wild turkey, American woodcock, wood ducks, red-shouldered hawks, broad-winged hawks, pileated woodpeckers, golden-winged warblers, and red-backed salamanders.

In Mille Lacs WMA, there are 4 classes of Mesic Hardwood Forest listed by increasing soil moisture levels:

- **MHc26 Central Dry-Mesic Oak-Aspen Forest** - Dry-mesic hardwood or, rarely, hardwood-conifer forests, usually with northern red oak as a canopy dominant. However, young forests (0-35 years) are strongly dominated by quaking aspen before transitioning to greater diversity. Present on well-drained loamy or sandy soils, primarily on stagnation moraines and less frequently on till plains or glacial river terraces.
- **MHc36 Central Mesic Hardwood Forest** - Mesic hardwood forests dominated by basswood, northern red oak, and sugar maple when mature. Young forests dominated by northern red oak

with some quaking and bigtooth aspen and basswood. Present on loamy or sandy loam soils on hummocky stagnation moraines and rolling till plains.

- **MHn46 Northern Wet-Mesic Hardwood Forest** - Wet-mesic lowland hardwood forests on level sites with clayey subsoils or high local water tables. Dominated by black ash, basswood, and quaking aspen; with red and sugar maple, bur and red oak, paper birch and green ash. Young forests (0-35 years) are strongly dominated by quaking aspen before transitioning to greater diversity.
- **MHc47 Central Wet-Mesic Hardwood Forest** - Wet-mesic hardwood forests on somewhat poorly drained sandy loam soils on till plains and stream terraces, often on broad flats and gentle slopes adjacent to wetlands and in ecotones between upland forests and wetlands. Soils are saturated for prolonged periods, either because of clayey subsoil horizons that impede drainage or because of high local water tables. Maintains a relatively stable species composition throughout its growth stages, dominated by black ash and basswood, with red and sugar maple, bur and red oak, and green ash (with some aspen and birch in its younger stages).

Wet Meadow/Carr

Wet Meadow/Carr plant communities are graminoid or shrub dominated wetlands that are subjected annually to moderate inundation following spring thaw and heavy rains and to periodic drawdowns during the summer. Focal wildlife species for management purposes will include sandhill crane. Other wet shrubland species that will benefit include alder flycatcher, veery, sedge wren, yellow warbler, common yellowthroat, song sparrow, and swamp sparrow.

There is one class of Wet Meadow/Carr in the Mille Lacs WMA:

- **WMn82 Northern Wet Meadow/Carr** - Open wetlands dominated by dense cover of broad-leaved graminoids or tall shrubs. Present on mineral to sapric peat soils in basins and along streams.

Wet Forest

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 water table is almost always within reach of plant roots but does not remain above the mineral soil surface for long periods during the growing season. Focal wildlife species for management purposes will include fisher, bats, wood duck, common goldeneye, hooded mergansers, American woodcock, pileated woodpecker, red-headed woodpecker, and four-toed salamander.

In Mille Lacs WMA, there is 1 class of Wet Forest:

- **WFn55 Northern Wet Ash Swamp** - Wet hardwood forests on mucky mineral soils in shallow basins and groundwater seepage areas and on low, level terrain near rivers, lakes, or other wetlands. Typically with standing water in the spring but draining by late summer.

Acid Peatland Forest

Acid Peatland Forest communities are dominated by conifer, low-shrub, or graminoid populations that develop in association with peat-forming *Sphagnum.* Acid Peatland communities are acidic (pH < 5.5),

extremely low in nutrients, and have hydrological inputs dominated by precipitation rather than groundwater. In both the acid peatlands and forested rich peatlands, management will focus on providing habitat for more-northern species that are at the southern end of their breeding range, including alder flycatcher, winter wren, red-breasted nuthatch, black-and-white warbler, Nashville warbler, purple finch, and sedge wren.

There are two forested Acid Peatland community classes at Mille Lacs WMA:

- **APn80 Northern Spruce Bog** - Black spruce–dominated peatlands on deep peat. Canopy is often sparse, with stunted trees. Understory is dominated by ericaceous shrubs and fine-leaved graminoids on high Sphagnum hummocks.
- **APn81 Northern Poor Conifer Swamp** - Conifer-dominated peatlands with sparse canopies of stunted trees. Understory is depauperate and dominated by ericaceous shrubs, fine-leaved graminoids, and low Sphagnum hummocks. Minerotrophic plant species are present.

Acid Peatland

Non-forested Acid Peatland Communities are dominated by conifer, low-shrub, or graminoid populations that develop in association with peat-forming *Sphagnum.* Acid Peatland communities are acidic (pH < 5.5), extremely low in nutrients, and have hydrological inputs dominated by precipitation rather than groundwater. Focal wildlife species for management purposes will include sedge wren, common yellowthroat, and swamp sparrow. These habitats may also support more-northern species at the southern end of their breeding range, but bird use of these habitats on Mille Lacs WMA are poorly known.

There are two non-forested Acid Peatland community classes in the Mille Lacs WMA:

- **APn90 Northern Open Bog** - Sphagnum-dominated peatlands with microtopography ranging from deep hollows and low Sphagnum carpets to well-developed high hummocks. Present in small basins in nutrient-poor outwash plains and non-calcareous till deposits.
- **APn91 Northern Poor Fen** - Open Sphagnum peatlands with variable development of hummocks and hollows. Dominated either by fine-leaved sedges or low ericaceous shrubs. Present in small basins and on floating mats near lakes and ponds.

Forested Rich Peatland Forest

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

There is one class of Forest Rich Peatland Forest in the Mille Lacs WMA:

- **FPn72 Northern Rick Tamarack Swamp (Eastern Basin)** - Tamarack-dominated swamps on shallow to deep peat in basins and in depressions in abandoned river channels.

Non-forested Rich Peatland

Rich Peatland communities are conifer or tall shrub dominated wetlands on deep (> 15in), actively forming peat. They are characterized by mossy ground layers, often with abundant shrubs and forbs.

Focal wildlife species for management purposes will include American woodcock, alder flycatcher, veery, sedge wren, yellow warbler, common yellowthroat, song sparrow, and swamp sparrow.

There is one non-forested Rich Peatland community class in the Mille Lacs WMA:

- **FPn73 Northern Rich Alder Swamp** - Tall shrub wetlands dominated by speckled alder on mineral, muck, or peat soils. Present in wetland basins on glacial moraines and till plains, along streams and drainage ways, and along peatland and upland borders.

Open Rich Peatland

Open Rich Peatland communities are graminoid or low shrub dominated wetland on actively forming deep (> 16 in) peat. Focal wildlife species for management purposes will include sandhill crane, sedge wren, common yellowthroat, and swamp sparrow.

There are two classes of Open Rich Peatlands in the Mille Lacs WMA:

- **OPn81 Northern Shrub Shore Fen** - Shrub-dominated peatlands on floating mats along margins of peatlands in ponds, lakes, and streams.
- **OPn92 Northern Rich Fen (Basin)** - Open peatlands on deep, well-decomposed peat or floating peat mats in basins, often adjacent to lakes and ponds. Dominated by fine-leaved graminoids or shrubs.

Marsh

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. Focal wildlife species for management purposes will include muskrat, beaver, Canada goose, trumpeter swan, wood duck, mallard, common goldeneye, hooded and common merganser, Virginia rail, sora, Wilson's (common) snipe, black tern, bald eagle, and yellow-headed blackbird.

There is one class of Marsh in the Mille Lacs WMA:

- **MRn83 Northern Mixed Cattail Marsh** - Emergent marsh communities, typically dominated by cattails. Present on floating mats along shorelines in lakes, ponds, and river backwaters or rooted in mineral soil in shallow wetland basins.

Upland Grasslands and Shrublands

There are no mapped upland grasslands and shrublands in Mille Lacs WMA. However, there are 200 acres of constructed prairie on the WMA. These managed upland grasslands are not considered a Native Plant Community.

Shallow and Open Water Communities

Shallow, open water plant communities generally have water depths of less than 6.6 feet, and are dominated by submergent and emergent vegetation, such as pondweeds, water milfoil, coontail, and duckweeds as well as cattails and reeds. Size can vary from quarter acre ponds to shallow bays of a lake. The presence or absence of floating vegetation depends upon the effects of the season, wind, availability of nutrients, and water level management (Eggers & Reed, 2015). Wetland impoundments

controlled by dikes and water control structures make up most of the shallow, open water communities on the Mille Lacs WMA, thus they are not Native Plant Communities.

Agricultural Lands

Currently, the Mille Lacs WMA has 1 annual hay lease and approximately 40 acres of food plots internally with a rotating crop of annuals and perennial food sources.

Land Cover Types

The Section of Wildlife further classifies land cover types within WMAs using the Wildlife and Aquatic Habitat Management Application (WAHMA). The WAHMA land cover types found within Mille Lacs WMA are shown in Figure 9. Table 5 shows the relative percentage of each land cover type found at Mille Lacs WMA.

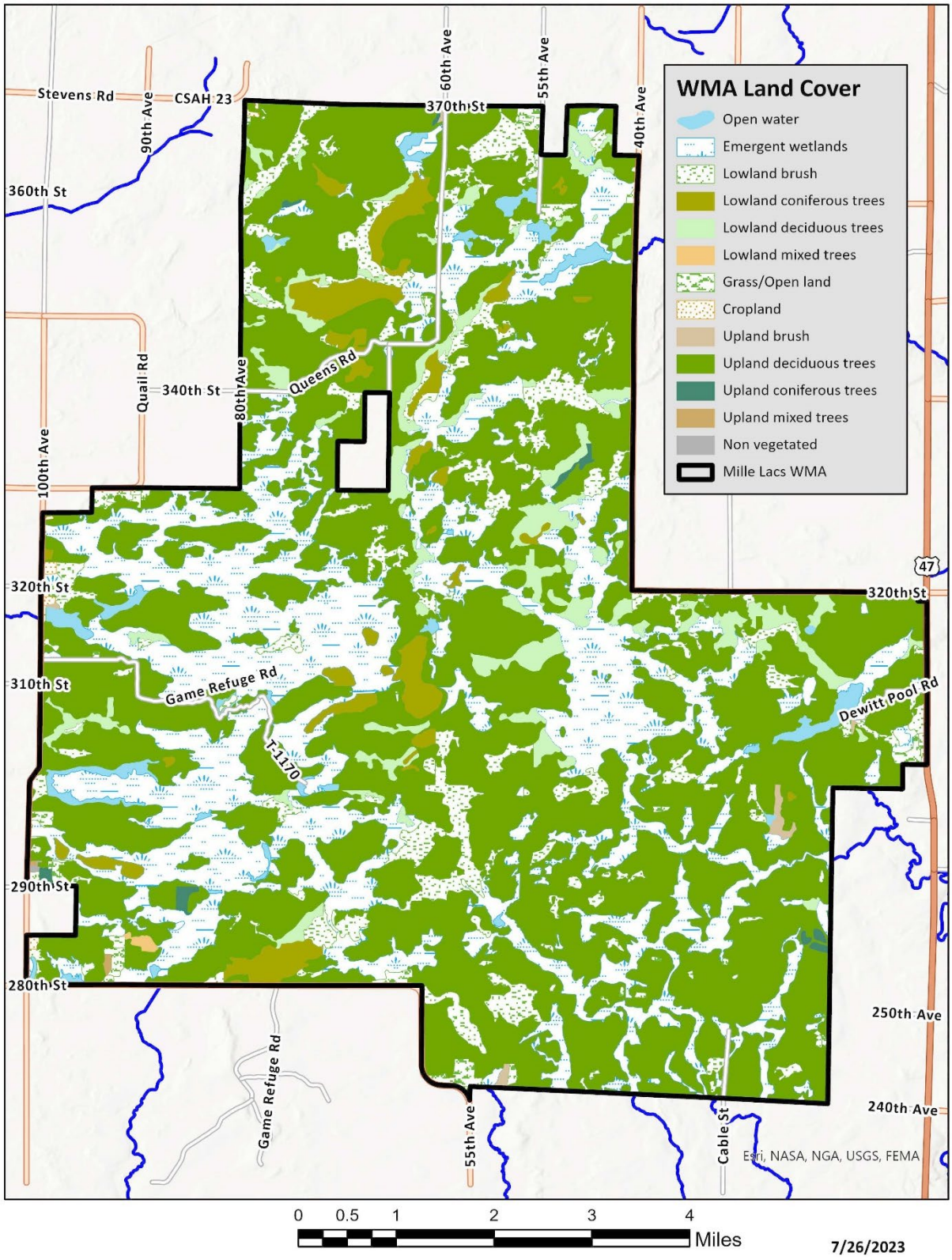

Figure 9: Mille Lacs WMA land cover types.

Table 5. Relative percentage of WAHMA land cover types found at Mille Lacs WMA.

WAHMA land cover type	Acres	Percentage of WMA
Open Water	570	1%
Emergent Wetlands	9,812	25%
Lowland Brush	2,521	7%
Lowland Coniferous Trees	1,158	3%
Lowland Deciduous Trees	1,585	4%
Lowland Mixed Trees	23	< 1%
Grass/Open land	478	1%
Cropland	40	< 1%
Upland Brush	65	< 1%
Upland Deciduous Trees	22,348	58%
Upland Coniferous Trees	98	< 1%
Upland Mixed Trees	12	< 1%
Non-Vegetated	6	< 1%
Total	38,716	100%

Rare Plants

The DNR's Minnesota Biological Survey (MBS) completed a systematic survey of native plant communities and rare species within the WMA in the 2000s. The results of this survey provided increased knowledge of the status and distribution of native and rare plant communities and animal species within the Mille Lacs WMA.

At the conclusion of work in a geographic region, MBS ecologists assign a biodiversity significance rank to each survey site of moderate, high, or outstanding (below threshold means the area was considered for survey work but did not appear to have enough diversity to warrant it). Areas not considered for surveys were primarily agricultural lands or recently harvested forests. These biodiversity rankings put into context the importance of an area compared to the rest of the state. This information helps guide conservation and management on the Mille Lacs WMA.

A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site. Figure 4

shows the extent of biodiversity ranks within the Mille Lacs WMA. There are four biodiversity significance ranks, outstanding, high, moderate, and below:

- "Outstanding" sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact or functional landscapes.
- "High" sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- "Moderate" sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- "Below" sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space.

Some of the plant communities found at Mille Lacs WMA are rare for Minnesota (Table 6). In the United States, many organizations use the Conservation Status Ranking system developed by The Nature Conservancy and maintained by NatureServe in cooperation with the Natural Heritage Network. The Conservation Status Ranking system ranks and categorizes the relative imperilment of plants, animals, other organisms, and native plant communities on a global, national, and state level. Minnesota uses this system. State-wide Conservation Status Ranks that are frequently used when discussing native plant community management are referred to as S-ranks, which indicate how a native plant community ranks at a statewide level. These ranks are determined using methodology developed by the conservation organization NatureServe and its member natural heritage programs in North America. Descriptions of Conservation Status Ranks can be found in Table 7. S-ranks were assigned to Minnesota's NPC types and subtypes based on information compiled by DNR plant ecologists on: 1) geographic range or extent; 2) area of range occupied; 3) number of occurrences; 4) number of good occurrences, or percent area of occurrences with good viability and ecological integrity; 5) environmental specificity; 6) long-term trend; 7) short-term trend; 8) scope and severity of major threats; and 9) intrinsic vulnerability. More information on Conservation Status Ranks and Condition Ranks and how they are determined can be found at the NatureServe website.

Rare plants found at Mille Lacs WMA are listed in Table 8. Detailed information on rare plant species can be found in the DNR Rare Species Guide.

Table 6. Rare native plant communities known to occur at Mille Lacs WMA. S ranks in parentheses are the potential S rank for that NPC class. Not all NPCs were classified to the type level at Mille Lacs WMA; most are classified to class only. Status ranks for native plant communities are given to type and subtype level classifications, a finer level of classification than class.

NPC	Description	Status Rank	Acres	Ecological Processes
FPn72; FPn72a	Northern Rich Tamarack Swamp; Rich Tamarack Swamp (Eastcentral)	S3	370	Intact hydrology; low to negligible levels of natural disturbance such as fire, windthrown and beaver activity. Tamarack are the dominant tree species and form as dense canopy. Gap opening are typically the result of tree loss due to widespread stressors (i.e., drought, climate) and/or natural pests and disease. Small openings support tamarack regeneration and recruitment.
WFn55; WFn55b	Northern Wet Ash Swamp; Black Ash-Yellow Birch-Red Maple-Basswood Swamp (Eastcentral)	S3	1842	Intact topography and natural groundwater seepages; flooding with prolonged inundation, occasional windthrown. Catastrophic disturbance such as fire is low to negligible in this system. Black ash is the dominant tree species and forms a closed to patchy canopy, occasionally interspersed with other hardwood tree species. Canopy tree loss due prolonged spring inundation or occasional windthrow create gaps for black ash recruitment. Withdraw can be widespread enough to cause major canopy loss. Downed, rotted woody debris are important for tree germination and growth. The invasive insect, Emerald Ash Borer, which causes rapid and widespread ash mortality poses a major threat to this NPC.
MHc47; MHc47a	Central Wet-Mesic Hardwood Forest; Basswood-Black Ash Forest	S3	224	Intact topography and surrounding hydrology ensure maintenance of overall soil moisture levels and seepages, especially important in the spring. The canopy is composed of mature hardwood species and catastrophic disturbance is near negligible in this system. Canopy gaps are produced primarily by tree maturation windthrow, or minor surface-level fires.
APn91	Northern Poor Fen	(S3)	463	Low level contact with mineral rich runoff supporting partial alkalization of the system and produces formation of fen conditions within the peatland.
MRn83	Northern Mixed Cattail Marsh	(S2)	318	Intact hydrology and natural sedimentation patterns; occasional disturbance events, such as flooding or fire during drought conditions. These events remove thatch and debris from the system, hence lowing the growing surface and making for the required, mucky inundated conditions. Wind and beaver activity can break up or dislodge floating march mats, creating gaps in this dynamic system.

Table 7. Conservation status ranks.

Rank Code	Rank Label
S1	Critically Imperiled
S2	Imperiled
S3	Vulnerable
S4	Apparently Secure; uncommon but not rare
S5	Secure, common, widespread, and abundant

Table 8. Rare plant species known to occur at Mille Lacs WMA.

Species (Common Name)	Species (Scientific Name)	State Status	Likely NPCs
Narrow triangle moonwort	*Botrychium lanceolatum spp. Angustisegmentum*	State threatened (S2)	MHc36, WFn55, WMn82
Goblin fern	*Botrychium mormo*	State threatened (S2)	MHc36, WFn55
Least moonwort	*Botrychium simplex*	State special concern (S3)	MHc36, MHn46, WFn55, FPn72, FPn73, WMn82
False mermaid	*Floerkea proserpinacoides*	State threatened (S2)	MHc36
Butternut	*Juglans cinerea*	State endangered (S1)	MHc36, MHn46
Bog bluegrass	*Poa paludigena*	State threatened (S2)	MHn46, WFn55

Wildlife

Mille Lacs WMA provides habitat for over 200 species of birds, 43 species of mammals, and 16 species of reptiles and amphibians during some part of the year. Abundant and diverse wildlife species are found in the Mille Lacs WMA due in large part to the wide diversity and quality of habitats.

Birds

Mille Lacs WMA's diverse habitats attract a large variety and number of birds. There are no currently-vetted bird lists for Mille Lacs WMA. A list prepared by Mille Lacs WMA staff in 1996 lists 234 species by migratory status (migrant, summer resident, permanent resident). An Avibase checklist for Mille Lacs WMA based on birders observations collated online contains 180 species but is light on owls, shorebirds, and winter visitors. Similarly, an eBird checklist compilation for Mille Lacs WMA contains

only 158 species and has the same limitations as the former. Lastly, there is a checklist for Mille Lacs Kathio State Park, which has many of the same features as Mille Lacs WMA, has 213 species listed by abundance and seasonality.

Many species, especially migrants, may be uncommon or rare because preferred habitat on Mille Lacs WMA may be lacking or because the unit lies near the normal limit of a species' range. Of the more than 230 bird species that may occur on Mille Lacs WMA, some are permanent or summer residents and commonly nest on Mille Lacs WMA, some are fall and spring migrants, and some are winter residents. Appendix C contains tables with common breeding and game species (Table 15), stewardship species (Table 16), and priority forest interior bird species (Table 17). Eleven bird species are listed on Minnesota's Endangered, Threatened or Special Concern Species list that was updated in 2013. SGCNs were identified in Minnesota's State Wildlife Action Plan. SGCNs include all of Minnesota's species listed as Endangered, Threatened or Special Concern. In total, 58 species of SGCNs likely use Mille Lacs WMA for some portion of their annual lifecycle.

All migratory birds, except non-native species such as house sparrows, European starlings, mute swans, and rock pigeons, are protected under the federal Migratory Bird Treaty Act, which prohibits the take of any migratory birds without authorization from USFWS. Minnesota also has state regulations that protect birds. Hunting regulations are developed and authorized by USFWS and DNR. Thirty-four bird species may be taken only during authorized hunting seasons.

Waterfowl and Game Birds

Waterfowl. At least 24 species of waterfowl have been documented on Mille Lacs WMA. Waterfowl hunting is available on all the pools, impoundments, and beaver ponds across Mille Lacs WMA. Hunting pressure can result in waterfowl leaving the area shortly after the season opens, however, the diligent hunter may still find birds using backwater areas and hidden water pockets around Mille Lacs WMA. Formal bag checks or car counts are not typically conducted during the waterfowl season, but mallards, wood ducks, blue-winged teal, and geese are the most prevalent waterfowl taken.

Wild Turkey. Oak forests provide preferred habitat for wild turkeys, but turkeys use a variety of habitats throughout their life cycle. Mature oak forests provide roost trees and hard mast as food. Grasslands and hay fields are used as nesting cover and brood rearing habitat. Agricultural fields can be used for feeding, especially in winter.

Wild Turkey reintroduction efforts used live-trapped and translocated wild turkeys of the eastern subspecies. Several releases were conducted in the late 1990's and early 2000's that resulted in the large number of turkeys present in the Mille Lacs area.

Ruffed Grouse. Ruffed grouse are abundant through Mille Lacs WMA's forested areas with higher concentrations associated with the young forest stands. Young forest with stands of high-density saplings provides predation protection for females raising broods, older stands contain diverse shrub layers and ground vegetation for optimal foraging, and older forests for mast production including acorns and buds for winter feeding. Ruffed grouse populations are monitored annually on three drumming count routes (Figure 10). Annual populations cycle up and down on a general 10-year cycle but even during low abundance years, hunters who focus on quality habitat generally find birds.

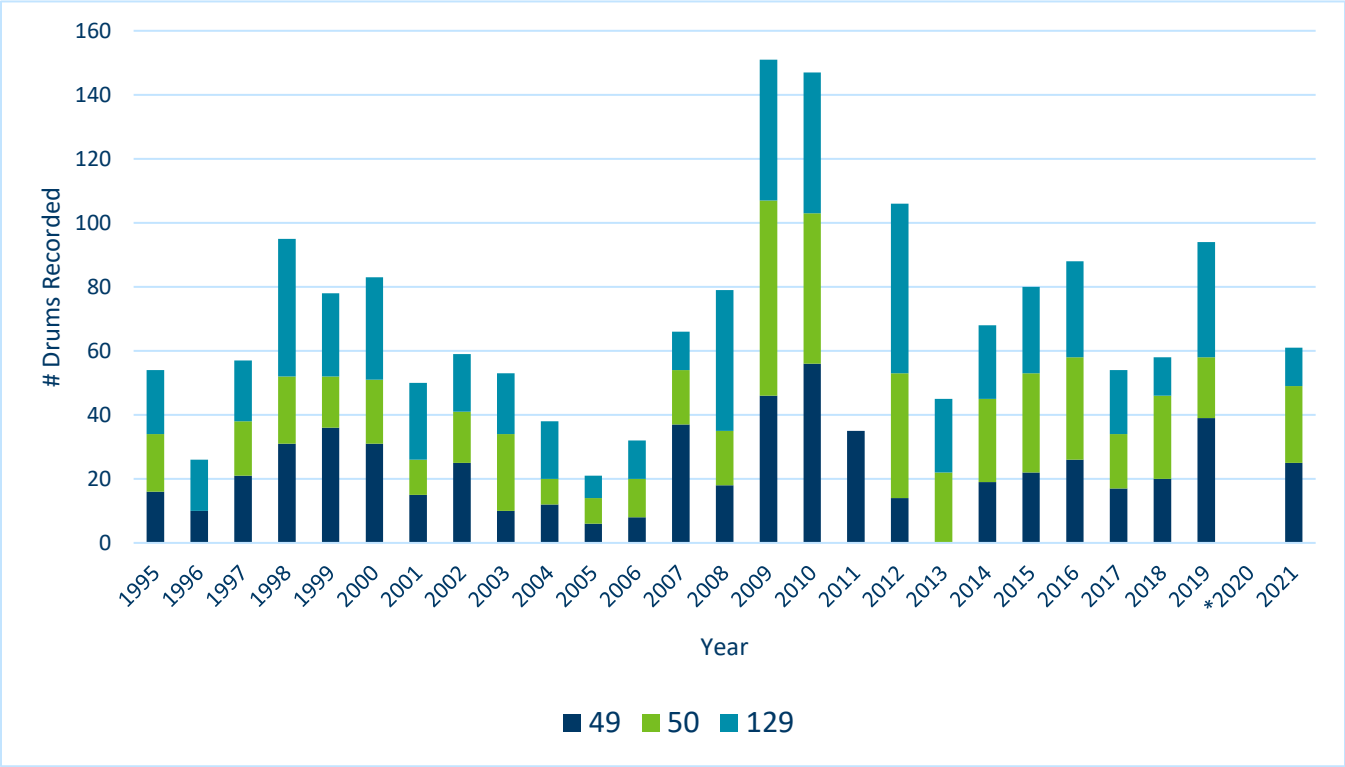

Figure 10: Mille Lacs WMA cumulative ruffed grouse drumming survey results by year, 1995 - 2022.Three drumming counts routes are used, named 49, 50, and 129. *Surveys were not conducted in the spring of 2020 due to Covid19 pandemic work restrictions. In 1996, 2011, and 2013, not all routes were surveyed.

Pheasant. Ring-neck pheasants are not commonly found on the Mille Lacs WMA. The Mille Lacs WMA is very near the northern extent of their range in Minnesota, but some birds can be found each year by hunters focusing on areas with brush and prairie grass fields.

American Woodcock. American woodcock is the only shorebird that inhabits the forest floor. This species is typically found in moist woodlands and edges of marshes and fields. Woodcock habitat on Mille Lacs WMA is young forest stands, particularly aspen, or other brushy areas located near more open fields, which are used for courtship displays and night roosting. Woodcock are a migratory species in this region and use the Mississippi River Flyway for much of its migration. While American woodcock numbers are stable in Minnesota, numbers have declined by one-third across North America. There is some uncertainty about populations in Minnesota because the birds are secretive, and surveying is difficult. Threats to the species include habitat loss due to urbanization, agricultural development, degradation of wetlands, and succession of young forests to an older age class.

Sandhill Crane. Sandhill cranes are migratory birds, using wet meadows and open grasslands. Sandhill cranes are a protected species in Minnesota, and although it is legal to hunt them in part of

northwestern Minnesota during the sandhill crane hunting season each year, they currently cannot be hunted in central Minnesota. Fluctuating water levels may hinder sandhill crane nesting. Impoundments on the Mille Lacs WMA are managed to avoid negatively impacting nesting for cranes and other waterfowl.

Nongame Birds

In addition to the common birds listed in Table 15, other SGCN that may use Mille Lacs WMA for breeding, foraging during breeding, or migration include least bittern, yellow rail (also SPC), upland sandpiper, Wilson's phalarope (also THR), common tern (also THR), black tern, eastern whip-poor-will, western meadowlark, and Nelson's sharp-tailed sparrow (also SPC). There is one record of a red-shouldered hawk from Mille Lacs WMA, during the 1997 breeding season.

SGCN that may use Mille Lacs WMA during migration include horned grebe (also END), American black duck, northern pintail, lesser scaup, peregrine falcon (also SPC), greater yellowlegs, Hudsonian godwit, semipalmated sandpiper, short-billed dowitcher, Forster's tern, Cape May warbler, bay-breasted warbler, and Connecticut warbler.

Trumpeter swans use and nest in most of the wetlands within Mille Lacs WMA. Minnesota supports the largest population of trumpeter swans south of Alaska and Canada, so maintaining nesting areas throughout the state is important for the long-term continental conservation of this species. Trumpeter swans eat primarily vegetation, so encouraging a diversity of aquatic plants such as pondweeds and bulrushes, is important. Trumpeter swans also eat fish, fish eggs, and small aquatic animals such as mussels and crayfish. In addition to maintaining adequate forage, swans are large birds requiring a minimum of 30 feet of open water to allow for a running start to become airborne. Thus, swan biology requires larger open areas be maintained within Mille Lacs WMA's wetlands. The pools need to be monitored annually for cattail expansion. If the pools begin to fill in with cattails or other vegetation, it may become necessary to actively manage for larger openings to retain trumpeter swans, and even tundra swans during migration. Nests are typically located closer to shore and are built on muskrat and beaver lodges, and floating vegetation mats.

Mammals

Most mammal species found on Mille Lacs WMA today were present during pre-European settlement times. As European settlement progressed, habitat destruction and unregulated hunting and trapping resulted in the decimation and, in some cases, the elimination of several larger mammals such as elk and woodland caribou from the area. The historical distribution of small, inconspicuous species is unknown. Mammal species present on Mille Lacs WMA were determined from information supplied by Section of Wildlife records and observations from staff working at Mille Lacs WMA (Appendix D, Table 18). Forty-three mammal species are known to occur on or near the WMA (southern flying squirrel also possibly occurs on Mille Lacs WMA, possibly overlooked amongst more common northern flying squirrels). Sixteen of these 43 mammal species are identified as game species, six are state listed as special concern, two are considered SGCNs, and two species, the Gray Wolf and Northern Long-eared Bat, are federally listed as Threatened and Endangered, respectively.

Large Mammals and Big Game

Mille Lacs WMA supports a moderate population of deer and accommodates large numbers of deer hunters. Deer are habitat generalists and use almost all the habitats available on Mille Lacs WMA. They tend to feed in early successional and oak forests, and on agricultural crops. They use forested habitat for security and thermal cover. They prefer that these cover types are well interspersed with each other and favor edge habitat. The current approach to management of the Mille Lacs' deer habitat – retaining oak and managing for diverse native plant community conditions – produces excellent deer habitat.

Mid-sized Mammals, Small Game, and Furbearers

Mille Lacs 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. Common small game hunted on Mille Lacs WMA include raccoons, coyote, red fox, rabbits, and squirrels. Furbearers include a variety of mammals trapped or hunted for their pelts. Important furbearers on Mille Lacs WMA include muskrats, mink, beaver, otter, raccoon, foxes and bobcat. Many furbearers are associated with water and wetlands (e.g., muskrats, otters, beavers, weasels). Rabbits, raccoons, and coyotes can be found in a wide variety of habitats, including croplands, open areas, and forests.

Gray squirrels are found throughout the forested areas of Mille Lacs WMA. Gray squirrels use oak forests with large, mast producing trees (Healy & Welsh, 1992). Current forest management on the Mille Lacs WMA supports such mast producing trees and results in abundant squirrel habitat. There is high squirrel hunting pressure on the WMA.

Small Mammals

Small mammals are important to ecosystems, serving as food for predators, distributors of seeds, grazers, and consumers of invertebrates. Although generally inconspicuous, small mammals are representative of deciduous forest, wetland and grassland communities on Mille Lacs WMA. Several species of small squirrels, chipmunks, voles, mice, shrews, bats, and moles are common.

Fish

Fisheries management within the area is primarily directed towards supporting water quality as only headwater portions of streams are found within the Mille Lacs WMA.

Seventy fish species have been sampled in the Snake River and Rum River watersheds, including three Special Concern species and one additional SCGN species (Appendix E, Table 19). Many of the species in these river systems are unlikely to occur on the WMA. Use of the Mille Lacs WMA by common fish species may be seasonal in nature, as shallow wetland complexes dominate the potential fish containing waters, and they leave during winter or drought. Species common to the WMA are composed of mostly warmwater species and are bolded in Appendix E (Table 19).

Figure 11: Photograph of a vernal pool in a northern hardwood forest. These areas are important habitats for wood ducks and amphibians.

Herpetofauna

Mille Lacs WMA has a moderate diversity of reptiles and amphibians, influenced by the diversity of habitats and native plant communities and their landscape connections. Twelve amphibian species and 5 reptile species are known to occur on Mille Lacs WMA. Herpetofauna species that occur on Mille Lacs WMA and their current conservation status are listed in Appendix F (Table 20).

Mille Lacs WMA provides habitat for two SGCN and state listed herpetofauna: four-toed salamander and red-backed salamander. Table 9 provides basic habitat needs for these two herpetofauna. Management guidelines for reptiles and amphibians can be found in the Habitat Management Guidelines for Amphibians and Reptiles of the Midwestern United States.

Table 9. Habitat requirements for SGCN and state listed herpetofauna within Mille Lacs WMA

Species	Habitat	Important Habitat Requirements
Four-toed Salamander	Mature deciduous and mixed deciduous-coniferous forests interspersed with ephemeral wetlands, sphagnum seepages, and other fish-free wetlands	Requires wetlands containing a sphagnum component and devoid of fish. Shaded moist forest floors with suitable leaf litter, organic soils, and coarse woody debris.
Red-backed Salamander	Mature deciduous and mixed deciduous-coniferous forests	Shaded moist forest floors with suitable leaf litter, organic soils, and coarse woody debris.

Invertebrates

The Mille Lacs WMA has a large diversity of invertebrate species ranging from dragonflies, to bumble bees, to butterflies and skippers. A plethora of common invertebrates occur on Mille Lacs WMA and can be observed widely across the entire unit. The invertebrates that are known to occur on Mille Lacs WMA likely represent only a fraction of what are actually present. Interest in invertebrate species has grown in recent years, and survey efforts and capacity to identify these challenging species has increased. This will likely lead to an increase in the number of invertebrates known to occur on Mille Lacs WMA, some of which may be rare or unique.

Recreational and Tribal Use

Minnesota's wildlife management areas are by statute used for public hunting, trapping, fishing, and other activities compatible with wildlife and fish management. Hunting has always accounted for the largest share of public use on the Mille Lacs WMA, but the Mille Lacs WMA is also used for non-hunting activities such as wildlife watching, foraging, and hiking. Knowledge of the present use-levels is necessary to predict the future demand for outdoor recreation and to guide management objectives and strategies.

Current Use of Tribal Communities

The Mille Lacs Wildlife Management Area is located within the area of MN ceded to the US in the treaty of 1837 in which Tribal Nations reserved the right to hunt, fish and gather natural resources. These treaty-reserved rights were upheld by the US Supreme Court (1999) and applied to the Mille Lacs and Fond du Lac Bands in Minnesota as well as six Ojibwe Bands in WI (Bad River Band of Lake Superior Chippewa, Lac Courte Oreilles Band of Lake Superior Ojibwe, Lac du Flambeau Band of Lake Superior Chippewa Indians, Mole Lake Band of Lake Superior Chippewa, Red Cliff Band of Lake Superior Chippewa, and St. Croix Chippewa Indians of Wisconsin). Although the Mille Lacs WMA is located at some distance from these bands (except for the Mille Lacs Band), the rights reserved in the treaty of 1837 apply to all their members.

The usufructuary rights reserved in the treaty of 1837 are described as rights to hunt, fish and gather. While these usufructuary rights were expressed in English (a foreign language to the Ojibwe) as a right to hunt, fish and gather, the intent was to continue their life way. Thus, while current use of the Mille Lacs WMA by tribal communities includes activities such as harvesting wild rice and hunting white-tailed deer and other species, the usufructuary rights are not limited to these activities. Other activities, such as conducting ceremonies and hiking, also fall within the range of treaty-reserved rights.

The extent of current use of the Mille Lacs WMA by tribal communities is not well known but includes activities such hunting large and small game and gathering wild rice and other plants.

Hunting

Ruffed Grouse Hunting.

Grouse hunting is the most popular activity on Mille Lacs WMA, thanks to both overall good population levels and large quantity of quality habitat across the Mille Lacs WMA. Ruffed grouse harvest data for Mille Lacs WMA is not available, but ruffed grouse drumming surveys are conducted in the spring. The survey results are provided in Figure 10. Mille Lacs WMA has three predetermined survey routes, and each route has 10 stops. Survey results on the Mille Lacs WMA mirror results of greater northeast Minnesota and the cyclical nature of a grouse population.

Deer Hunting.

Deer hunting is the second most popular activity on Mille Lacs WMA, thanks to moderate deer numbers and the Mille Lacs WMA representing the largest block of public land in central Minnesota. Deer population density is managed almost exclusively through hunter harvest strategies. Annual assessment of population modeling and hunter harvest data by DNR staff leads to the annual hunter harvest strategy designation to help meet deer density goals, set through a stakeholder informed process. Population goals are revisited approximately every five years and were updated in 2023.

The fall deer harvest in Deer Permit Area (DPA) 152 (Mille Lacs WMA) averages around 211 deer per year, with 111 bucks and 100 antlerless deer. Figure 12 shows reported deer harvest by year and method. In the 100 series of DPAs, the firearms deer season is a 16-day season.

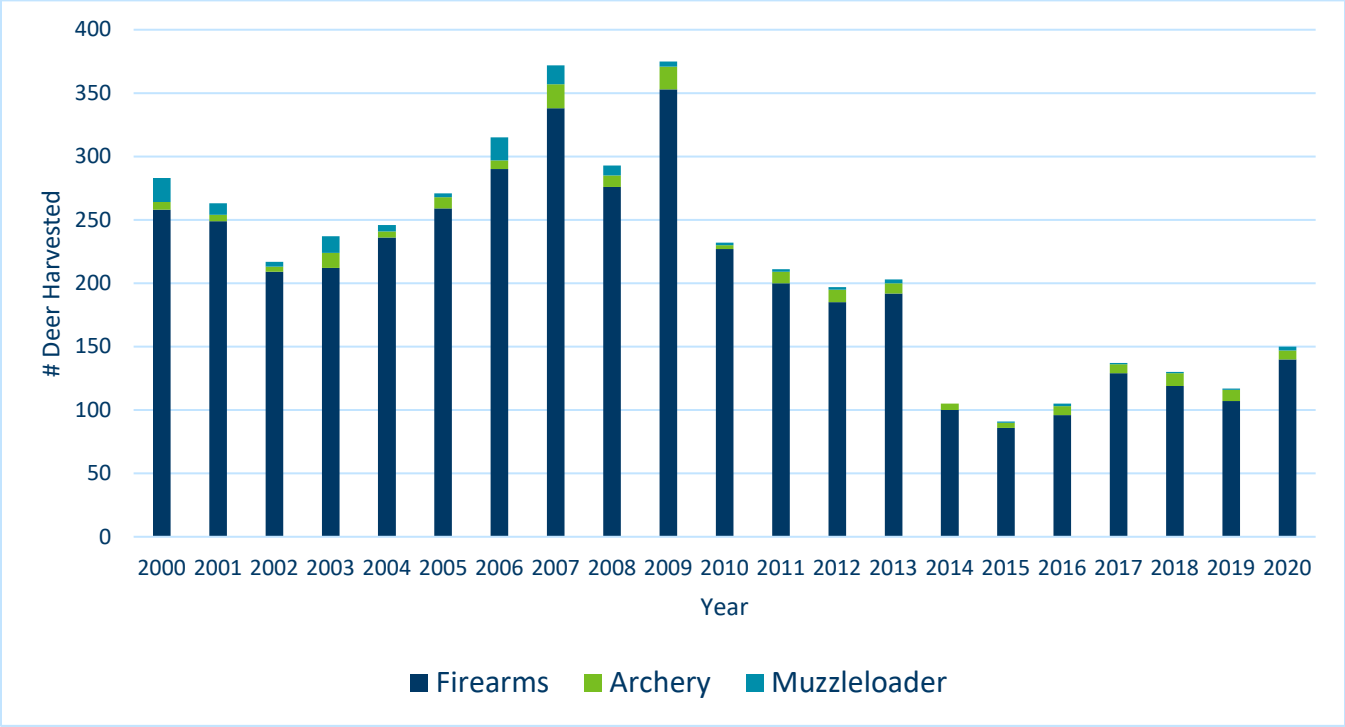

Figure 12. Total deer harvest in DPA 152 by method, 2000-2020.

Waterfowl Hunting.

Waterfowl hunting is available on most of the pools, impoundments and beaver ponds across the Mille Lacs WMA. Waterfowl hunting is popular but limited by access. Heavy hunting pressure typically results in waterfowl leaving the area shortly after the season opens. Formal bag checks or car counts are not conducted during the waterfowl season, but mallards, wood ducks, and geese are the most prevalent waterfowl taken.

Turkey Hunting.

The spring turkey harvest in the Mille Lacs WMA averages 25 male turkeys a year since a season opened in 2008. Figure 13 shows the spring harvest in Permit Area 512. Seasons A-C are lottery periods requiring firearms hunters to draw permit. Archery hunters and youth are exempt from the lottery requirements and as a result the unit receives heavy pressure during the 1st three time periods. Hunter success and hunting pressure gradually decrease as the season progresses. Fall turkey harvest is not popular with hunters, with an average of only 1-2 turkeys of either sex harvested by hunters each fall.

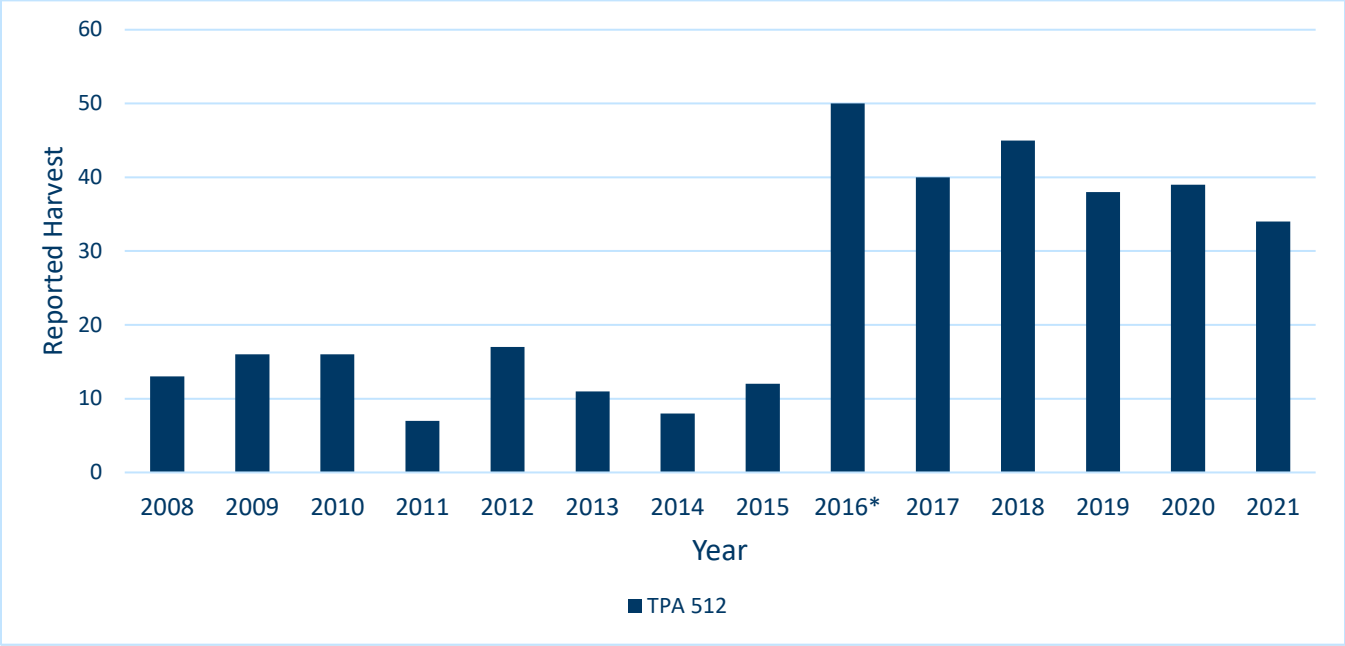

Figure 13: Reported spring turkey harvest for Area 512 by season, 2008 - 2021. Starting in 2016, youth and archers no longer needed a specific lottery permit to hunt in the Mille Lacs WMA during turkey season.

Squirrel Hunting.

Squirrels are one of the most popular game species on the unit after grouse and deer. Current regulations allow for a daily bag limit of seven, with the season running from mid-September through February. Bag counts and harvest estimates do not exist for the Mille Lacs WMA.

Trapping

Many furbearers on Mille Lacs WMA are dependent on aquatic habitats but there are large number of upland furbearers within the Mille Lacs WMA as well. Aquatic trappers pursue beaver, mink, muskrat and otter while the upland trappers pursue fisher, bobcat, raccoon, coyote, red fox and gray fox. Annual fur prices typically dictate trapping pressure. When prices rise the Mille Lacs WMA sees an increase in permit requests with a subsequent decline when prices drop. Precise estimates for annual trapping harvest do not exist as the voluntary annual harvest reports have low completion rates.

All trappers on Mille Lacs WMA are required to obtain a special use permit. This permit provides managers the ability to monitor trapping pressure within the Mille Lacs WMA boundary. Roughly 4-10 trappers apply for special use permits annually. Spring beaver trapping is limited to 8 permits annually that are allocated through a lottery at the beginning of each year.

Wildlife Observation

Wildlife observation is another activity that occurs on the WMA. WMA staff regularly talk with visitors who engage in wildlife observation on evenings and weekends outside of hunting seasons.

Recreational birding is predominantly focused on waterfowl and takes place in the spring near wetlands and impoundments.

Camping

Overnight use (camping) is allowed in all of the designated parking areas across the Mille Lacs WMA from September 1st through February 28th. There are 88 maintained parking areas where camping is allowed. All of these parking areas are primitive campsites that do not contain amenities. Campsites must be occupied each night while in use and campsites may be used by multiple groups at once. No remote or dispersed camping is allowed. During firearm deer season these campsites are widely used.

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 the Mille Lacs WMA. A variety of wild foods commonly collected for personal consumption include raspberries, blackberries, mushrooms, fiddleheads, nettles and leeks.

VI. Strategic Considerations

Climate and Climate Change

Mille Lacs WMA has a moist continental mid-latitude climate, typical of the northern part of the Upper Midwest. Summers are cool to warm, and winters are cold (National Weather Service 2022). According to data from 1991 to 2020, the hottest month is July (69.0°F), and the coldest month is January (11.1°F) (Minnesota State Climatology Office 2022). The median dates for last and first killing frosts (28°F) from 1991 to 2022 are approximately April 30 and October 1 (Midwestern Regional Climate Center 2022), with a growing season of 153 days spanning the time between those killing frosts (U.S. Department of Agriculture 2022). The wettest month is June (4.6 inches of precipitation), and the driest month is January (0.7 inches of precipitation) (Minnesota State Climatology Office 2022). Mille Lacs WMA receives around 44 inches of snowfall annually from October through April (average of the 3 closest weather stations – Onamia Ranger Station, Milaca, and Mora – with snowfall records from 1991–2020) (NOAA Regional Climate Centers 2022). Prevailing winds come from the northwest in winter and switch to the southwest in summer (Columbia Institute for Climate and Society 2022).

The future climate of Mille Lacs WMA is projected to be warmer and wetter than it is currently, as modeled by the University of Minnesota (precipitation projections especially, but also temperature projections). Table 10 and Table 11 contain the historic (1895-1969) and current (1991–2020) mean seasonal precipitation and temperature values as well as projected end-of-century values under a moderate greenhouse gas emissions scenario. All seasons are projected to be warmer and wetter by end-of-century, with fall and winter experiencing the greatest increases proportionally for precipitation and temperature, respectively.

Table 10: Precipitation by season for the Mille Lacs WMA. (Minnesota State Climatology Office 2022)

Season	1895–1969 mean (inches)	1991–2020 mean (inches)	2080–2099 (inches) (mean under a moderate emissions scenario)
Winter (December–February)	2.2	2.5	2.8
Spring (March–May)	6.9	7.7	7.7
Summer (June–August)	11.6	12.9	12.5
Fall (September–November)	6.4	7.6	9.8

Table 11: Temperature by season for the Mille Lacs WMA. (Minnesota State Climatology Office 2022)

Season	1895–1969 mean (°F)	1991–2020 mean (°F)	2080–2099 (°F) (mean under a moderate emissions scenario)
Winter (December–February)	10.6	14.7	19.5
Spring (March–May)	39.8	41.7	48.0
Summer (June–August)	65.8	66.7	71.6
Fall (September–November)	43.3	45.0	49.2

These climate changes affect fish, wildlife, and plant populations—altering behavior, distribution, development, reproduction, and survival. Many changing climate factors and resultant habitat changes affect animals and plants, such as altered snow cover, shorter winters, shifts in dissolved oxygen regimes in lakes, and increasing stream temperatures. Some species may benefit from climate change, while many other native fish, wildlife, and plant populations will be negatively affected.

Winter Severity

Temperature in wintertime is predicted to increase more than any other seasonal temperature and precipitation value. Days with snow coverage are also predicted to decrease (Liess et al. 2022). These changes may benefit deer populations at the WMA as well as certain plant species growing at the northern edge of their ranges. However, nuanced changes to snow quality affected by warmer air temperatures in the winter and early spring can negatively affect wildlife. One example is freezing rain

forming a hard icy crust on the snow surface, which can prevent grouse from roosting under snow. Subtle changes in snow quality cannot be predicted to confidently forecast potential impacts to wildlife.

A shift towards milder winters can already be seen in data the Minnesota DNR collects. The DNR measures snow depth and cold temperatures from November through May to calculate a winter severity index (WSI), which estimates winter weather impacts on deer survival. More days with extreme cold and deep snow result in a higher WSI, correlating to lower deer survival. Winter severity indices for Mille Lacs WMA's deer permit area 152 were calculated back to 1981 and are shown in Figure 14. WSIs in permit area 152 are trending downward, primarily due to fewer days with deep snow. The average WSI for the first 20 years in this dataset is 72, with 4 winters being ranked as severe (WSI greater than 120). The average WSI for the last 21 years is 48, with only 1 winter ranked as severe.

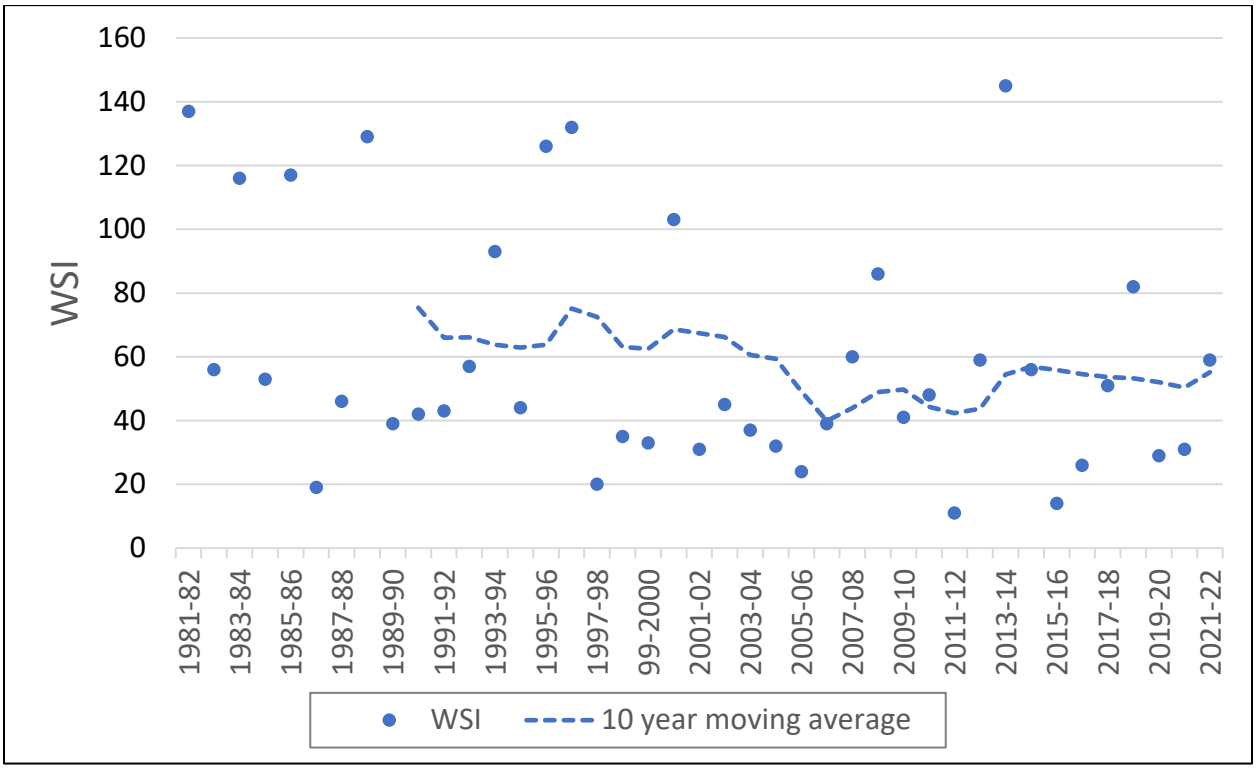

Figure 14. Winter severity index for Mille Lacs WMA, 1981 - 2022.

Extreme weather

One result of climate change is more extreme weather, especially heat and precipitation. The frequency of extreme seasonal temperature and precipitation is increasing in Mille Lacs WMA. From 2011–2021, Mille Lacs WMA experienced 23 seasonal precipitation or average temperatures ranking in the top or bottom 10 on record (1895–2022) (see Table 12). There are successively fewer such records

in the previous three decades (18 in the top or bottom 10 on record from 2001–2011, 15 from 1991–2001, and 11 from 1981–1991)[2].

Table 12: Recent extreme weather records, by season, for the Mille Lacs WMA.

Year	Season			
	Winter	Spring	Summer	Fall
2011				7th Driest
2012	3rd Warmest	**Wettest on record** 2nd Warmest	9th Warmest	4th Driest
2013		7th Coldest		
2014	6th Coldest 10th Wettest	10th Wettest	6th Wettest	
2015				**Warmest on record**
2016	5th Warmest	9th Warmest	4th Wettest	2nd Warmest
2017	8th Warmest			10th Wettest
2019				2nd Wettest
2020			5th Warmest	
2021			10th Driest 2nd Warmest	5th Warmest

An increasing likelihood of extreme rainfall events, plus a historic predisposition to mega-rain events, suggest managers prepare infrastructure and vegetation in the WMA for greater threats from flooding. Mille Lacs WMA historically is prone to mega-rain events (Minnesota State Climatology Office 2022b). Mega-rains are defined as 6 inch or greater rainfalls within 24 hours covering at least 1000 square miles with at least one location receiving 8 inches or more. Mega-rains have been recorded in Minnesota since 1973. The WMA has been affected by 2 of the 16 mega-rains recorded statewide since 1973, once in October 2005 and again in July 2016. Additionally, an intense rainfall event covered the WMA in 1972, prior to establishment of high-density rainfall observations. Heavy precipitation events such as these are predicted to increase across the country (USGCRP 2017).

Invasive Species

Invasive plants and animals pose management concerns by outcompeting native organisms for sunlight, food, space and other resources. Many invasive plants produce fruits that are attractive food for wildlife, particularly birds, which contribute to their widespread occurrence. Public recreation also greatly contributes to the movement of invasive species.

Based on DNR invasive species monitoring data, there are not many invasive plants and animals within and adjacent to Mille Lacs WMA. Although the DNR's monitoring programs have increased recently, there are likely species under reported or not reported at all. It is likely that invasive plants and animals are more widespread than current data indicate. In the future, the number, and abundance, of different invasive species will increase, and these organisms will pose significant risks to native species. Looking at the records for known occurrences of invasive plants and animals, many invasive species are much more abundant in areas where WMA users come from (Twin Cities Metro, St. Cloud, Brainerd Area Lakes). Given that the WMA is a recreation destination for the public around the state, it's likely that the risk is high over the next 10+ years to see an increased presence of new invasive species in the unit. Educating users, early detection, and aggressive treatment of invasive species can be effective tools in minimizing new introductions and their further spread.

Monitoring and Control

The DNR uses proactive tools to help prevent the introduction of new invasive species, including those outlined in Operational Order 113 Invasive Species Prevention and Management and the Division of Fish and Wildlife's guidelines on Operational Order 113. These documents outline how staff are to minimize spread of invasive species and pathogens on state lands. Protocols include day to day guidelines on preventing intentional movement of invasives 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 EDDMapS Midwest website or app (Early Detection Distribution and Mapping System) or using the Invasive Species Reporting Form. Invasive species reports are verified by DNR invasive species specialists and with the help of these staff, fast action can be taken for new invasive plants and animals found on the WMA. New invasive discoveries on the WMA should be prioritized with a goal of eradication.

For invasive plant and animals already present in the WMA, control of limited populations on higher-quality sites in larger project areas should be prioritized. Prioritizing these limited invasions will reduce spread into uninvaded areas. Funding for future invasives control should be identified and applicable on multiple invasive species using multiple control tactics.

Below is a listing of plants and animal species present in or very near the Mille Lacs WMA according to the Minnesota DNR's Invasive Terrestrial and Aquatic Observations data sources and in consultation with DNR staff specialists. Species that could be potential invaders over the next 10 years are also listed. Because of shortages in staff time to monitor invasive species populations, this is likely not a complete list.

Animals

Terrestrial animals

Several non-native terrestrial animals are well established in and around Mille Lacs WMA and are not tracked in invasive species databases. These include rock pigeons, European starlings, house sparrows, house mice, Norway rats, and invasive earthworms. There are currently no cost-effective control methods for these species. Invasive earthworms have the greatest impact on habitat structure; if new control techniques are developed in the future, they may be implemented. The other species are undesirable because they may spread diseases or compete with native cavity-nesting birds.

Aquatic animals

There are no reports of invasive fish species in the WMA. Common carp (*Cyprinus carpio*), while not present in the pools at the WMA, are present in both watersheds of the Rum and Snake Rivers. The most likely avenue for introduction is by people transporting baitfish.

There are no reports of zebra mussels (*Dreissena polymorpha*) in the unit, but their potential arrival would likely be from fishing recreation. Zebra mussels are present in Mille Lacs Lake and have been since at least 2005.

Other invasive aquatic animals present in Mille Lacs Lake that could impact the pools at Mille Lacs WMA: spiny waterflea (*Bythotrephes longimanus*), snail species (*Viviparus georgianus, Cipangopaludina chinensis*), and the rusty crayfish (*Faxonius rusticus*).

Terrestrial Plants

Woody Plants

Two impactful invasive woody species known to occur within the Mille Lacs WMA are European buckthorn (*Rhamnus cathartica*) and Amur maple (*Acer ginnala*).

It appears that buckthorn and Amur maple are not widespread yet in Mille Lacs WMA. But, in the future, the populations of these two plants are expected to increase in both abundance and numbers of infestations. It is not known when or how these plants arrived at Mille Lacs WMA, but the earliest records are from 2008 for buckthorn and 2019 for Amur maple (although, Amur maple was first found in the adjacent Rum River SF in 2009). There is not much information known about the density of the current populations at these locations. Spatially, both plants seem to be located on the perimeter of the unit, but it is noteworthy that two records of buckthorn are in the interior of the WMA. One record is 1/3 mile southwest of the Dinosaur Island old growth stand and the other is just south of Olson Field.

Due to its potential impact on forest habitats, European buckthorn is the highest priority for detection and treatment on the Mille Lacs WMA. Currently, staff treat sites with higher abundance of European buckthorn through chemical or mechanical means, especially during the late fall when it is more easily detected.

Other invasive species known to occur in low abundances on or near the Mille Lacs WMA include:

- Siberian peashrub (*Caragana arborescens*)
- Glossy buckthorn (*Frangula alnus*)

- Exotic bush honeysuckles (*Lonicera* spp.)
- Japanese knotweed (*Polygonum cuspidatum*)
- Scots pine (*Pinus sylvestris*)

Over the next 10-20 years, the following invasive woody plants could arrive in the Mille Lacs WMA:

- Japanese barberry (*Berberis thunbergia*)
- Norway maple (*Acer platanoides*)
- Black locust (*Robinia pseudoacacia*)
- Siberian elm (*Ulmus pumila*)

Herbaceous Plants

There are several invasive herbaceous plant species in the Mille Lacs WMA. These include:

- Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare)*
- Spotted knapweed (*Centaurea stoebe spp. microanthos*)
- Common tansy (*Tanacetum vulgare*)

These three species are mechanically or chemically treated when observed.

Over the next 10-20 years, the following invasive herbaceous plants could arrive in the Mille Lacs WMA:

- Leafy spurge (*Euphorbia esula*)
- Wild parsnip (*Pastinaca sativa*)
- Garlic mustard (*Alliaria petiolata*)
- Poison hemlock (*Conium maculatum*)

If any garlic mustard populations are found on the unit, it should be prioritized for treatment. This species is known to significantly increase in population in just a few years once found. It typically occurs in forested settings, particularly moist woods, but it can be found in a variety of habitats. It spreads rapidly after disturbance and is easily spread by wildlife and human footwear.

Wild parsnip occurs commonly in grassland, riparian, roadsides, and agricultural areas. Poorly timed mowing is the most likely culprit for spread of this species; however, its papery seeds can easily move in wind and water. This species is a target for control, not only because it can outcompete native vegetation, but because it also can cause a photosensitive rash on humans.

Poison hemlock is a relatively new invasive species to Minnesota, showing up in the past 10 years. This plant is poisonous if consumed by humans and some wildlife. Control of this species should also be prioritized.

Aquatic Plants

There are two known invasive aquatic plant species occurring within or very nearby the WMA, purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*). Purple loosestrife is located around Mille Lacs Lake but is not known to occur in the WMA itself—most of the populations occur between US Highway 169 and the WMA along the Rum River. Mille Lacs WMA staff will chemically or mechanically treat any future detections of purple loosestrife in the WMA.

Reed canary grass (*Phalaris arundinacea*) is well established throughout the Mille Lacs WMA and due to the lack cost-effective largescale treatment options, no specific management actions are currently being conducted.

Hybrid cattail (*Typha x glauca*) is well established throughout the Mille Lacs WMA and management has been focused on minimizing further spread.

Other species not currently present in the WMA but threatening include:

- European common reed (*Phragmites australis ssp. australis*)
- Flowering rush (*Butomus umbellatus)*
- Pale yellow iris (*Iris pseudacorus*)
- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Curly-leaf pondweed (*Potamogeton crispus*)

Fish and Wildlife Diseases and Parasites

The diseases and parasites listed below have the potential to impact fish and wildlife populations on the WMA. Responses to diseases and parasites will vary depending on the scale and causative agent. All actions will be closely coordinated with other DNR divisions, FAW's Health Programs, and partners (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. A common denominator among outbreaks is 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, which also serve as the requisite concentration point.

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. As of the writing of this plan, no CWD positive wild deer have been detected on Mille Lacs WMA or within the adjacent DPA 157. See the following link for updated DNR CWD response plan.

Epizootic Hemorrhagic Disease

Epizootic hemorrhagic disease (EHD) is a viral disease that occurs naturally and 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 impact on the overall deer population. There are no management interventions available to combat the disease. EHD is seasonal and most often occurs during drought-like conditions in the late summer and early fall. Frost will kill the virus and midge that carries it, ending the potential infection period. Finding seemingly healthy multiple 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. EHD has not been documented at or near the Mille Lacs WMA as of late 2022.

Mange

Mange, particularly sarcoptic mange, is a disease transmitted by mites, and affects mainly canids (wolves, foxes, 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 the 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 this primarily affects raccoons, grey fox and skunks in the spring and fall. Clinical signs begin 10-14 days after infection and include discharge from the eyes and nose, dyspnea (difficulty breathing), coughing, and pneumonia. Fever, anorexia and respiratory tract issues are most common. Canine distemper virus (CDV) also causes gastrointestinal illness, thickening of the nose and foot pads, and a neurologic phase that has symptoms similar to rabies and can be difficult to distinguish as a result. Transmission occurs from contact with infected saliva, urine, feces or respiratory secretions. Animals can shed up to 2 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 that is 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 themselves, rabies is 100% fatal; however, proper post-bite treatment is nearly 100% effective in preventing onset. As with mange, rabies outbreaks in the wild can be controlled by oral vaccinations in food items left out for consumption, but this is difficult and expensive.

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 in bats. All sites surveyed in southeast Minnesota in 2017 were positive for WNS. The extent of the impact to all bat species occurring in Minnesota is unknown, but dramatic declines are expected based on population trends in other states where WNS has been confirmed. Northern Long-eared Bats have been hit particularly hard by WNS. As a result, the USFWS designated this species as threatened in April 2015. It is listed as Special Concern in Minnesota. Because this species is now Federally listed, the USFWS established a 4(d)1 rule for protecting the species. This 4(d) rule prohibits most purposeful take, sets guidelines for incidental take, and identifies specific activities that are exempt from incidental take prohibitions. Currently, there are not any known bat hibernacula on the WMA. If any bat hibernacula were to be discovered, the DNR's Bat Habitat Conservation Plan would be implemented to protect them. DNR

Ecological and Water Resources Division would be consulted upon discovery of active hibernacula on the WMA. White Nose Syndrome is not known to occur on the Mille Lacs WMA.

Waterfowl Intestinal disease from trematodes carried by faucet snail

The faucet snail (*Bithynia tentaculata*) is an aquatic snail native to Europe, introduced to the Great Lakes in the 1870s. The snail is an intermediate host for three intestinal trematodes, or flukes, (*Sphaeridiotrema globulus, Cyathocotyle bushiensis, Leyogonimus polyoon*) that cause mortality in waterfowl. These parasites have a complex life history and require two intermediate hosts to develop, the first of which must be a faucet snail. When waterfowl consume the infected snails, the adult trematodes attack the internal organs and cause lesions and hemorrhage. Infected birds appear lethargic and have difficulty diving and flying before eventually dying. Faucet snails have not been documented on the Mille Lacs WMA.

Newcastle Disease

Virulent Newcastle disease is a contagious and fatal viral disease affecting the respiratory, nervous and digestive systems of birds and poultry. The disease is so virulent that many birds and poultry die without showing any clinical signs. In Minnesota it has occurred periodically in colonial nesting waterbirds (pelicans, cormorants, gulls, terns, and herons). Waterbird colonies occur on nearby Mille Lacs Lake and diseases could be spread to the Mille Lacs WMA from there. Birds that die from Newcastle Disease are collected from colonies and disposed of by incineration. Newcastle has been documented in cormorant colonies on nearby Mille Lacs Lake in prior years but not on the WMA.

Bovine TB

Bovine TB 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 TB transmission to humans is unlikely, in Michigan it has been transmitted to omnivores and carnivores such as black bear, raccoon, coyote, bobcat and red fox. Bovine TB has not been found on the Mille Lacs WMA with the last known infection located in NW MN in 2009.

West Nile Virus

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

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 Mille Lacs and Kanabec 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. Symptoms of the disease may include loss of appetite, depression, fever, coughing, pain and skin lesions.

Threats to Forest Tree Health

The most significant current threats to trees on Mille Lacs WMA are floods and droughts. These environmental threats are driven by the climate and made worse if trees are quite old or if they are simultaneously affected by defoliation or harvesting. In addition, there are three visible tree threats on Mille Lacs WMA's horizon. The most pressing threat is to ash forests from emerald ash borer (EAB). Eastern larch beetle potentially threatens most of the mature tamarack on the WMA. A third serious threat is to oak forests from oak wilt. Informed management can increase forest resiliency and mitigate the potential harm caused by these threats.

Aspen health

Aspen is the most common tree species on the Mille Lacs WMA, found in most forest stands and the dominant species in approximately 40% of its forest stands. Currently, there is no significant threat to aspen forest health in Minnesota. As is true with all tree species, aspen have an age limit, and it is relatively short. As aspens grow older, environmental and biotic stressors negatively impact them more and can start a slow stand-wide decline. These declines are associated with a variety of unmanageable, opportunistic insect pests and diseases.

A variety of stem canker diseases can kill aspen, the most common one being hypoxylon canker. Usually, hypoxylon canker acts as a natural thinning agent in younger aspen forests. In rare circumstances, an aspen forest is extremely susceptible to hypoxylon canker and tree density diminishes to undesirable levels. If this happens with any aspen stand in the WMA, the manager could consider allowing forest succession to naturally convert the stand to a different forest cover type.

Oak Health

Oak species are the primary trees on almost 30% of the WMA's forested acres. The greatest pest threats to oaks are oak wilt and twolined chestnut borer. Neither of these problems threaten oak's existence on the WMA, but oak wilt left unchecked accelerates oak timber losses as well as promotes non-oak trees and shrubs that are not desirable for wildlife or native plant communities (e.g., buckthorn and red maple).

Twolined chestnut borer infestation following defoliation, drought, or flooding

Twolined chestnut borer is a native cambium-feeding beetle that only causes problems after severe stresses, such as serious drought, flooding, or consecutive years of heavy leaf feeding. Managing damage from twolined chestnut borer involves minimizing additional stress. To reduce risks from twolined chestnut borer, oak stands should not be thinned or harvested for a few years after significant droughts or defoliation events.

Oak wilt

Oak wilt is a serious non-native threat to forests with large proportions of red oaks. This disease also can kill and spread amongst bur oaks. As of January 2023, oak wilt was 24 miles from the WMA. The most likely pathway for oak wilt to get to the WMA is on infected fresh oak firewood brought to or near the WMA by campers or nearby property owners.

It is not a guarantee that oak wilt will arrive on the WMA soon, but if oak wilt is discovered in the WMA, there is a high likelihood that it can be eradicated if discovered early enough. Therefore, monitoring by DNR staff and WMA users for this disease is important. Symptoms can be seen at the oak wilt webpage and in the appendix in DNR's oak wilt guide. The forest health team remotely monitors for this disease with its aerial survey program, but oak wilt discoveries from the air are relatively rare, especially in richer forests like those in the WMA.

Prevention. Oak wilt can be prevented by not wounding oaks from April through mid-July. Once oak wilt is known to be within 20 miles of an oak tree, the risk of contracting oak wilt through a fresh wound becomes significant. Restricting harvesting and other activities that could damage trees in or adjacent to oak stands reduces the likelihood that oak wild will spread. The DNR's forest health team maintains a map of at-risk areas for oak wilt on the oak wilt webpage.

Control. If oak wilt is suspected on the WMA, the DNR region forest health specialist will be consulted for disease confirmation and to determine a site appropriate management strategy. The DNR's forest health program can also provide control recommendations and possibly control funding. Control is highly recommended to protect surrounding forests as well as minimize losses to oaks on the WMA. Also, control can slow the encroachment of buckthorn and red maple, both of which thrive in slowly expanding canopy gaps made by oak wilt.

Northern hardwood health

Northern hardwood stands make up about 25% of the Mille Lacs WMA's forests. They are dominated by sugar maples and basswoods amongst other tree species. There are no significant pest threats to this covertype, as it is more resilient to disturbance due to higher plant diversity and typically occurs on rich soils. Common pests and diseases that can slow stand growth are introduced basswood thrips, forest tent caterpillars, and neonectria canker on basswoods; and Eutypella canker and sugar maple borer on sugar maples.

Ash health

Black ash is the main tree species in about 7% of the WMA's forests. Historically, the main threat to black ash forests has been flooding. In the future, the main threats to ash in the WMA will be flooding and emerald ash borer (EAB).

Emerald ash borer

Emerald ash borer is a non-native cambium feeder of ash trees. Once EAB has been discovered in a new location in Minnesota, it has moved outward at a relatively moderate pace. After 6 years, there has been widespread infestation within about 10 miles of the original EAB detection. Near total

mortality of a local area's ash has occurred roughly 12 years after discovery. As of November 2022, EAB was about 35 miles from the WMA and it will likely arrive in the WMA during the lifespan of this plan.

In the absence of human-mediated spread, the rate of warming winters will determine how rapidly EAB spreads in the WMA. By mid-century, minimum winter temperatures are predicted to not be consistently cold enough to kill the majority of overwintering EAB larvae. By end-of-century, if warming occurs according to the most drastic predictions[2], EAB will spread in the WMA at rates seen in southern Minnesota.

Strategies to prepare for emerald ash borer. Monitoring and reporting EAB are important for knowing timelines for EAB impact to the WMA's wet forest resource. When EAB is suspected on the WMA, the DNR region forest health specialist will be consulted for disease confirmation and to determine a site appropriate management strategy, in accordance with DNR guidance.

Due to the possibility of more flooding from a wetter climate and eventual mortality of most black ash in the WMA from EAB, a strategy to maintain wet forest tree cover would be to plant a variety of flood-tolerant tree species in canopy gaps in the WMA's black ash stands. Planting could also occur in small gaps or narrow strips purposefully created by harvesting mature ash. Caution should be taken to not remove too many older black ash in any given stand, as that can promote dense ash sprouts or loss of forests due to flooding. Some case studies illustrating promotion of other tree species on black ash sites are published in the Great Lakes Silviculture Library.

Tamarack health

Tamarack trees dominate only 3% of the WMA's forests, but they serve a valuable ecological role and are important in the landscape. Since 2001, Minnesota has lost a large amount of its mature tamarack cover to the eastern larch beetle, a native bark beetle. This outbreak has affected, to some degree, almost 70% of the state's tamarack cover type.

Only a small amount of larch beetle damage has been recorded in the WMA. There is no indication that the larch beetle outbreak will end in Minnesota, so at some point, most of the WMA's mature tamarack could be lost to this bark beetle. This loss is not a guarantee though. Some stands in Minnesota that were severely impacted by the larch beetle have naturally regenerated back to tamarack.

Human Activities

The Mille Lacs WMA is the fourth largest WMA in the State and the one of largest blocks of contiguous public land units in Central Minnesota. The unit is within a 2-hour drive of the greater Twin Cities seven

[2] Matthews, S. N., Iverson, L. R., Peters, M. P., & Prasad, A. M. (2018). Assessing potential climate change pressures across the conterminous United States: mapping plant hardiness zones, heat zones, growing degree days, and cumulative drought severity throughout this century. RMAP-NRS-9. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station. 31 p., 9, 1-31. https://www.fs.usda.gov/nrs/pubs/rmap/rmap_nrs9

county metropolitan area and the St. Cloud metropolitan area. Over half of Minnesota's total population can make a day trip to utilize the resources that the unit has to offer.

The Mille Lacs 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 users may seek additional uses or enhancements to the area to address other recreational activity interests or priorities. These will be allowed or implemented only when determined to be compatible with the primary purpose of the WMA.

However, it should be noted other state lands are present locally and have facilities or capacity to address these interests. For example, Division of Forestry lands have facilities for snowmobiling, ATV, and horseback trail riding. The Mille Lacs-Kathio and Father Hennepin State Parks have developed facilities for camping, hiking, swimming, and nature interpretation facilities and services. Bird watchers, hikers, and canoeists can use Mille Lacs WMA roads, dikes, parking lots, and other facilities for compatible uses.

Hunting, fishing, and trapping are regulated activities and are not a threat to habitat or wildlife populations when done in line with regulations. Taking of animals or plants beyond the legal allowances could threaten habitat and wildlife. Other compatible and non-compatible uses and activities at Mille Lacs WMA are regulated by Minnesota statute or administrative rule and generally do not pose a threat to the WMA.

Neighboring Land Use

Purchase, development, or fragmentation of private lands adjacent to the Mille Lacs WMA may present challenges to WMA management activities, recreational use, and access. These threats include water quality and management issues, introduction of invasive species in areas of high biodiversity, changes in adjacent land use, misunderstandings of Mille Lacs WMA management activities, and increased human and wildlife conflicts. As people continue to migrate from population centers to rural areas around the state, changes in the use of private lands may present challenges to existing land, resource, and infrastructure management activities within Mille Lacs WMA.

These concerns can be viewed as an opportunity for more coordinated land planning efforts to ensure farming, natural resource, and other public objectives are addressed. Efforts should identify areas where development or fragmentation would have the most impact, and coordinate tools to address or limit this impact. Local communication and coordination are key, incorporating other private and state lands (i.e., Rum River State Forest) in the area to maintain large areas of forest habitats with travel corridors connecting them. Proper land planning will enhance the value of these lands for wildlife, plants, residents, and visitors.

Examples of land planning tools include the following:

- Educate the public on the unique high biodiverse areas, unique wildlife, and rare plant communities located in the area.
- Encourage private landowners to enroll their lands in permanent conservation easements to protect use and habitat.

- Encourage other DNR Divisions to engage with private landowners to establish stewardship, or other management plans, and develop habitat management projects. This includes Forest Stewardship Plans, Firewise Minnesota, and Landowner Wildlife Habitat Planning.
- Work with local government units to promote the protection and use of significant wildlife habitats.

Unit Access Limitations

In addition to public highways and roads that border the unit, the Mille Lacs 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 access is maintained for ongoing management and public recreation activities.

Dikes, water-control structures, and culverts.

Water control structures are important infrastructure and resource management components of Mille Lacs WMA. These structures include public road and unit road culverts, dikes on impoundments, and associated impoundment water control structures. These elements serve multiple purposes for controlling water during high water and significant precipitation events, controlling runoff during spring snow melt, and maintenance or adjustment of water levels on the pools.

Water control structures are vulnerable to extreme precipitation events, deferred maintenance due to funding limitations, and degradation over years of use. Periodic maintenance, repair, replacement, or removal of water control structures is needed to ensure that surface water management is effective and resilient to future weather events.

Operational Context

Administrative and Fiscal

The Mille Lacs WMA is managed by the Section of Wildlife, within the DNR's Division of Fish and Wildlife, and is in the DNR's Central Region, also known as Region 3. WMA operations are funded primarily through the Game and Fish Fund, which is supported by the sale of hunting, fishing, and trapping licenses and federal aid from surcharges on hunting and fishing equipment. Game and Fish funding is used primarily to cover salary and operational costs, such as maintenance. Some wildlife management projects on the Mille Lacs WMA are funded through dedicated wildlife accounts (deer, wild turkey, waterfowl, and pheasant stamp), and the majority of current project funding is through the Minnesota Outdoor Heritage Fund, or other grant funding, such as the Competitive State Wildlife Grant and Legislative-Citizen Commission on Minnesota Resources. Additional project funding is brought to the WMA through partnerships with NGOs such as The Nature Conservancy, National Wild Turkey Federation, The Sharp-tail Grouse Society, Ruffed Grouse Society, and others. These organizations apply for grants and help administer habitat projects on the Mille Lacs WMA to achieve combined organizational and resource goals.

Staffing

The Mille Lacs WMA staff consists of one Area Supervisor, two Assistant Area Managers and one Seasonal Labor Trades & Equipment (LTE). The Area Supervisor is responsible for supervision, work planning, budgets and administrative tasks but also assists with habitat and facility projects as needed. Assistant managers and the LTE are responsible for implementing day to day operations and field project work. Staffing levels are an important factor in implementing plan strategies and priority work.

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 division of Fish and Wildlife Mille Lacs WMA staff participate in annual coordination meetings with the divisions of Forestry and Ecological and Water Resources. In addition to these annual meetings, Mille Lacs WMA staff work in coordination with other divisions continuously throughout the year. Mille Lacs WMA staff also communicate with the DNR Regional Management Team on ongoing or emerging WMA issues.

Figure 15: Photograph of the Cranberry Trail in the Mille Lacs WMA.

VII. Desired Conditions

The desired conditions for Mille Lacs WMA are described through twenty-eight objectives grouped under two goals:

1. Maintain or enhance a diverse mosaic of forest and wetland habitats at various successional stages for the benefit of native wildlife species.
2. Maintain or enhance sustainable human use including compatible recreational opportunities and the exercise of reserved treaty rights.

Goal 1 is further categorized by habitat type. Each goal contains specific management objectives (bolded and numbered) and strategies (listed by lowercase letter) for achieving these objectives. While many management objectives are specified in terms of acreages, the exact goals may not be reached due to environmental conditions, catastrophic natural events, climate change and other factors that are outside DNR's span of control.

Habitats in Mille Lacs WMA are recognized as vitally important for sustaining wildlife populations and biological diversity in central Minnesota. Many habitats in Mille Lacs WMA require active attention and management to maintain appropriate amounts and successional states and to sustain them in healthy condition over time. Treatments require an adaptive management approach as prescriptions are developed, results are evaluated, and follow-up treatments are designed.

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 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 such as increasing the amount of mast-producing oak or maintaining high-quality ruffed grouse 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 or to reduce invasive species presence and prevalence.

Management decisions will protect threatened and endangered species and support rare species and habitats. Endangered species impacts are considered before the implementation of individual management actions, including burn plans. Individual management actions will align with requirements for protection of endangered species.

One of the tools used to develop yearly Mille Lacs WMA-specific work plans is DNR's annual stand exam list process. The annual stand exam lists for fiscal years 2024-2030 (Table 13) were identified using modelling criteria developed by FAW as part of DNR's most recent 10-year forest modeling effort. These stands will be field visited and will serve as the starting point for meeting the habitat objectives articulated in this plan. DNR intends to conduct another 10-year forest modeling effort that will identify stands for examination and potential treatment beginning with fiscal year 2029.

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 may include timber harvest, no treatment, prescribed burning, understory planting, thinning, seeding, or scarification can also be used to meet the goals of this plan. In selecting among potential management actions, considerations will include effectiveness in achieving goals, available resources, and specific local conditions and spatial considerations.

Table 13: Mille Lacs WMA stand examination acres for fiscal years 2024-2030.

Cover Types	Number of Examination Stands 2024-2030	Total Examination Acres 2024-2030	Total Acreage of Cover Type on WMA
Ash	59	1,282	1,604
Aspen	166	2,751	9,431
Oak	58	1,778	6,200
Northern Hardwoods	56	1,258	5,730
White Pine	2	33	37
Lowland Black Spruce	1	8	318
Tamarack	2	10	549
Total	**344**	**7,119**	**23,869**

Goal 1: Maintain or enhance a diverse mosaic of forest and wetland habitats at various successional stages for the benefit of native wildlife species.

Objectives for All Habitat Types

1. **Manage native plant communities and watersheds to ensure a sustainable landscape that supports healthy fish, wildlife, and plant populations.**
    a. Verify NPC accuracy before determining management actions.
    b. Consult Native Plant Community Field Guides and associated silvicultural strategy tools for management guidance.
        i. https://www.dnr.state.mn.us/npc/classification.html
        ii. https://www.dnr.state.mn.us/forestry/ecs_silv/npc/index.html
    c. Prescribe management that maintains or enhances rare NPCs (see Table 6).
    d. Maintain or increase within-stand species and structural diversity to benefit wildlife and ecosystem resilience.
        i. Follow MFRC Site Level Guidelines.

ii. During harvests, leave a variety of living tree species, particularly long-lived species, in clumps and as scattered individuals.
iii. Preferentially retain native conifers, particularly as clumps, during harvests.
iv. Retain snags during harvests, especially those of long-lived species.
v. Leave or create at least 2 to 5 logs greater than 12 inches in diameter per acre during harvests; hollow logs or logs with cavities preferred.

2. Maintain or increase coverage of habitats, components, and growth stages that are under-represented on the surrounding landscape to promote species biodiversity.

a. Maintain or enhance designated old growth stands within the WMA. Evaluate new potential old growth stands.
b. Maintain a diverse age structure of forest cover types across the WMA to provide species-specific wildlife benefits at all growth stages.
c. Perform a spatial analysis of age-classes within forest cover types every 10 years or in alignment with future STH planning.
d. Manage mesic hardwood forest stands toward older growth communities either with active management (e.g., thinning) or no management; see specific NPC goals that follow. Increase conifer component in 25% of mesic hardwood forest stands through leave tree selection and underplanting, considering site suitability for specific species (white pine, red pine, balsam fir, white spruce, black spruce).

3. Maintain or increase rare native plant communities, rare plants, rare animals, and their associated habitats.

a. Maintain upland forested buffers around interior wetlands, vernal pools, and riparian areas. Blue-spotted and four-toed salamanders will also benefit from increased coarse woody debris surrounding breeding pools known to exist on the WMA that contain suitable fishless habitat.
b. Consider rare species guidance and follow policies and statutes when proposing and implementing projects.
c. Report rare plant and animal sightings to the Natural Heritage Information System.
d. Consult Natural Heritage Information System and other DNR policies and guidelines before taking management actions.
e. Evaluate the effect of management activities, such as prescribed fire, on rare species populations where they are known to occur. Adapt management activities as appropriate.
f. Partner with EWR to document and verify rare plant locations, assess threats to each population's viability, and develop long term monitoring protocols.
g. Maintain and enhance the existing designated High Conservation Value Forest site within the WMA by consulting the management guidelines provided within its HCVF Informational Report.

h. Reference Minnesota Biological Survey information to assist in managing rare plant communities and sites of outstanding, high, and moderate biodiversity significance.
i. Maintain and enhance Dinosaur Island Natural Areas Registry Site in accordance with existing Memorandum of Understanding (see Appendix B).

4. Encourage and accommodate monitoring and research to address management questions.

a. Continue vegetation monitoring at the Adaptive Forest Management Project site to increase knowledge about oak regeneration practices.
b. Explore habitat and wildlife monitoring protocols to inform and assess the effectiveness of management actions.
c. Locate partners to collaborate with in establishing a network of avian point count surveys at least every other year to determine long-term population trends for avian species.
d. Attend conferences and workshops to foster continuous improvement learning for staff.
e. Support establishment of Minnesota Ecological Monitoring Network plots within the WMA.
f. Incorporate citizen science into wildlife monitoring programs.

5. 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.

a. Maintain forested buffers around water bodies and wetlands by meeting or exceeding MFRC site level guidelines in areas where harvest will occur.
b. Maintain forested wetlands using site-specific management evaluations.
c. Manage impoundment water at levels to support wild rice abundance and a diversity of wildlife habitats for species including waterfowl, other waterbirds, muskrats, beaver, otter, and turtles.
d. Develop water level management plans for individual pools on the WMA, with the goal of developing one per year.
e. Manage wildlife species where they are causing issues with flooding and threatening local native plant communities and infrastructure.
f. Assure culverts are maintained and/or replaced with appropriate sizes and bottom placements for wildlife passage and more extreme rain events.
g. Maintain dikes and other water control structures. When necessary, work with fisheries and engineering to evaluate structures to repair, remove, or replace them with new structures that are safe, cost efficient, capable of handling extreme precipitation events, and beneficial to fish and wildlife passage. The highest priorities for water control structure replacement include Olson Pool, Section 3, Rum River 1-5, Rum River Large Impoundment.

6. **In response to Minnesota's changing climate, develop strategies to enhance ecosystem resiliency and mitigate impacts to WMA resources and infrastructure.**
    a. Use Native Plant Community silvicultural interpretations and tree suitability tables to guide timber harvesting, open plantings, and under plantings that support diverse, adaptable forest communities.
    b. Continue maintenance, repair, and replacement of water control structures to withstand high precipitation and/or water events.
    c. Favor timber harvest strategies that promote natural regeneration. However, when appropriate facilitate higher tree diversity by planting tree species that are: i) native to Minnesota, ii) not present or common in the Mille Lacs WMA, iii) predicted to expand their range northward in a future climate, and iv) have been shown to thrive in a given site's conditions. Partner with the Division of Forestry to develop and fund a monitoring plan prior to any such plantings on the Mille Lacs WMA.
    d. Plant native seedlings, especially those impacted by climate change, before or after stand disturbance. Source seed from seed zones that align with projected climate scenarios and NPC covertypes.

7. **Minimize the introduction, establishment, and spread of invasive species.**
    a. Monitor high quality native plant communities to ascertain whether they are being invaded or degraded by terrestrial invasive species.
    b. Report new invasive species confirmations through appropriate channels. Consult with other invasive species specialists for identification, monitoring, and financial resources as well as management guidance.
    c. Treat at least 10 acres of common buckthorn a year. Continue to treat all known infestations of spotted knapweed and Japanese knotweed.
    d. Consider the use of interns, the Conservation Corps, and volunteers for early detection invasives surveys.
    e. Monitor for oak wilt, emerald ash borer, and other relevant forest invasive species and report positive detections to appropriate channels. Consult with specialists for control strategies and potential funding.
    f. Identify and secure funding resources for annual invasives monitoring and management.
    g. Use Best Management Practices to prevent soil compaction and rutting to maintain soil structure.
    h. Clean and inspect equipment used on-site to prevent the spread of invasive species.
    i. Use only weed-free erosion-control materials, soil, mulch, and seed mixes.

8. **Maintain or increase the number of natural and woodpecker-created cavities for cavity-nesting waterfowl (wood ducks, goldeneyes, mergansers; sometimes mallards) in deciduous forests within 0.5 miles of emergent wetlands.**

a. When harvesting stands near open wetlands, manage for tree species and tree characteristics that promote cavities.
b. Consider placing harvest reserves adjacent to riparian management zones.
c. Retain large aspen with conks and other large trees with broken branches and tops as leave trees.

Objectives for Upland Forests

Oak trees and the acorns they produce are a crucial and common food source for a wide variety of both game and non-game wildlife species on the Mille Lacs WMA. In general, the more oaks with large, healthy crowns that are fully exposed to sunlight, the more acorns will be produced for wildlife species. This is the rationale for the oak management objectives described below.

9. **Manage oak forests to maximize mast production to benefit wildlife species such as deer, black bear, ruffed grouse, gray squirrel, racoons, and wild turkeys.**
    a. Ensure oak stands are widely distributed across Mille Lacs WMA and across NPCs by maintaining or increasing the oak cover type (see Objective 10).
    b. Manage stands with a variety of regeneration techniques (clearcut with reserves, irregular shelterwood, large gap, and small gap regeneration harvests), thus providing vertical and horizontal structural habitat diversity within the stands. Implement new management guidance that may emerge and support oak regeneration.
    c. Begin managing for balanced oak age class distributions without creating greater imbalances in the younger age classes by conducting a regeneration harvest on 380 acres per decade out of the current pool of 80-99 year old oak stands (See Figure 16 and Figure 17).
    d. Thin overly dense oak stands to improve stand vigor (and thus acorn production) and resilience. When thinning:
        a. Leave healthy oaks with dominant crowns to maximize acorn production.
        b. Retain a mixture of oak species to minimize the impact of year-to-year fluctuation in acorn production in any one species.
        c. Favor removing non-mast-producing tree species, while retaining oaks in the intermediate and overtopped crown classes.
        d. Do three- or four-sided release on some co-dominant oaks to improve sun exposure and increase acorn production.
        e. Retain bur (white) oaks $\geq$16” dbh and red oaks 16-28” dbh.
    e. Planned timber stand improvement (TSI) needs will be discussed by assigned staff during or before the initial stand evaluation process. TSI funding will be identified before planned harvest management actions are implemented. TSI could include timber harvest, prescribed burning, planting, seedling protection and release or other activities as determined by forest managers.

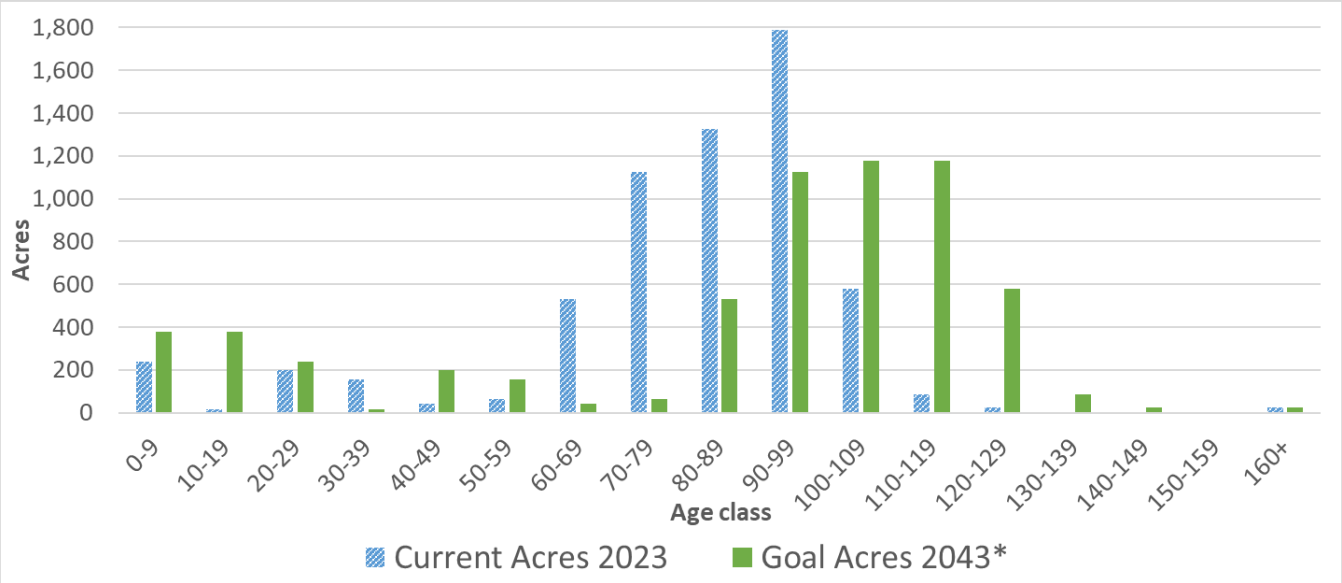

Figure 16: Oak stand age class distribution - current and goal acreage.*Due to the long-term nature of forest management, goal acres are shown for 2043 so that changes in the age class distribution are more visible. That is, the age class shifts 20 years over from the current acres to the goal acres. For example, the 530 goal acres represented as a solid green bar in the 80-89 age class are the same 530 acres listed as current acres in the 60-69 age class and represented by the stripped blue bar in the 60-69 age class. This indicates that there is no planned regeneration harvest planned for the 530 acres currently in the 60-69 age class.

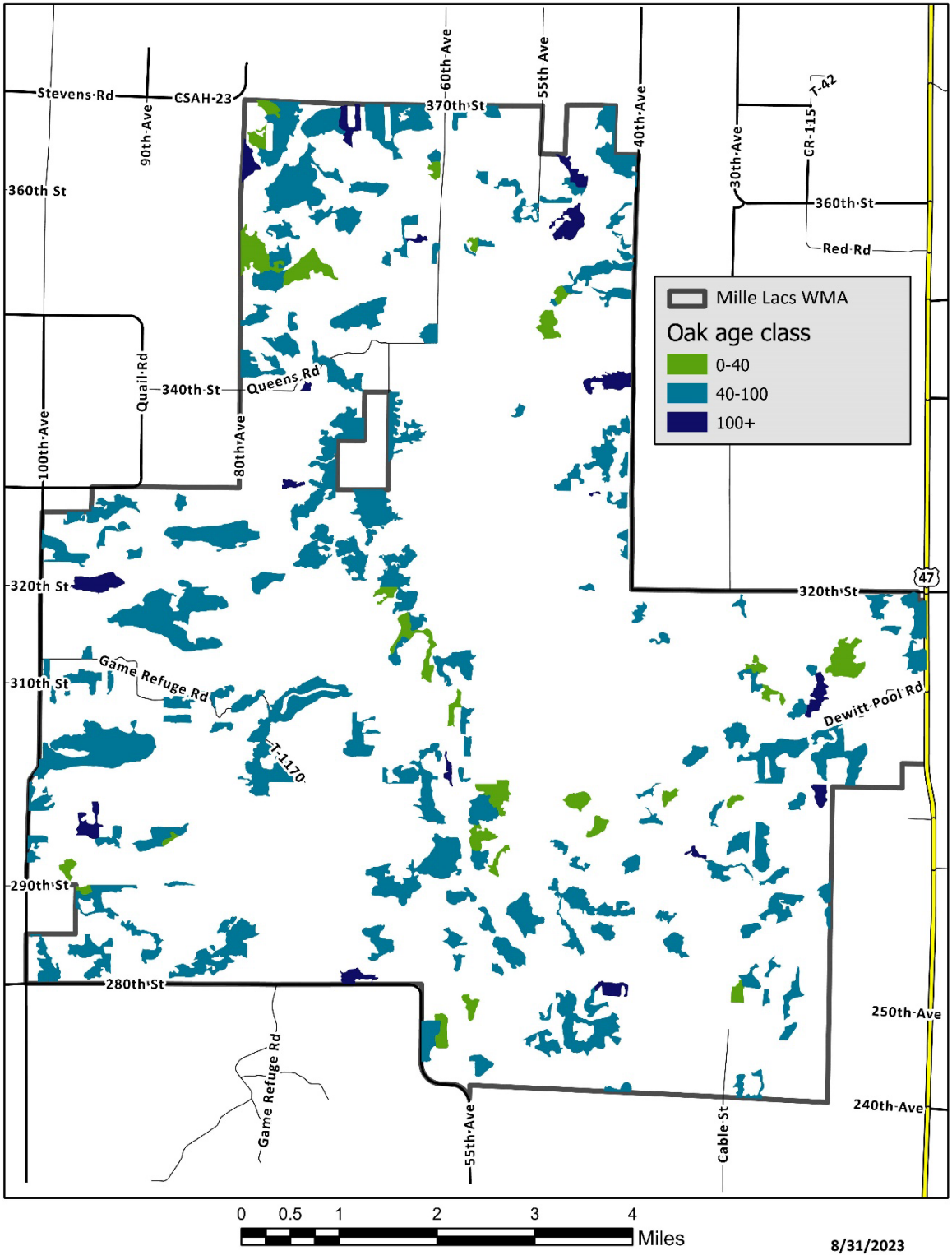

Figure 17: Current oak distribution map.

10. **Maintain or increase the oak cover type to provide multi-seasonal habitats for species including black bear, wild turkey, grey squirrel, red shouldered hawk, broad-winged hawk, eastern wood pewee, scarlet tanager, bats, salamanders, and shade-dependent plant species.**
    a. Plant a diversity of oak species, along with other site-appropriate tree species, prior to or after harvest if advanced regeneration is not abundant enough or if the oak species diversity is low.
    b. Continue supporting the Mille Lacs WMA Oak Regeneration Adaptive Forest Management Project. Monitor stands utilizing Forestry's new 2023 MHc oak evaluation guidelines to determine when a supplemental planting or release project should be implemented and/or implement other new management guidance that may emerge.
    c. Where necessary, protect natural and artificial oak regeneration from deer browse using methods such as bud-capping, fencing, or chemical deterrents.
    d. Protect natural and artificial oak regeneration from competing vegetation through prescribed fire, brush saw release, and herbicide application.
    e. Increase the use of prescribed burning over multiple years prior to regeneration harvest and concurrent with thinning operations or shelterwood creation. Pause burning during mast years and for several years while oak seedlings and saplings are maturing.
    f. Identify stands in MHc26 and MHc36 to increase the oak component in currently non-oak dominated stands.
    g. Monitor oak age-class distributions on Mille Lacs WMA via FIM/4Trees assessments at least once every 10 years to ensure progress towards goal acreage.
    h. If an oak stand is declining (i.e., canopy dieback is widespread and worsening over time, and/or scattered death is occurring), regenerate the stand with techniques described above to increase acorn production over the long-term across the landscape.
    i. Identify and obtain funding for pre- and post-harvest oak management actions.

A diversity of aspen age classes provides habitat for a suite of species, some requiring young forest habitat while others are dependent on old forest characteristics such as snags and cavities. This rationale for the aspen objective described below.

11. **Manage aspen in multiple-age classes for ruffed grouse breeding and winter habitat, for deer browse, and for woodpecker nesting and other cavity-dependent wildlife (see Figure 18 and Figure 19).**
    a. Maintain current amount of aspen (approximately 9,500 acres).
    b. Manage for ruffed grouse and woodcock habitat by maintaining diverse age classes from 0-40 years around a spatially centered older stand (45+).
    c. For aspen stands in mature age classes (60+), harvest about 1/3 of aspen stands at 60 years, 1/3 at 70 years, and 1/3 at or after 80 years to establish an extended (trailing)

distribution to provide habitat for cavity-dependent species including fishers, wood ducks, and pileated woodpeckers.

d. Encourage tree species diversity within or along regenerating stands.

f. Plant small conifer patches in openings or adjacent to harvest sites to create future roosting and thermal shelter.

g. Plant native fruit/mast producing shrubs and trees in or adjacent to harvest sites to increase food production.

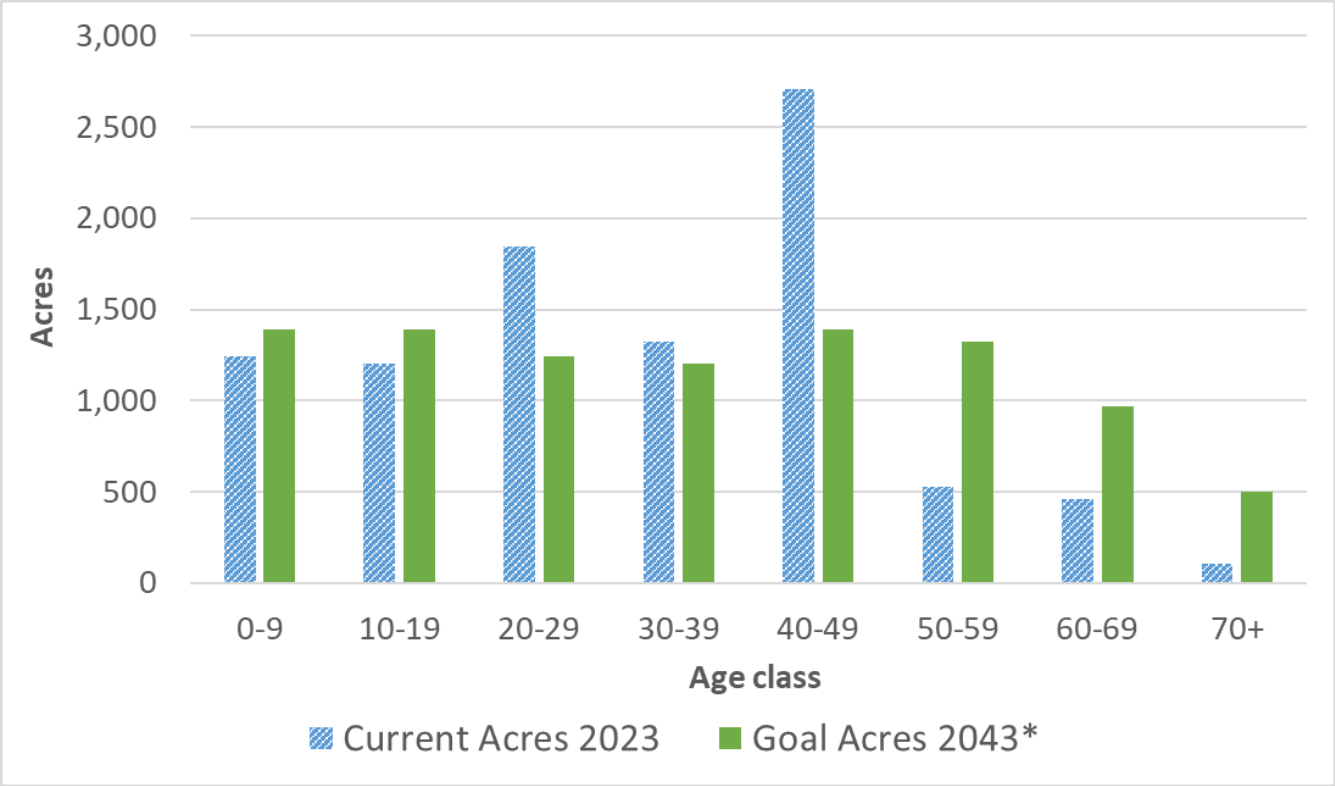

Figure 18. Aspen stand age class distribution - current and goal acreage. *Due to the long-term nature of forest management, goal acres are shown for 2043 so that changes in the age class distribution are more visible.

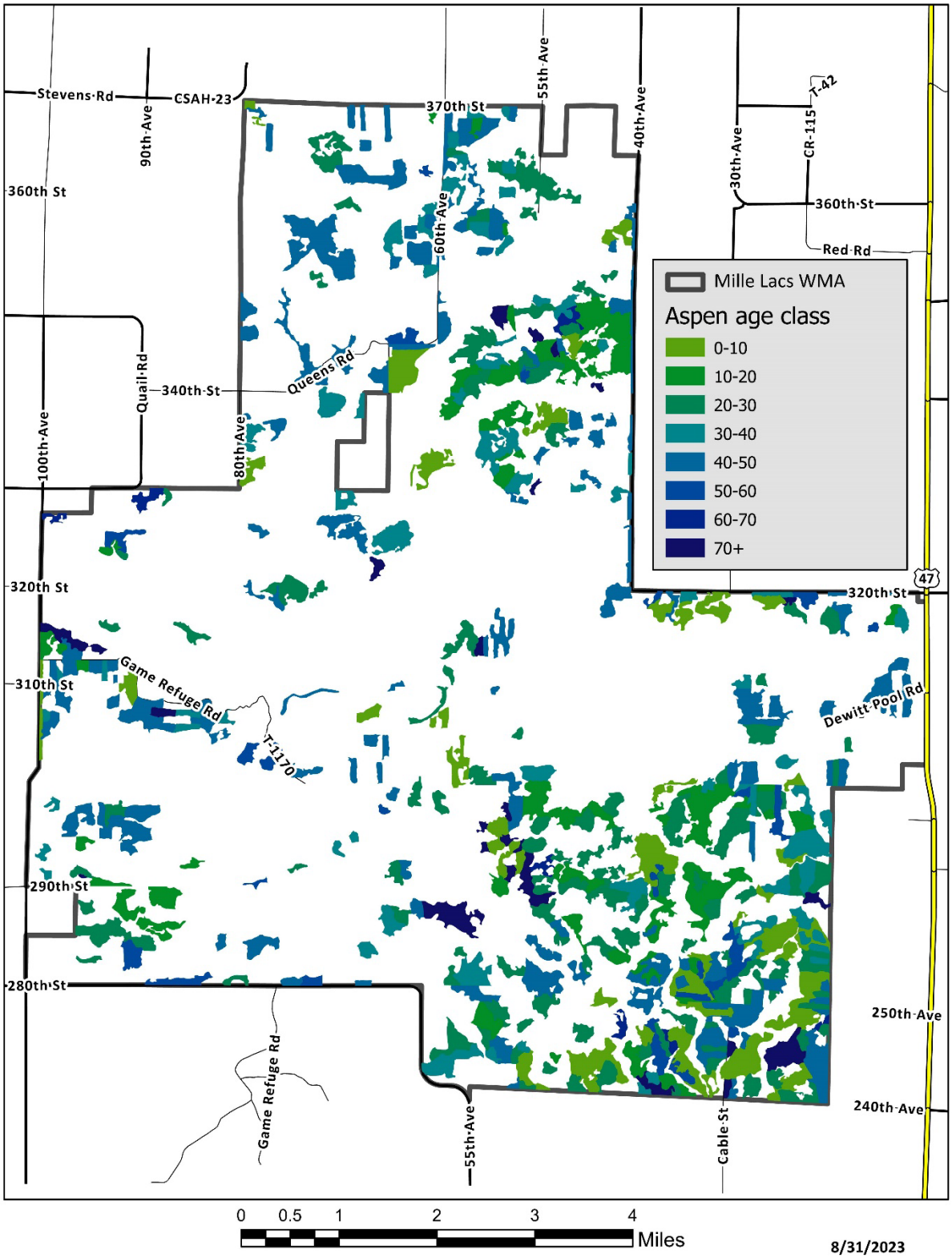

Figure 19: Current aspen distribution map.

Objectives for Mesic Northern Hardwoods

12. Manage mesic northern hardwoods to balance across NPC growth stages to provide multi-seasonal habitats for species including black bear, wild turkey, grey squirrel, red shouldered hawk, broad-winged hawk, eastern wood pewee, scarlet tanager, bats, salamanders, and shade-dependent plant species (see Figure 20 and Figure 21).

a. Begin managing for balanced northern hardwoods age class distributions without creating greater imbalances in the younger age classes by conducting a regeneration harvest on 370 acres per decade out of the current pool of 80–99-year-old oak stands (See Figure 20). Stands selected for harvest will depend on several factors including the presence of rare species, remoteness, and ability to perpetuate underrepresented NPCs.

b. Utilize techniques (patch harvest, large & small gap management, single tree selection harvest) to provide vertical and structural diversity within stands.

   i. Increase oak component in Mesic Hardwood native plant communities (northern hardwood and aspen covertypes). See oak management section for specific recommendations.

   ii. Retain oak where present during management actions, favoring oak in DBH classes that maximize acorn production.

   iii. Plant oak seedlings in large canopy gaps, protect from deer browse, and control competing vegetation.

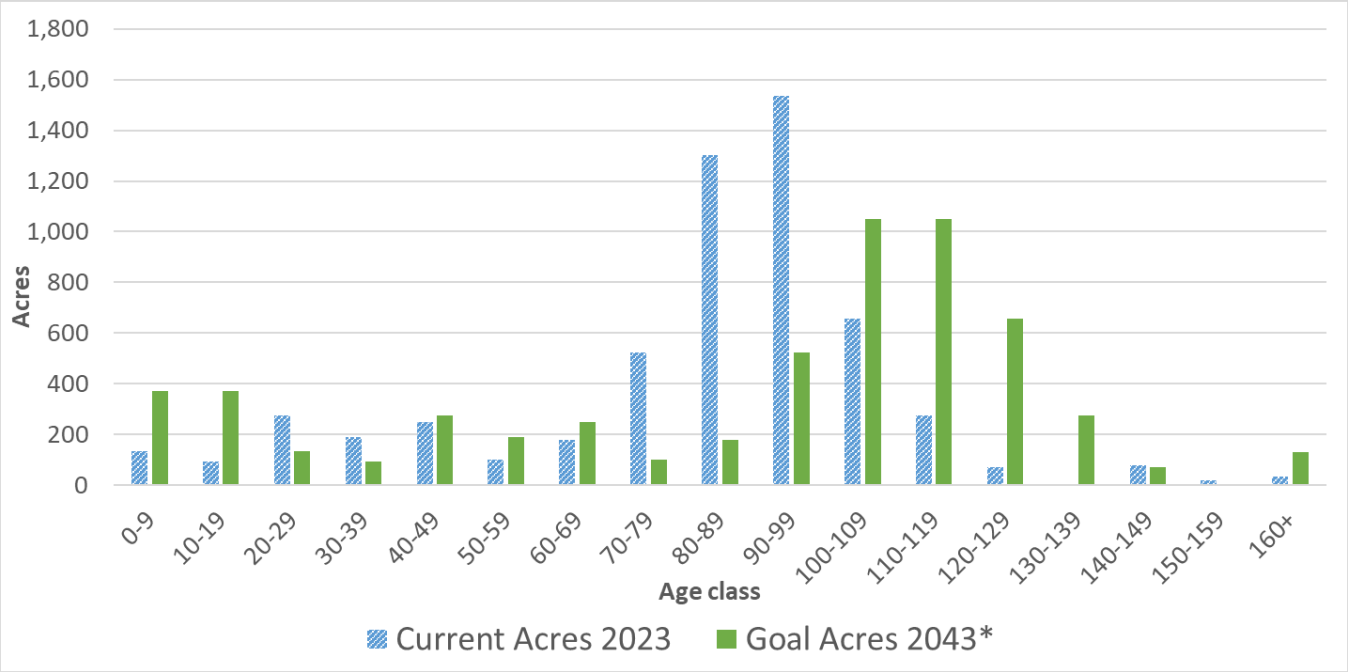

Figure 20. Northern hardwood stand age class distribution - current and goal acreage.*Due to the long-term nature of forest management, goal acres are shown for 2043 so that changes in the age class distribution are more visible. That is, the age class shifts 20 years over from the current acres to the goal acres. For example, the 523 goal acres represented as a solid green bar in the 90-99 age class are the same 523 acres listed as current acres in the 70-79 age class and represented by the stripped blue bar in the 70-79 age class. This indicates that there is no planned regeneration harvest planned for the 523 acres currently in the 70-79 age class.

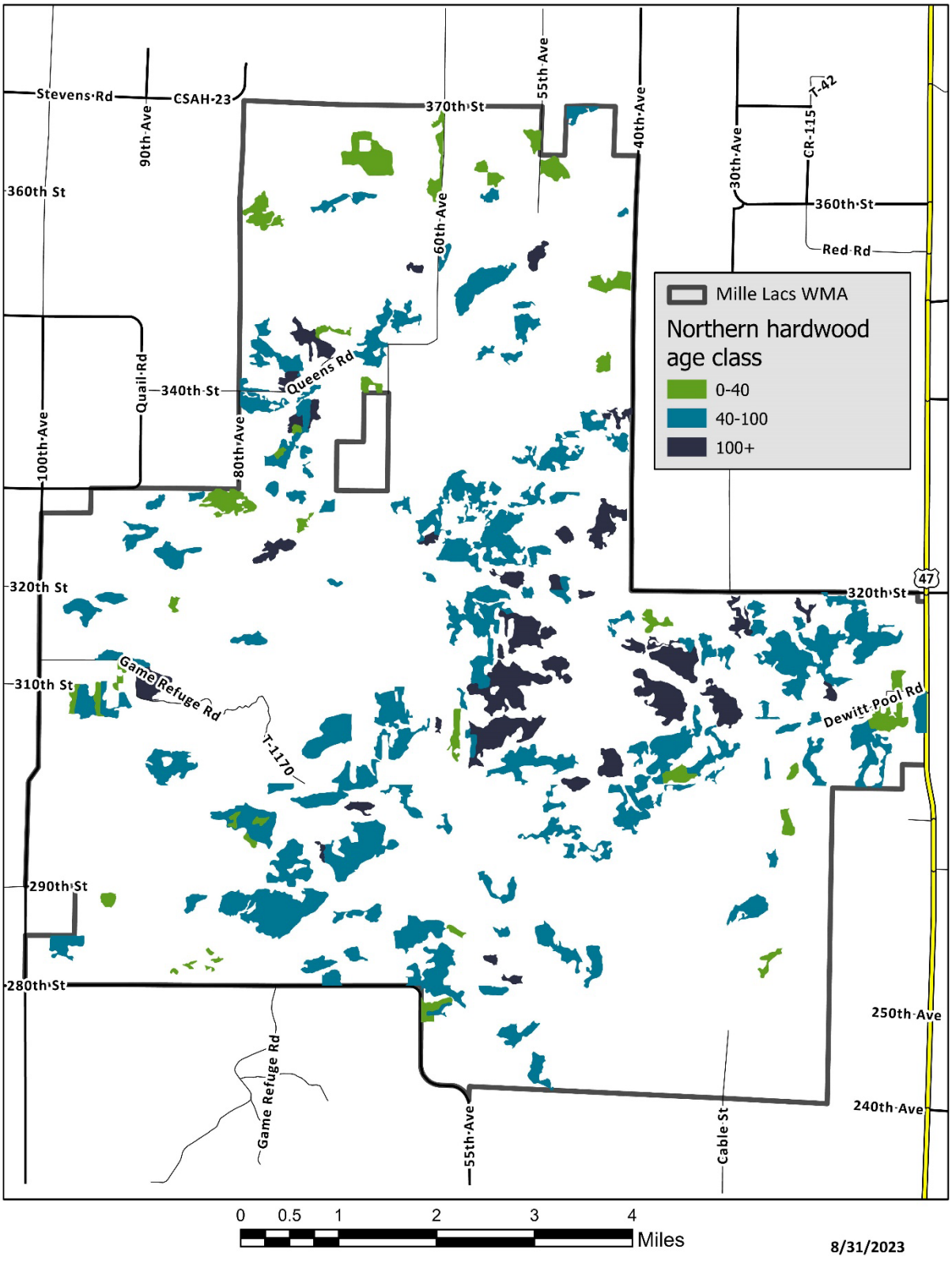

Figure 21: Current northern hardwood distribution map.

13. **Manage mesic northern hardwood forests for plant species diversity, open understory, and structural complexity to provide multi-seasonal habitats for species including black bear, wild turkey, grey squirrel, red shouldered hawk, broad-winged hawk, eastern wood pewee, scarlet tanager, bats, salamanders, and shade-dependent plant species.**
    a. Retain conifers in managed stands.
    b. Plant white and a limited amount of red pine (in MHc26 NPC's) in large canopy gaps, protect from deer browse, and control competing vegetation.
    c. Plant an average of 5 acres annually of white pine in the forest understory, protect from deer browse, and release from competition once white pine have grown to reach the base of the hardwood canopy.
    d. Use prescribed burns to control shrubs; maintain some open understory for ruffed grouse nesting. Priority areas will be adjacent to other wetland and prairie prescribed burning sites.

Objectives for Wetland Forests

14. **Maintain and enhance lowland forest acreage to provide habitat for species including deer, black bear, and neotropical songbirds.**
    a. Plant 200 acres (average 20 acres a year) of a variety of wet-forest tree species in natural or created canopy gaps in black ash stands prior to emerald ash borer's arrival. Priority will be given to black ash stands showing greatest levels of mortality. Species to consider for planting include American elm, swamp white oak, hackberry, red maple, silver maple, box elder and white pine. Protect seedlings from deer browse and release from competing vegetation.
    b. Manage lowland conifer stands to maintain northern tree species occurring at the southern extent of their range. Monitor tamarack-dominated forests for infestation by eastern larch beetle. Consider planting tamarack, black spruce and other NPC-appropriate species in lightly infested stands to lessen larch beetle risk in the future.
    c. Monitor regeneration and health of black spruce-dominated wet forests. Consider planting/seeding black spruce and other site-appropriate species in natural or created canopy gaps.

15. **Maintain lowland conifer forests in acid peatlands to maintain biodiversity and provide thermal cover for wildlife species.**
    a. Monitor the health of lowland conifer stands.
    b. Develop a management plan to ensure the persistence of these species.

Objectives for Upland Grasslands

16. **Maintain, enhance, and restore grassland habitat to benefit species that utilize open landscapes including pheasants, woodcock, and deer.**
    a. Maintain and enhance plant species diversity in existing prairie fields through prescribed burns (25 acres annually) and inter-seeding forbs (5 acres annually).
    b. Over the next decade, restore 85 acres of native prairie from the existing pool of cool season grasses.
    c. Of remaining cool season grasses, convert 20 acres to forest over the next decade. Specific tree species planted will depend upon site characteristics.

Objectives for Wetlands, Shrublands, Marshes and Open water

17. **Protect, maintain, enhance, and restore riparian areas and wetlands to provide habitat for trumpeter swans, other waterfowl, and aquatic furbearers.**
    a. Maintain balance of grass, shrub, and open water cover. Over the next decade, increase open water cover from 200 acres to at least 300 acres.
    b. Conduct 10 acres annually of targeted aquatic vegetation management using prescribed burning, water level management, mechanical vegetation removal, and, where necessary, chemical control.

18. **Increase the acreage of wild rice in the WMA for human use to benefit wildlife species including waterfowl, rails, and soras.**
    a. Work with Mille Lacs Band of Ojibwe to obtain a local seed source for wild rice planting.
    b. Conduct targeted aquatic vegetation management using a variety of management tools to protect and promote wild rice habitat.
    c. Conduct an average of 5 acres of wild rice seeding per year.

Objectives for Wildlife Openings and Annual Food Plots

19. **Maintain existing 55 wildlife openings across the WMA to provide open areas utilized by wildlife species including deer, black bear, woodcock, and turkeys.**
    a. Manage wildlife openings using mowing and prescribed burning.

20. **Limit annual crop acreage to the existing 60 acres for wildlife use.**
    a. Utilize low impact farming practices, including minimizing pesticide usage and tillage.
    b. Plant a diversity of crop species to increase soil health and productivity.

Goal 2: Maintain or enhance sustainable human use including compatible recreational opportunities and the exercise of reserved treaty rights.

21. Verify, locate, and, when appropriate, protect cultural sites within the WMA.

a. Work with Tribal Historic Preservation Office to implement a survey of cultural sites within the WMA.

22. Increase the number of large diameter birch trees available for use by tribal communities.

a. When conducting forest management activities consider retaining birch, especially medium and large diameter trees, in areas used by tribal gatherers.
b. When possible, thin paper birch clumps in conjuncture with other forest treatments.

23. Maintain and enhance access to diverse quality hunting and trapping opportunities in the WMA.

a. Seek funding to install accessible facilities such as hunting blinds, gate systems, access trails, boardwalks, and parking lots.
b. Survey WMA hunters and trappers about how they use the Mille Lacs WMA and their experience.
c. Maintain existing trail and road infrastructure and, as funding allows, improve areas that are seasonally difficult to traverse. Priority will be given to improving frequently utilized hunter access routes.

24. Provide opportunities for compatible recreation including birdwatching, wildlife viewing, photography, hiking, and foraging.

a. Create a new bird species checklist for the WMA.
b. Collect information from WMA users about how they do/will use the WMA and their experiences.
c. Complete feasibility study for increasing accessible facilities for outdoor activities such as bird watching.
d. Work with Outreach staff to occasionally post to the DNR's social media outlets highlighting WMA phenology and recreation opportunities.
e. Consider hosting a Big Birding Weekend.
f. Improve trail signage on the WMA to facilitate a safe user experience.

25. Reduce the impacts from unmanaged access and trespass on the WMA.

a. Address agricultural and private land trespass through conversations with nearby landowners to reduce negative impacts to the WMA.
b. Obtain consistent funding for Mille Lacs WMA boundary, parking lot, and rules signage to reduce negative impacts to the WMA, its users, and adjacent landowners.

c. Design infrastructure, such as parking lot barriers, that deters unmanaged access to the WMA to reduce negative impacts to the WMA and its users, while considering accessibility needs.
d. In areas where there is reoccurring illegal activity, increase monitoring through, for example, trail cameras to reduce the frequency of illegal activity and assist in prosecution.

26. Maintain and enhance WMA buildings for safe, reliable use by the public and staff.

a. Work to establish ADA accessible office space.
b. Research funding for facility improvements including new storage facilities and a new meeting and training space.

27. Provide interpretation of the natural and cultural history, resources, and management of the WMA for visitors and potential visitors.

a. Work with DNR staff and the Mille Lacs Tribal Historic Preservation Office to develop and implement interpretive services.

28. Work with adjacent landowners to identify opportunities to acquire inholdings and round-outs as funding and opportunity allows and restore to forest or prairie.

VIII. Implementation Process

The management objectives and strategies laid out in this plan describe the "what" and "why" for management intended to occur on the Mille Lacs WMA in the next 10 years, but specific operations at Mille Lacs 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 14 shows an overview of ongoing annual work activities that are performed at Mille Lacs WMA in a typical year.

Table 14: Overview of annual work activities performed at Mille Lacs WMA in a typical year.

Activity/Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Develop project specs & site marking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Required training	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes
Ag lease renewals	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Rx burn plans	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Gate/ sign repairs	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Timber harvest	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No	Yes
WCS maintenance/ monitoring	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Brush mowing	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Deer season/ CWD management	Yes	No	No	No	Yes	No	No	No	No	Yes	Yes	Yes
Timber stand exam reviews	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Timber sale supervision	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Trapping season/ data entry	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Inventory	Yes	No	No	No	No	No	No	No	No	No	No	Yes
Furbearer registration	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes
Review & update site emergency plan	Yes	No	No	No	No	No	No	No	No	No	No	No
Rx burn equipment inventory & prep	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No
Rx burning	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No
Fire Suppression	No	No	Yes	Yes	Yes	Yes			Yes	Yes	Yes	
Wildlife project proposals	No	No	Yes	Yes	No	No	No	No	No	No	No	No
Invasive species control	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mow/Doze firebreaks	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes
Partner coordination meetings	No	No	Yes	No	No	No	No	No	No	No	No	No
OHF proposals	No	No	No	Yes	Yes	No	No	No	No	No	No	No
Deer goal setting/ public meetings	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No
Grouse surveys	No	No	No	Yes	Yes	No	No	No	No	No	No	No
Tree planting	No	No	No	Yes	Yes	No	No	No	No	No	No	No
Road repair/ maintenance	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Dike repair	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Boundary posting	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Prairie planting	No	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No
Mow dikes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No
New prairie mowing	No	No	No	No	No	Yes	No	No	No	Yes	No	No
Mowing trails, roads, & parking lots	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No
Accomplishment reporting	No	No	No	No	No	No	Yes	No	No	No	No	Yes
Roadside wildlife survey	No	No	No	No	No	No	No	Yes	No	No	No	No

Predator scent post survey	No	No	No	No	No	No	No	No	Yes	No	No	No
CPL & ECP grants	No	No	No	No	No	No	No	No	Yes	No	No	No
Rx burn reporting	No	No	No	No	No	No	No	No	No	No	No	Yes

IX. Research, Monitoring, and Adaptive Management

Current Research and Monitoring Projects

Wildlife Monitoring

- Chronic Wasting Disease (no official monitoring but investigate reports of sick deer)
- Grouse Drumming Surveys
- August Roadside Counts
- Wolf collaring

Public Use Monitoring

- Trapping permits
- Furbearer harvest

Habitat Monitoring

- DNR Forest Canopy Health Aerial Survey
- Water level /temperature monitoring
- Weather station (seasonal)
- MNDNR Adaptive Forest Management Project: Oak regeneration methods in mesic hardwood communities (MHc36)

Invasive Species Monitoring

- Informal buckthorn monitoring
- Informal Japanese Knotweed monitoring
- Spongy moth monitoring (Minnesota Department of Agriculture)

Wildlife Research

- Effects of Timber Harvest on Forest Dependent Wildlife
    - Ongoing study by the MN DNR Nongame Wildlife Program (2021-2026), report will be available here: Research reports | Minnesota DNR (state.mn.us) once published.

Potential Research and Monitoring Projects

- Conduct forest management monitoring using Adaptive Forest Management Project site:

    - Continue with tree regeneration surveys at site, determine next management steps, and share results
    - The effects of broadcast herbicide treatments on understory plant diversity
    - The effects of prescribed burning treatments on understory plant diversity
    - Habitat assessment for wildlife (game and non-game)
    - Resurvey for rare plant and animal in project site
- Survey rare plants and animals.
- Research tree seedling diversification in wet forest (currently ash dominated) NPC sites.
- Evaluate and monitor oak regeneration / management techniques.
- Monitor effects of prescribed burning on habitats.
- Use existing and future remote sensing products (aerial imagery, Lidar) to assess and analyze changes in forested and open habitat.
- Monitor the density and distribution of aquatic vegetation, including wild rice, using Floating Leaved and Emergent Mapping.
- Track public use using car counts.
- Survey cultural and historic site (working with the Mille Lacs Band of Ojibwe).
- Monitor the bird frequency, abundance, and trends using a point count network. Explore using volunteers or a contractor.

Adaptive Management

Adaptive management for Mille Lacs WMA will include:

- Continuously reviewing research and monitoring results and building off the results to improve habitat restoration techniques, maximize wildlife benefit, and increase user satisfaction.
- Collaborating with other divisions and partners to continue, improve, and expand research and monitoring projects.

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 in 10 years, or 2034.

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XI. Appendix A. Mille Lacs WMA Planning Team Members

Role	Name	Division	Position	Location
Executive Sponsor	Kelly Straka	FAW	Wildlife Section Manager	St. Paul
Managing Sponsor	Jesse Roberts	FAW	Acting Regional Wildlife Manager; Assistant Regional Wildlife Manager	St. Paul
Managing Sponsor	Gretchen Miller	FAW	Regional Wildlife Manager	St. Paul
Project Manager	Adam Kokotovich	FAW	Policy and Planning Consultant	St. Paul
Project Manager	Amanda Dirnberger	OSD	R3 Regional Planner	St. Paul
Team Member	Steve Piepgras	FAW	Area Wildlife Manager	Mille Lacs WMA
Team Member	Eric Altena	FAW	Area Fisheries Manager	Little Falls
Team Member	Mike North	FAW	NR Specialist Senior Wildlife	Brainerd
Team Member	Michelle Martin	FOR	ECS Forester	St. Paul
Team Member	Brian Schwingle	FOR	Forest Health Specialist	St. Paul
Team Member	Matt Wappler	FOR	Area Forestry Supervisor	Littlefork
Team Member	Kris Erickson	PAT	Park Manager	Kathio State Park
Technical Advisor	Jordan Williams		Mille Lacs Band of Ojibwe	
Technical Advisor	Jonathan Gilbert		Great Lakes Indian Fish and Wildlife Commission	
Technical Advisor	Melissa Collins	EWR	NR Specialist Senior Eco Services	Region 3
Technical Advisor	Mark Anderson	EWR	Area Hydrologist	Little Falls
Technical Advisor	Erica Hoaglund	EWR	Regional Nongame Specialist	St. Paul
Technical Advisor	Kit Elstad-Haveles	EWR	Regional Plant Ecologist	St. Paul

XII. Appendix B. MOU for Dinosaur Island Natural Areas Registry Site

Memorandum of Understanding
for inclusion of the Dinosaur Island area
in portions of Sections 27, 28, 33, & 34 of T41N R25W
and portions of Sections 5, 6, 7 & 8, T40N R25W
of Mille Lacs Wildlife Management Area
in the Minnesota Natural Areas Register

The Minnesota Natural Areas Register recognizes tracts of public land that contain natural features of statewide ecological significance and honor those agencies and individuals that manage these lands to protect and perpetuate the features of interest. Many of Minnesota's finest natural areas occur on public lands. Through careful management of these lands it is possible to preserve and protect a cross section of the rich natural diversity of the state.

This memorandum describes those ecologically significant features that occur within the Dinosaur Island area of the Mille Lacs Wildlife Management Area (WMA). A map showing the location of the features and the boundary of the registered area is attached. This memorandum includes a summary of the appropriate management that will maintain and enhance the natural features of the registered area to ensure their perpetuation.

The DNR policy for WMAs recognizes the importance of areas containing these special features. Uncommon species and plant communities of concern are noted as factors that are considered in the management of WMAs. Enrolling sites in the Natural Areas Register helps to increase protection over time as changes in WMA staff occur, and helps to link DNR expertise in the Fish and Wildlife and Ecological Services Divisions to ensure that the best possible management practices are utilized in these significant areas.

Natural Features of Interest

The report "An Evaluation of the Ecological Significance of Dinosaur Island," prepared by Bruce Carlson in 2002, gives detailed information about the natural features of the registered area. A brief summary of this information is included here. The boundaries of the 1,209 acre Dinosaur Island registered area are shown on the attached two maps. This area contains high-quality occurrences of seven types of native plant communities and three state-listed rare plant species. The upland forest, which occurs in the south portion of the registered area, is Central Mesic Hardwood Forest (Red Oak-Basswood Forest Non-calcareous till), described in the *Field Guide to Native Plant Communities of Minnesota: the Laurentian Mixed Forest Province* (Minnesota DNR, 2003). This is near the northern extent of this plant community's range, and the occurrences here are excellent quality. One stand is a DNR-designated old-growth forest. The three state-listed rare plant species occur in the Red Oak-Basswood Forest community. The lowland plant communities that occupy the rest of the registered area include Northern Wet Ash Swamp, Aspen-Ash Forest, Alder Swamp, Willow-Dogwood Shrub Swamp, Northern Mixed Cattail Marsh, and Sedge Meadow. These wetland communities provide a buffer to the upland forests and are high quality plant communities that provide important wildlife habitat.

Healthy populations of three rare plant species occur in the registered area, including the state-threatened species triangle moonwort *(Botrychium lanceolatum)*, and two special concern species: least moonwort *(Botrychim simplex* var. *tenebrosum))* and Wood's sedge *(Carex woodii)*. One rare plant with no legal status that is tracked in the Natural Heritage Information System, matricary grapefern *(Botrichium matricariifolium)* also occurs in the registered site. All of these species occur in Red Oak-Basswood Forest in the south portion of the registered area.

There have been no rare animals documented in the registered area, but this may be due to the lack of intensive survey work there. There is potential habitat for several state-listed birds that have been found in similar habitat nearby, including yellow rail *(Coturnicops noveboracensis)*, red-shouldered hawk, *(Buteo lineatus)* and cerulean warbler *(Dendroica cerulean)*. A bald eagle has nested just east of the southern edge of the registered area in recent years and Mille Lacs WMA staff have reported seeing sandhill cranes many times within the registered area.

Management Guidelines

A meeting was held on April 4, 2004 to discuss designation and management of the registered area. DNR staff in attendance included Richard Tuszynski, Steve Piepgras, and Tim Quincer from the Section of Wildlife; Peter Willis from the Divison of Forestry; and Hannah Dunevitz and Bruce Carlson from the Division of Ecological Services. All agreed to the following management guidelines.

The Red Oak-Basswood Forests, wetland forest communities, and any small forest inclusions within open areas will be closed to all logging activities, including timber stand improvement, salvage logging, and construction of logging roads. Hunting and trapping will be allowed in the registered area, in keeping with existing WMA rules and regulations. The open and shrub-dominated wetland plant communities thrive with controlled burning, and it is recommended that this practice should continue. There should be no mechanical cutting of brush in wetland communities, to avoid compaction and soil disturbance. Off-road vehicles will not be allowed in the registered area. The Three-in-One Trail on the edge of the registered area will continued to be maintained as a trail. No new trails will be developed in the registered area.

Summary

It is agreed that, in order to have the opportunity to comment on possible impacts of proposed management activities on the natural features of interest, the area wildlife manager will inform the Scientific and Natural Areas program of proposed developments or actions on the registered portions of this WMA. Of particular interest are actions concerning cutting of any vegetation, hydrologic alteration, prescribed burning, physical alterations (such as roads, the Three-in-One Trail or permanent burn breaks), or the introduction of live plant material, including seeds and plantings for woody cover. Unless carefully planned, activities such as these can alter the scientific value and natural qualities of the registered area.

1

Signatures:

Tim Bremicker, Supervisor
Central Region Wildlife

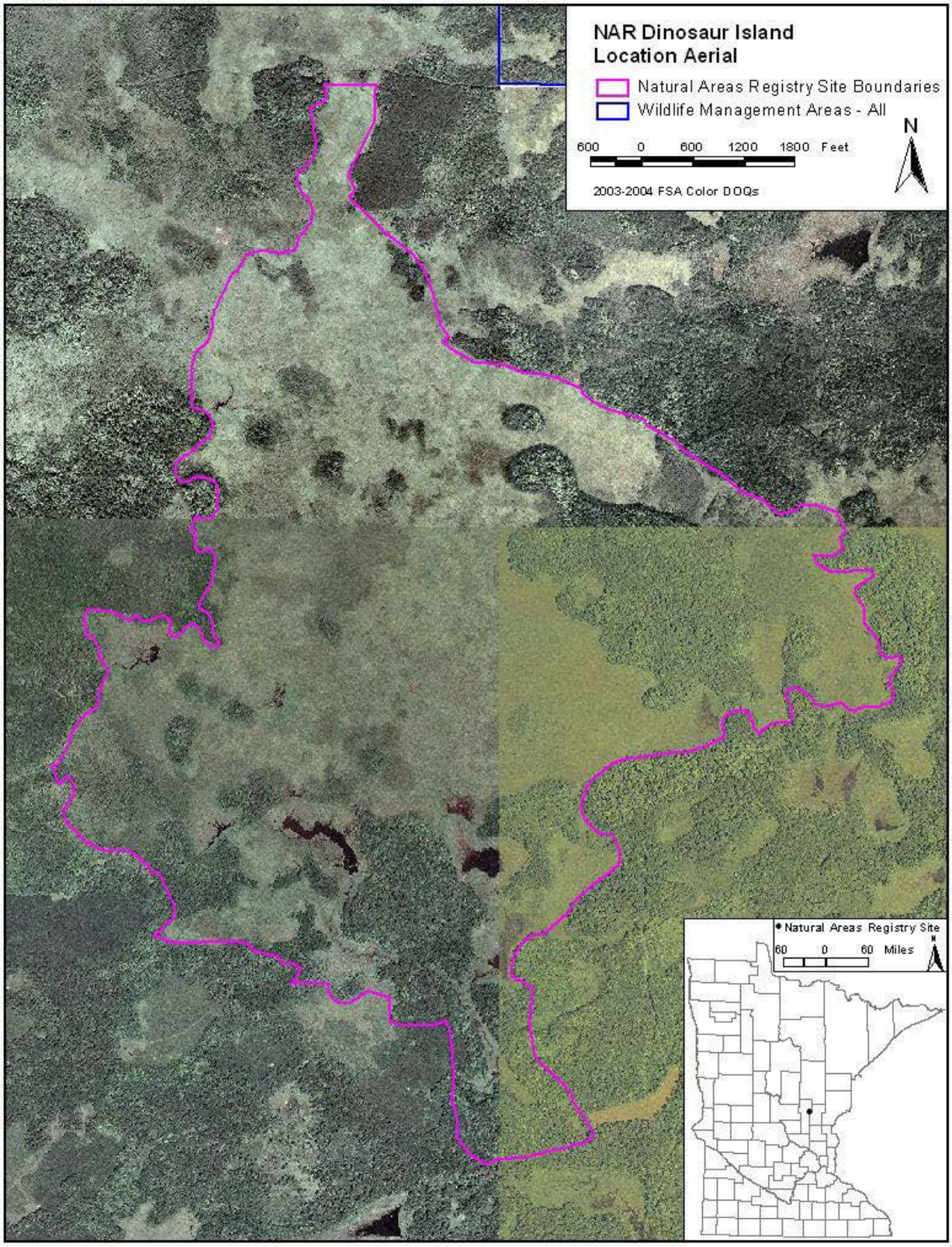
John Guenther, Director
Division of Fish and Wildlife

Richard Tuszynski, Manager
Mille Lacs WMA

Bob Djupstrom, Supervisor
Scientific and Natural Areas
Program

2/22/05

1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Natural Areas Registry Site
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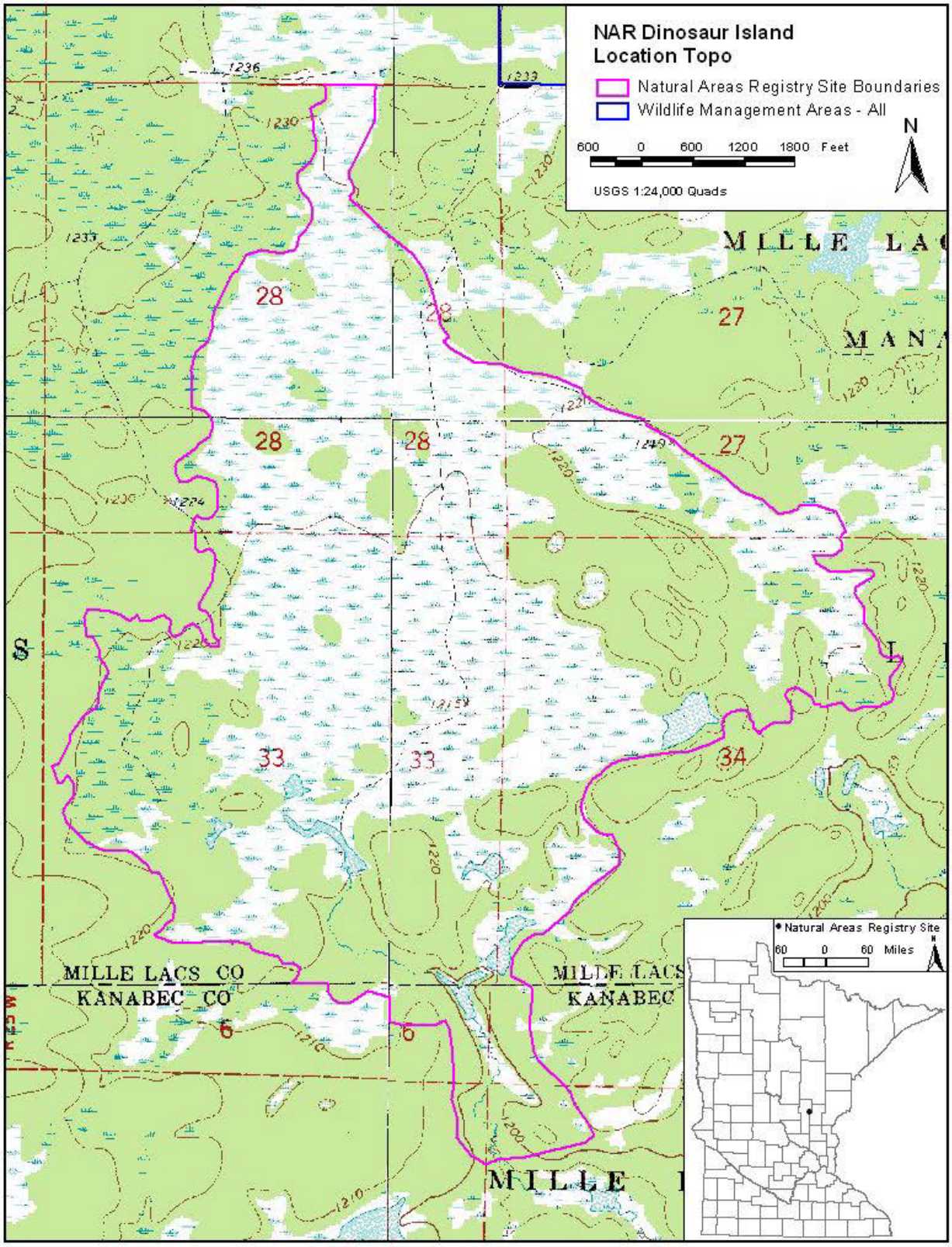
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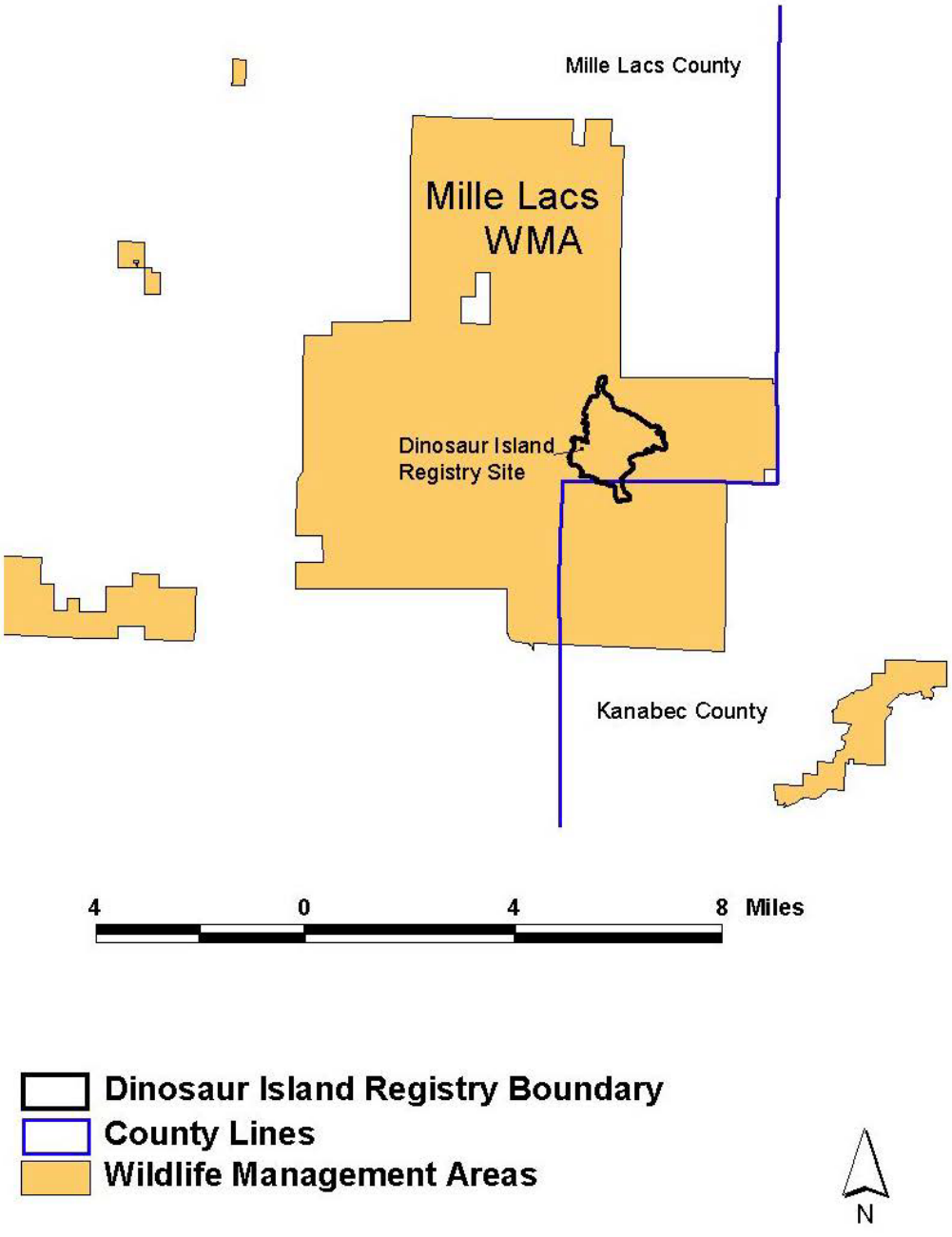
Dinosaur Island Registry Site Location



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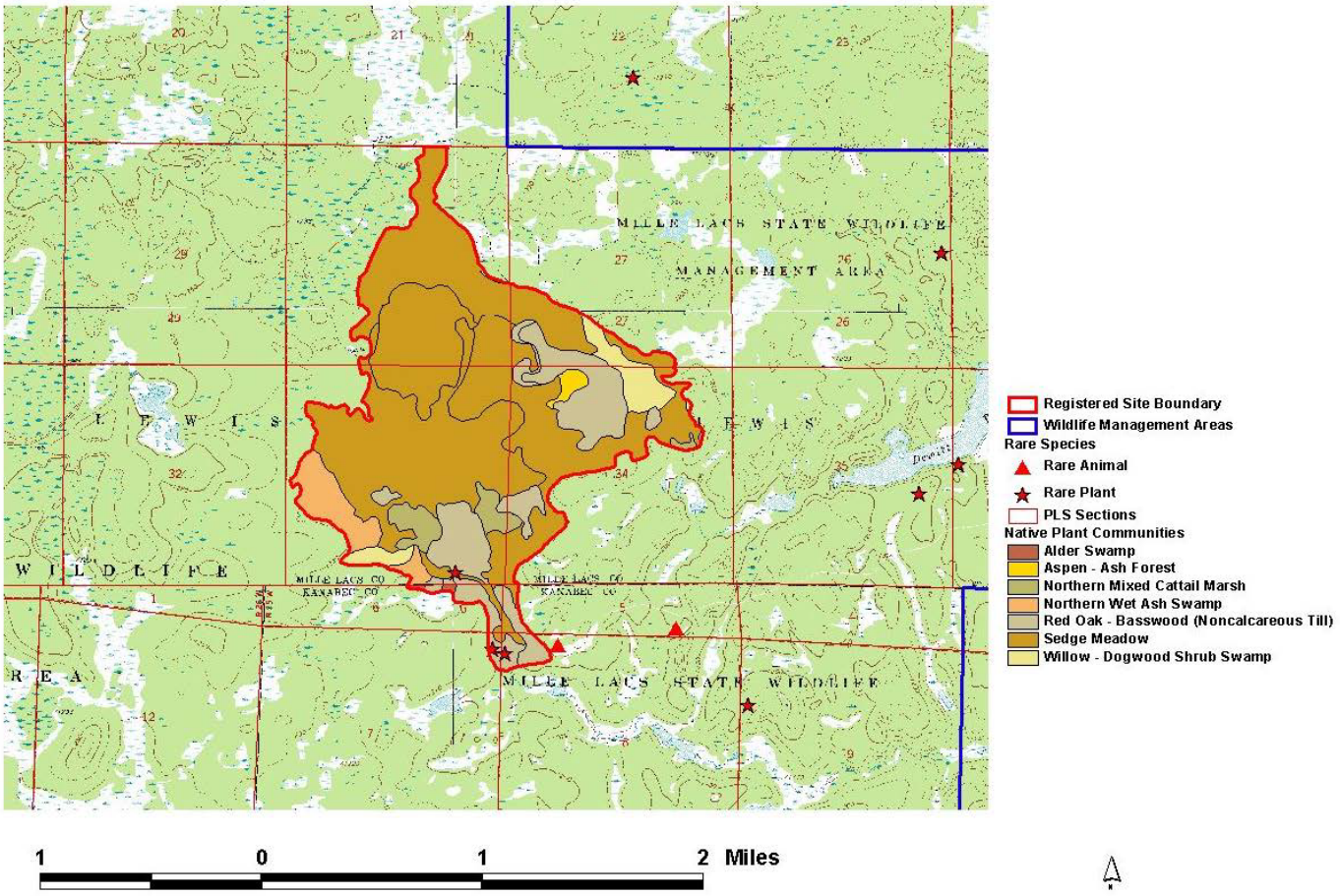

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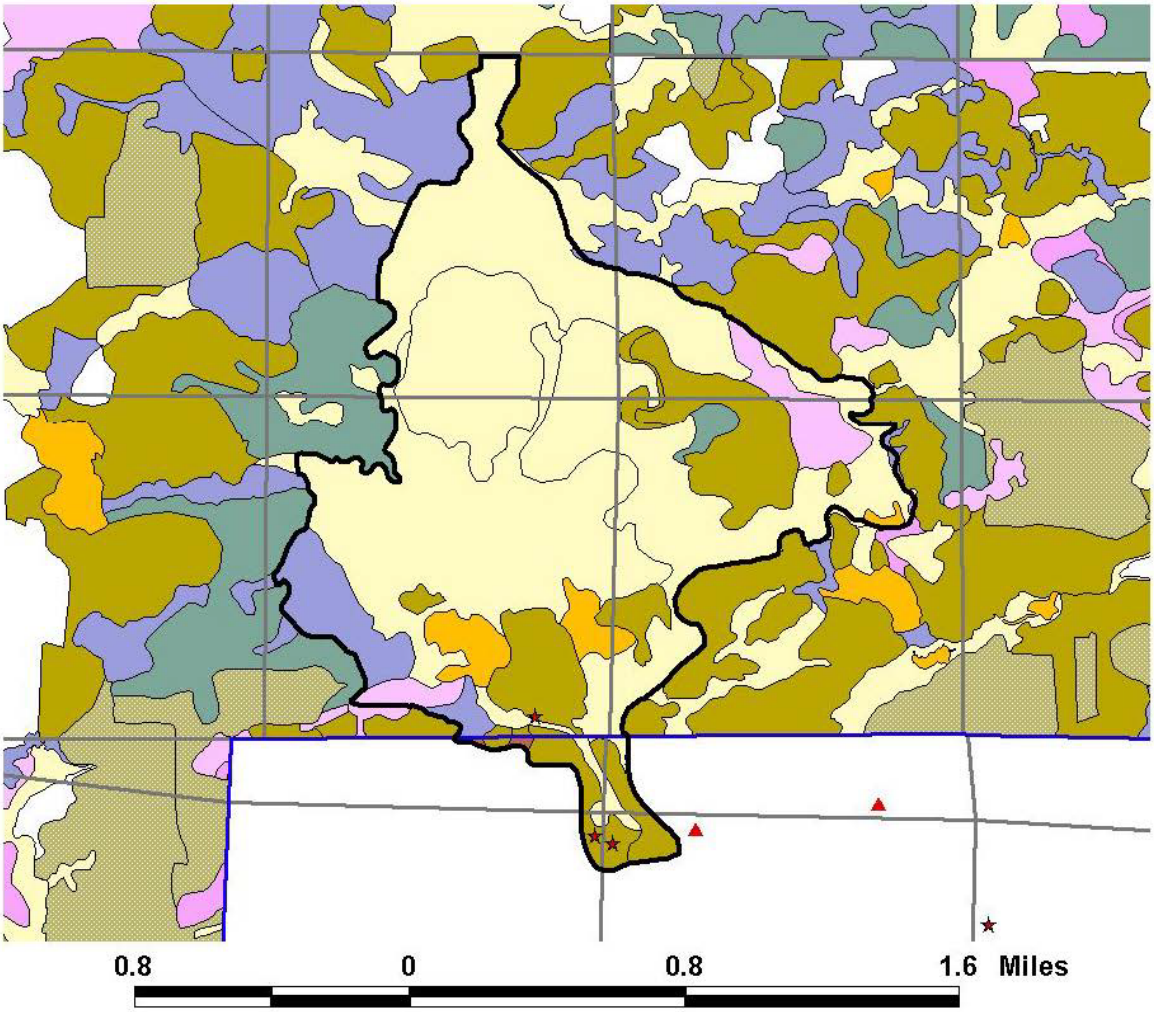
Dinosaur Island Natural Areas Registry Site
Natural Features



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XIII. Appendix C. Mille Lacs WMA Bird Species

Table 15. Common breeding bird species found at Mille Lacs WMA and their associated habitats, in taxonomic order.

Habitat	Game Species	Nongame Species
Lakes, Wetlands, and Waterways	Canada Goose, Wood Duck, Mallard, Blue-winged Teal, Green-winged Teal, Ring-necked Duck, Hooded Merganser, Common Merganser[1], Common Goldeneye, American Coot, Sandhill Crane, Virginia Rail[1], Sora, Wilson's (Common) Snipe, American Woodcock[1]	Common Loon[1], Trumpeter Swan[1,2], Tundra Swan, Pied-billed Grebe, Lesser Yellowlegs, Spotted Sandpiper, Black Tern, American White Pelican, Double-crested Cormorant, American Bittern,[1] Great Blue Heron, Great Egret, Green Heron, Bald Eagle, Belted Kingfisher[1], Eastern Kingbird, Alder Flycatcher, Purple Martin[1,2], Tree Swallow, Northern Rough-winged Swallow[1], Bank Swallow, Sedge Wren[1], Gray Catbird, Common Yellowthroat, Northern Waterthrush, Swamp Sparrow, Song Sparrow, LeConte's Sparrow[1], Yellow-headed Blackbird[1], Red-winged Blackbird
Forests (Coniferous, Deciduous and Mixed)	Wild Turkey, Ruffed Grouse, American Woodcock[1]	Barred Owl, Great Horned Owl, Saw-whet Owl, Turkey Vulture, Cooper's Hawk, Broad-winged Hawk, Red-tailed Hawk, Bald Eagle, Red-bellied Woodpecker, Chimney Swift,[1] Ruby-throated Hummingbird, Black-billed Cuckoo[1], Yellow-billed Cuckoo[1], Yellow-bellied Sapsucker, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Pileated Woodpecker, Eastern Wood-Pewee, Great Crested Flycatcher, Least Flycatcher, Yellow-throated Vireo, Warbling Vireo, Red-eye Vireo, Blue Jay, Black-capped Chickadee, White-breasted Nuthatch, Red-breasted Nuthatch, House Wren, Blue-gray Gnatcatcher, American Robin, Veery[1], Wood Thrush[1], Ruby-crowned Kinglet, Golden-crowned Kinglet, Brown Thrasher[1], Gray Catbird, Cedar Waxwing, Ovenbird, Golden-winged Warbler[1], American Redstart, Yellow Warbler, Chestnut-sided Warbler, Black-and-white Warbler, Scarlet Tanager, Northern Cardinal, Rose-breasted Grosbeak, Indigo Bunting, Baltimore Oriole, Purple Finch[1]
Brushlands	Ruffed Grouse, American Woodcock[1]	Alder Flycatcher, Sedge Wren[1], Veery[1], Gray Catbird, Brown Thrasher[1], Northern Waterthrush, Common Yellowthroat, Yellow Warbler, Song Sparrow, Swamp Sparrow
Prairies, Grasslands, Savannas	Ring-necked pheasant	American Kestrel[1], Common Nighthawk[1], Red-headed Woodpecker[1], Eastern Kingbird, Horned Lark, Bank Swallow, Barn Swallow, Eastern Bluebird, Chipping Sparrow, Field Sparrow[1], Savannah Sparrow, Song Sparrow, Vesper

		Sparrow, Eastern Towhee[1], Lark Sparrow[1], Grasshopper Sparrow[1], Dickcissel[1], Brown-headed Cowbird, Bobolink[1], Eastern Meadowlark[1], Western Meadowlark[1], Brewer's Blackbird
Agricultural Areas	Canada Goose, Mallard, Ring-necked Pheasant, Sandhill Crane, Mourning Dove	Killdeer, Northern Harrier[1], Red-tailed Hawk, American Sparrow, American Goldfinch, House Finch, Common Grackle, Brown-headed Cowbird, American Crow, American Robin, Vesper Sparrow, Horned Lark

[1]SGCN

[2]Minnesota Special Concern species

[3]Endangered

Table 16. Stewardship Species in Minnesota and relationship to Mille Lacs WMA.Stewardship species are those species for which populations in Minnesota represent a significant portion of their North American breeding, migrating, or wintering population, or species whose Minnesota populations are stable, but whose populations outside of Minnesota have declined or are declining in a substantial part of their range.

Species	% Global Population	% of Range in Minnesota	Occurrence in WMA	Habitat
American White Pelican	18	In combo with North Dakota – 40% of global population	Migrant	Uses wetlands during migration
American Woodcock	10	6% of its breeding range	Breeding	Young forests
Baltimore Oriole	5	8% of its breeding range	Breeding	Forest edges, open woodlands
Black-billed Cuckoo	10	10% of its breeding range	Breeding	Forest edges and thickets
Bobolink	13	9% of its breeding range	Possibly Breeding	Open grassland/prairie
Chestnut-sided Warbler	6	6% of its breeding range, and highest U.S. abundance	Breeding	Young forests
Golden-winged Warbler	42	12% of its breeding range	Breeding	Shrub wetlands, and young and old

				forests in close proximity
Nashville Warbler	5	5% of its breeding range, and highest U.S. abundance	Migrant	Middle-aged forests (15-40 years old)
Rose-breasted Grosbeak	6	10% of its breeding range	Breeding	Mesic upland forests 20-40 years old
Sedge Wren	33	14% of its breeding range, and highest U.S. abundance	Breeding	moist grasslands with shrubby component /wet meadows
Trumpeter Swan	12	Largest population south of Alaska/Canada	Breeding	Marshes and shallow lakes
Veery	6	5% of its breeding range, and highest U.S. abundance	Breeding	Damp deciduous forests/riparian forests

1 Table 17. Priority forest interior bird species for the Mille Lacs WMA, their habitat requirements, and characteristics.

Species	Minimum area required	Habitat	Forest Age	Forest Structure	Cavity Trees	Other
Ruffed Grouse	A few acres (each)	Diverse old and young deciduous and coniferous forests	Young and old in close proximity	Dense young aspen for broods, old aspen for winter food, open mature deciduous for nesting, conifers for winter cover	Not needed	
Pileated Woodpecker	320 acres	Mixed upland coniferous and deciduous forest	Mature	Several large diameter aspen (>16 inches dbh)	Create nests and roost cavities	Provide cavities for other game species and furbearers

2

XIV. Appendix D. Mille Lacs WMA Mammal Species

Table 18. Mammal species known or suspected to occur at Mille Lacs WMA

Common Name	Scientific Name	Habitat[1]	Game Species[2]	State Status[3]	Federal Status[3]
Virginia Opossum	*Didelphis virginiana*	F,W,A			
Eastern Cottontail	*Sylvilagus floridanus*	F,B	X		
Snowshoe Hare	*Lepus americanus*	F, B	X		
Masked shrew	*Sorex cinereus*	F,B,W,P			
Short-tailed Shrew	*Blarina brevicauda*	B,W,P,A			
Eastern Mole	*Scalopus aquaticus*	Dry soils			
Big Brown Bat	*Eptesicus fuscus*	F,B,W,P,A		SPC	
Red Bat	*Lasiurus borealis*	F,B		SGCN	
Hoary Bat	*Lasiurus cinereus*	F		SGCN	
Little Brown Myotis	*Myotis lucifugus*	F,B,W		SPC	
Northern Long-eared Bat	*Myotis septentrionalis*	F,B,W		SPC	END
Tri-colored Bat	*Perimyotis subflavus*	F,B,W		SPC	
Gray Wolf	*Canis lupus*	F,B,W,P,A			THR
Coyote	*Canis latrans*	F,B,P,A	X		
Red Fox	*Vulpes vulpes*	F,B.P	X		
Gray Fox	*Urocyon cinereoargenteus*	F, B, P, A	X		
Bobcat	*Lynx rufus*	F,B	X		

Fisher	*Pekania pennanti*	F	X		
Striped Skunk	*Mephitis mephitis*	F,B,P,A			
Northern River Otter	*Lontra canadensis*	W	X		
Ermine (Short-tailed Weasel)[4]	*Mustela erminea*	F,B,P	X		
Mink	*Neovison vison*	W	X		
Raccoon	*Procyon lotor*	F,B,P,A	X		
Black Bear[5]	*Ursus americana*	F,B	X		
White-tailed Deer	*Odocoileus virginianus*	F,B,P,A	X		
Beaver	*Castor canadensis*	W	X		
House Mouse	*Mus musculus*	F,B,P,A			
Woodland Jumping Mouse	*Napaeozapus insignis*	F			
White-footed Mouse	*Peromyscus leucopus*	F,B,A			
Deer Mouse	*Peromyscus maniculatus*	F,B,P,A			
Western Harvest Mouse[4]	*Reithrodontomys megalotis*	P		SPC	
Meadow Jumping Mouse	*Zapus hudsonius*	B,W,P			
Meadow Vole	*Microtus pennsylvanicus*	B,P			
Woodland Vole	*Microtus pinetorum*	F		SPC	
Common Muskrat	*Ondatra zebethicus*	W	X		

Plains Pocket Gopher	*Geomys bursarius*	P,A			
Northern Flying Squirrel	*Glaucomys sabrinus*	F			
Southern Flying Squirrel[4]	*Glaucomys volans*	F			
Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*	P			
Woodchuck	*Marmota monax*	B,P,A			
Eastern Gray Squirrel	*Sciurus carolinensis*	F	X		
Eastern Chipmunk	*Tamias striatus*	F			
Red Squirrel	*Tamiasciurus hudsonicus*	F			

[1]Habitat Key: F=Forest, B=Brushlands, W=Wetlands, P=Prairies/Grasslands, A=Agricultural Lands
[2]Game species, may be taken only under DNR regulations
[3]END=endangered, THR=threatened, SPC=special concern, SGCN=Species of Greatest Conservation Need (all of Minnesota's endangered, threatened, and special concern species are SGCN, those listed as SGCN in the table are species not on the Minnesota's endangered, threatened, and special concern list)
[4]Possible occurrence
[5] Occasional

XV. Appendix E. Mille Lacs WMA Fish Species

Table 19: Fish species sampled in the Rum River and Snake River Watersheds. Bolded species may be present in the Mille Lacs WMA.

Common Name	Scientific Name	Snake River Watershed	Rum River Watershed	Status
Bigmouth Shiner	Notropis dorsalis	X	X	
Black Bullhead	**Ameiurus melas**	X	X	
Blacknose Dace	Rhinichthys atratulus		X	
Black Crappie	Pomoxis nigromaculatus	X		
Blacknose Shiner	Notropis heterolepis	X	X	
Blackside Darter	Percina maculata	X		
Bluegill	Lepomis macrochirus	X	X	
Bluntnose Minnow	Pimephales notatus	X	X	
Bowfin	Amia calva	X		
Brassy Minnow	Hybognathus hankinsoni	X	X	
Brook Stickleback	Culaea inconstans	X	X	
Brown Bullhead	Ameiurus nebulosus	X		
Burbot	Lota lota	X		
Central Mudminnow	**Umbra limi**	X	X	
Central Stoneroller	Campostoma anomalum	X	X	
Channel Catfish	Ictalurus punctatus	X		
Channel Shiner	Notropis wickliffi	X		
Chestnut Lamprey	Ichthyomyzon castaneus	X		
Common Carp	Cyprinus carpio	X	X	
Common Shiner	Luxilus cornutus	X	X	
Creek Chub	Semotilus atromaculatus	X	X	
Fathead Minnow	**Pimephales promelas**	X	X	
Finescale Dace	Chrosomus neogaeus	X	X	
Freshwater Drum	Aplodinotus grunniens	X		

Gilt Darter	Percina evides	X		SPC
Golden Redhorse	Moxostoma erythrurum	X		
Golden Shiner	Notemigonus crysoleucas	X	X	
Greater Redhorse	Moxostoma valenciennesi	X	X	
Green Sunfish	**Lepomis cyanellus**	X	X	
Hornyhead Chub	Nocomis biguttatus	X	X	SCGN
Hybrid Chrosomus	Chrosomus hybrid	X		
Hybrid Minnow	Cyprinidae hybrid	X		
Hybrid Sunfish	Lepomis hybrid	X	X	
Iowa Darter	Etheostoma exile	X		
Johnny Darter	**Etheostoma nigrum**	X	X	
Lake Sturgeon	Acipenser fulvescens	X		SPC
Lamprey Ammocoete	Petromyzontidae larvae	X		
Largemouth Bass	Micropterus salmoides	X	X	
Logperch	Percina caprodes	X	X	
Longnose Dace	Rhinichthys cataractae	X	X	
Mimic Shiner	Notropis volucellus	X		
Mottled Sculpin	Cottus bairdii	X		
Muskellunge	Esox masquinongy	X		
Northern Brook Lamprey	Ichthyomyzon fossor	X		SPC
Northern Hogsucker	Hypentelium nigricans	X		
Northern Pearl Dace	Margariscus nachtriebi	X		
Northern Pike	**Esox lucius**	X	X	
Northern Redbelly Dace	**Chrosomus eos**	X		
Pearl Dace	Margariscus nachtriebi		X	
Pumpkinseed	Lepomis gibbosus	X	X	
Quillback	Carpiodes cyprinus	X		
River Redhorse	Moxostoma carinatum	X		

Rock Bass	Ambloplites rupestris	X	X	
Sand Shiner	Notropis stramineus	X		
Shorthead Redhorse	Moxostoma macrolepidotum	X	X	
Silver Lamprey	Ichthyomyzon unicuspis	X		
Silver Redhorse	Moxostoma anisurum	X		
Slenderhead Darter	Percina phoxocephala	X		
Smallmouth Bass	Micropterus dolomieu	X	X	
Southern Brook Lamprey	Ichthyomyzon gagei	X		
Spotfin Shiner	Cyprinella spiloptera	X	X	
Spottail Shiner	Notropis hudsonius	X		
Stonecat	Noturus flavus	X		
Tadpole Madtom	Noturus gyrinus	X	X	
Trout-perch	Percopsis omiscomaycus	X	X	
Walleye	Sander vitreus	X	X	
Western Blacknose Dace	Rhinichthys obtusus	X		
White Sucker	**Catostomus commersonii**	X	X	
Yellow Bullhead	Ameiurus natalis	X		
Yellow Perch	**Perca flavescens**	X	X	

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XVI. Appendix F. Mille Lacs WMA Reptile and Amphibian Species

Table 20. Reptiles and amphibians known to occur in the Mille Lacs WMA

Taxa	Common Name	Scientific Name	State Status[1]
Amphibian	Eastern Tiger Salamander	*Ambystoma tigrinum*	
Amphibian	Blue-spotted Salamander	*Ambystoma laterale*	
Amphibian	Red-backed Salamander	*Plethodon cinereus*	SGCN
Amphibian	Four-toed Salamander	*Hemidactylium scutatum*	SPC
Amphibian	American Toad	*Anaxyrus americanus*	
Amphibian	Cope's Gray Tree Frog	*Hyla chrysoscelis*	
Amphibian	Gray Tree Frog	*Hyla versicolor*	
Amphibian	Green Frog	*Lithobates clamitans*	
Amphibian	Spring Peeper	*Pseudacris crucifer*	
Amphibian	Boreal Chorus Frog	*Pseudacris maculata*	
Amphibian	Northern Leopard Frog	*Lithobates pipiens*	
Amphibian	Wood Frog	*Lithobates sylvaticus*	
Reptile	Snapping Turtle	*Chelydra serpentina*	
Reptile	Painted Turtle	*Chrysemys picta*	
Reptile	Red-bellied Snake	*Storeria occipitomaculata*	
Reptile	Common Garter Snake	*Thamnophis sirtalis*	

[1] END = endangered, THR = threatened, SPC = special concern, SGCN = Species of Greatest Conservation Need; all of Minnesota's endangered, threatened, and special concern species are SGCN, those listed as SGCN in the table are species not on the Minnesota's endangered, threatened, and special concern list.

XVII. Appendix G. Acronyms Used in the Mille Lacs WMA Plan

Acronym	Definition
ADA	Americans with Disabilities Act
BWSR	Board Water and Soil Resources
CDV	Canine Distemper Virus
CWD	Chronic Wasting Disease
DBH	Diameter at breast height
DPA	Deer Permit Area
DNR	Minnesota Department of Natural Resources
EAB	Emerald Ash Borer
ECS	Ecological Classification System
EHD	Epizootic Hemorrhagic Disease
END	Endangered
EWR	Ecological and Waters Resources Division
FAW	Fish and Wildife Division
EEDMapS Midwest	Early Detection Distribution and Mapping System
FOR	Forestry Division
HCVF	High Conservation Value Forest
LCCMR	Legislative-Citizen Commission on Minnesota Resources
LSOHC	Lessard-Sams Outdoor Heritage Council
LTA	Land Type Association
LTE	Labor Trades & Equipment

MBS	Minnesota Biological Survey
MFRC	Minnesota Forest Resources Council
MNDNR	Minnesota Department of Natural Resources
MNWAP	Minnesota's Wildlife Action Plan
NPC	Native Plant Communities
OSD	Operations Services Division
PAT	Parks and Trails Division
SGCN	Species of Greatest Conservation Need
SPC	Special Consern
SSURGO	Soil Survey Geographic Database
STH	Sustainable Timber Harvest
THR	Threatened
TSI	Timber Stand Improvement
USFWS	United States Fish and Wildife Service
WAHMA	Wildlife and Aquatic Habitat Management Application
WMA	Wildlife Management Area
WNS	White Nose Syndrome
WSI	Winter Severity Index

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