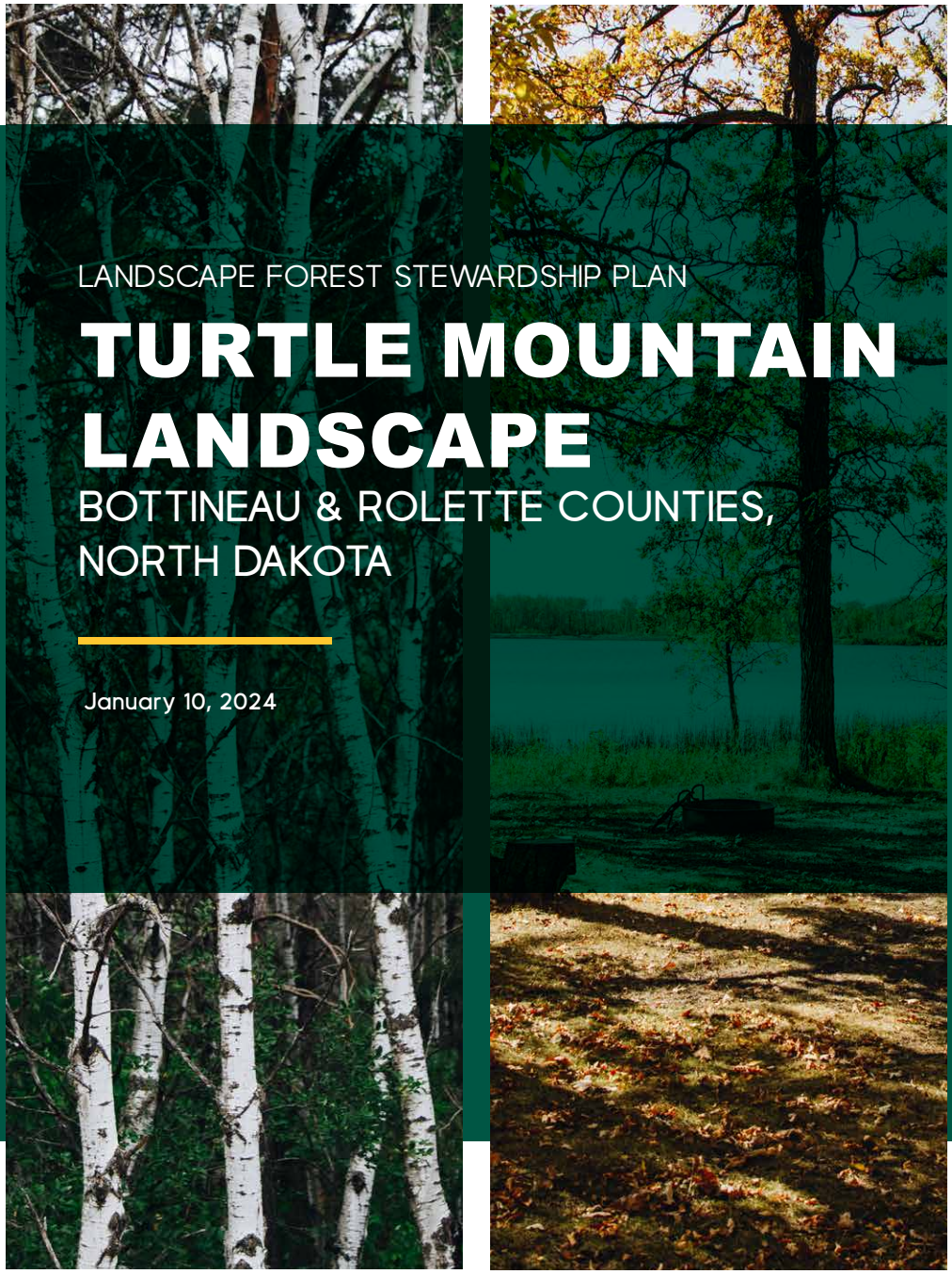

LANDSCAPE FOREST STEWARDSHIP PLAN

TURTLE MOUNTAIN LANDSCAPE

BOTTINEAU & ROLETTE COUNTIES, NORTH DAKOTA

January 10, 2024

USDA

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

NORTH DAKOTA STATE FOREST SERVICE

NDSU

ACKNOWLEDGEMENTS

Land Acknowledgement

We collectively acknowledge that the Turtle Mountain Landscape is located within the traditional lands of the:

- Anishinaabe, OĆhethi Šakówiŋ (Dakota, Lakota, Nakoda)
- Yanktonai (Nakoda), Michif Piyii (Métis/Cree)
- Assiniboine (Nakodabi) Peoples in addition to many diverse Indigenous Peoples still connected to these lands.

We honor with gratitude Mother Earth and the Indigenous Peoples who have walked with her throughout generations. We will continue to learn how to live in unity with Mother Earth and build strong, mutually beneficial, trusting relationships with the Indigenous Peoples of our region.

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Development of this plan was supported by the:

- Landscape Forest Stewardship Plan Working Group
  (comprised of members representing the North Dakota Forest Service)
- North Dakota Game and Fish Department
- Natural Resource Conservation Service
- North Dakota State University.

The team leader for the Turtle Mountain working group is Lezlee Johnson (NDSU Forestry and Fire Management team leader). Primary assistance provided by:

- Cody Clemenson (Forest Stewardship Specialist, North Dakota Forest Service)
- Kevin Kading (Private Lands Section Leader, North Dakota Game and Fish Department)
- Jodi Delozier (Program Director and Extension Specialist for Soil and Water Leadership Development, North Dakota State University).

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Many other stakeholders were engaged during the development of this Landscape Forest Stewardship Plan, including federal and state agencies, Non-governmental Organizations, non-profits, landowners, and community members. This plan was distributed to numerous stakeholders for a 30-day comment period.

Cover photos are courtesey of NDSU.

ACROYNYMS

ACEP: Agricultural Conservation Easement Program

ATV: All-terrain Vehicle

CRP: Conservation Reserve Program

DBH: Diameter at Breast Height

DFC: Desired Future Condition

EAB: Emerald Ash Borer

EQIP: Environmental Quality Incentive Program

ESA: Endangered Species Act

ESD: Ecological Site Description

FIA: Forest Inventory Analysis

FLP: Forest Legacy Program

FORI: Forest of Recognized Importance

FSP: Forest Stewardship Plan

IBA: Important Bird Area

LAT: Large Aspen Tortrix

LFSP: Landscape Forest Stewardship Plan

NDDA: North Dakota Department of Agriculture

NDDEQ: North Dakota Department of Environmental Quality

NDFAC: North Dakota Forestry Advisory Council

NDFS: North Dakota Forest Service

NDGFD: North Dakota Game and Fish Department

NDPRD: North Dakota Parks and Recreation Department

NDSU: North Dakota State University

NGO: Non-government Organization

NLCD: National Landcover Database

NLEB: Northern Long-Eared Bat

NRCS: Natural Resource Conservation Service

NWOS: National Woodland Owner Survey

NWI: National Wetlands Inventory

NWR: National Wildlife Refuges

OHV: Off-highway Vehicle

PAC: Project Advisory Committee

RCPP: Regional Conservation Partnership Program

SCP: Species of Conservation Priority

SFAP: State Forest Action Plan

SGCN: Species of Greatest Conservation Need

SWAP: State Wildlife Action Plans

TMBCI: Turtle Mountain Band of Chippewa Indians

TMCC: Turtle Mountain Community College

TML: Turtle Mountain Landscape

USDA: United States Department of Agriculture

USFS: U.S. Forest Service

USEPA: U.S. Environmental Protection Agency

USFWS: U.S. Fish and Wildlife Service

USGS: U.S. Geological Survey

WMA: Wildlife Management Area

WMP: Watershed Management Program

WPA: Waterfowl Production Areas

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1 INTRODUCTION

1.1 WHAT IS THE PURPOSE OF A LANDSCAPE FOREST STEWARDSHIP PLAN?

A Landscape Forest Stewardship Plan (LFSP) is a multi-landowner Plan written to address landscape-level forestry issues and identify common goals and objectives across all ownerships. This LFSP seeks to provide a framework for stakeholders to voluntarily work together to implement landscape-scale management strategies and articulate, work toward, and achieve shared desired future conditions by setting goals and objectives that will ultimately guide forest management towards sustaining forests for future generations.

Specifically, this LFSP intends to:

- Be implemented adaptively across various conditions, landowner objectives, and property ownerships and used flexibly as forest conditions and objectives change.
- Serve as an informative reference.
- Identify and articulate landscape-level desired future conditions, goals, and objectives.
- Identify and articulate commonly held landowner objectives.
- Illustrate practical forest management options and support the efforts of natural resource professionals from multiple sectors to promote conservation initiatives.
- Be the technical framework for local, state, and national funding opportunities for conservation initiatives on private and public lands.

Landscape stewardship planning operates on various scales, aligning with administrative boundaries such as counties and/or environmental delineations such as watersheds or land use. As the scales narrow (i.e., evaluating parcels compared to states or regions), forest stewardship planning adopts a more specific approach. Landscape-level stewardship planning serves a significant role in providing overarching guidance to smaller-scale planning. The cumulative understanding of objectives at smaller scales is instrumental in accomplishing the expansive goals and objectives set at the landscape level.

1.2 WHAT IS LANDSCAPE STEWARDSHIP?

The U.S. Forest Service (USFS) 2011 Landscape Stewardship Guidance defines landscape stewardship as "bringing together the stakeholders in a community of place or community of interest to address resource-based issues of mutual concern." They further define landscape stewardship as "an 'all lands' approach to forest conservation that works across multiple ownerships to address issues and opportunities identified in each State's Forest Action Plan."

This approach to forest conservation includes four interrelated phases, summarized as:

1. **Planning:** Develop shared desired future conditions with goals and objectives to achieve those conditions.
2. **Coordination:** Build on existing relationships, foster new partnerships, initiate outreach, and allocate responsibilities.
3. **Implementation:** Engage interested stakeholders to implement strategies to achieve the Plan's goals.
4. **Monitoring and Evaluation:** Track accomplishments and evaluate the effectiveness of implementation. Celebrate outcomes and identify ways for the Plan to adapt for continual success.

These phases intend to serve as a guide to help organize and develop a LFSP.

1.3 WHAT IS A FOREST?

At its core, the term "forest" refers to an area predominantly occupied by trees. However, this term carries diverse interpretations, from the strictly scientific to the deeply poetic. The USFS, for instance, furnishes a strictly technical definition of forest as an area with trees covering at least one acre, having minimum dimensions of 120 feet by 363 feet, and 10% live canopy cover. Beyond this, a forest can be understood as a complex ecosystem that includes not only trees but a wide range of plants, animals, fungi, and microorganisms that interact with each other and their environment and therein provide vital habitats for many forms of life. Furthermore, forests hold immense and widely varying recreational, cultural, and spiritual significance. The purpose of the LFSP is not to assign or follow one specific understanding or meaning of the term "forest" but instead to affirm the value of the habitats and showcase the many understandings and meanings of forests within the TML through its collaborative development and expression of desired future conditions, goals, and objectives.

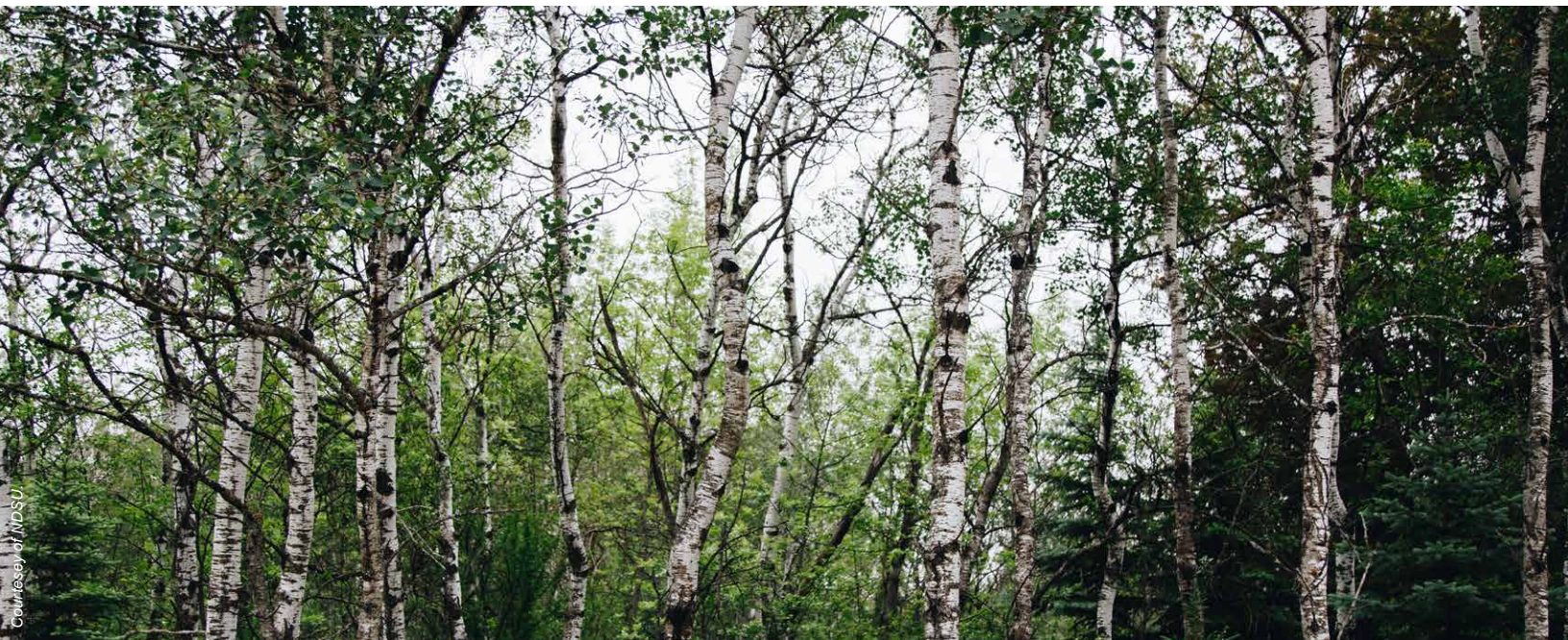
Courtesey of NDSU.

1.4 WHAT IS THE LANDSCAPE?

The purpose of the LFSP is to encourage engagement by stakeholders. Therefore, the Turtle Mountain Landscape (TML) is defined using a combination of existing political and administrative features and ecological boundaries.

This LFSP defines the TML as the forested region of North Dakota, known as the Turtle Mountain. The specific plan area was restricted to the boundary of the Turtle Mountain as mapped by the U.S. Environmental Protection Agency's (USEPA) Level IV Ecoregions of the Continental United States. This allows for a consistent and previously recognized boundary focusing on the ecological components. The TML's forests encompass portions of Bottineau and Rolette counties, which provide administrative boundaries for geopolitical context.

The TML extends north into the Canadian province of Manitoba. While the ecological components are similar, as would be potential goals and outcomes, the LFSP is focused only on the portions within the United States.



Courtesy of NDSU

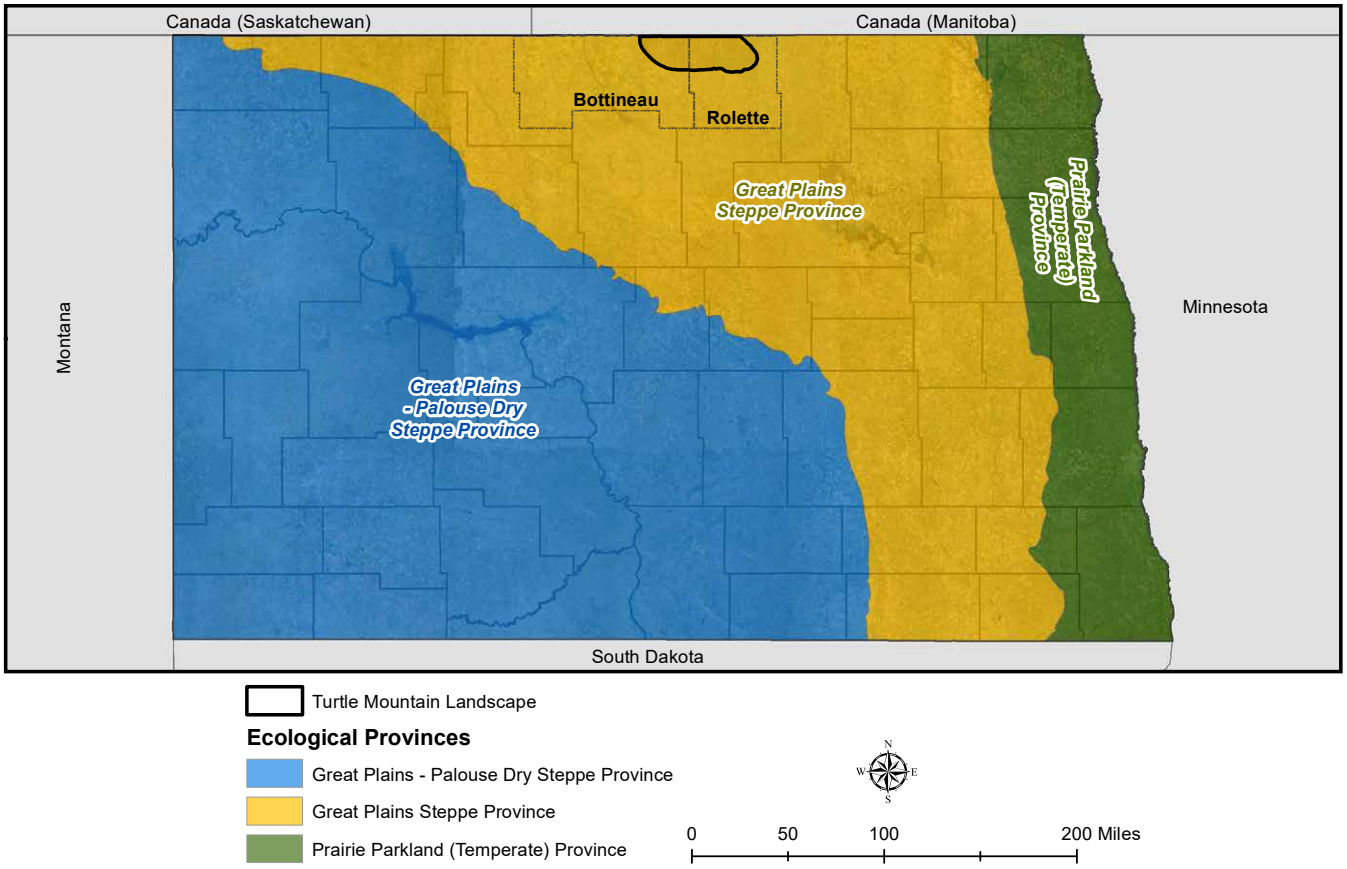


Figure 1: The TML in relation to the USFS's mapping of ecological provinces in North Dakota.

Geopolitical Context

The geopolitical context of the LFSP is summarized in Table 1.

Table 1: Summary of TML Geopolitical Components and Demographics.

County	Area within the TML		Municipal Divisions				2020 Population	
	Acres	% of TML	Cities	Townships	Unorganized	Total Municipal Divisions	Population	% of Total
Bottineau	100,595	39%	N/A	Dalen, Homen, Roland, Whitteron, Pickering, Cordelia	N/A	6	6,379	34%
Rolette	157,904	61%	St. John, Belcourt	N/A	8 unorganized Territories	10	12,187	66%
Totals	**258,499**	**100%**				**16**	**18,566**	

Source: U.S. Census Bureau and ND GIS HUB Data Portal

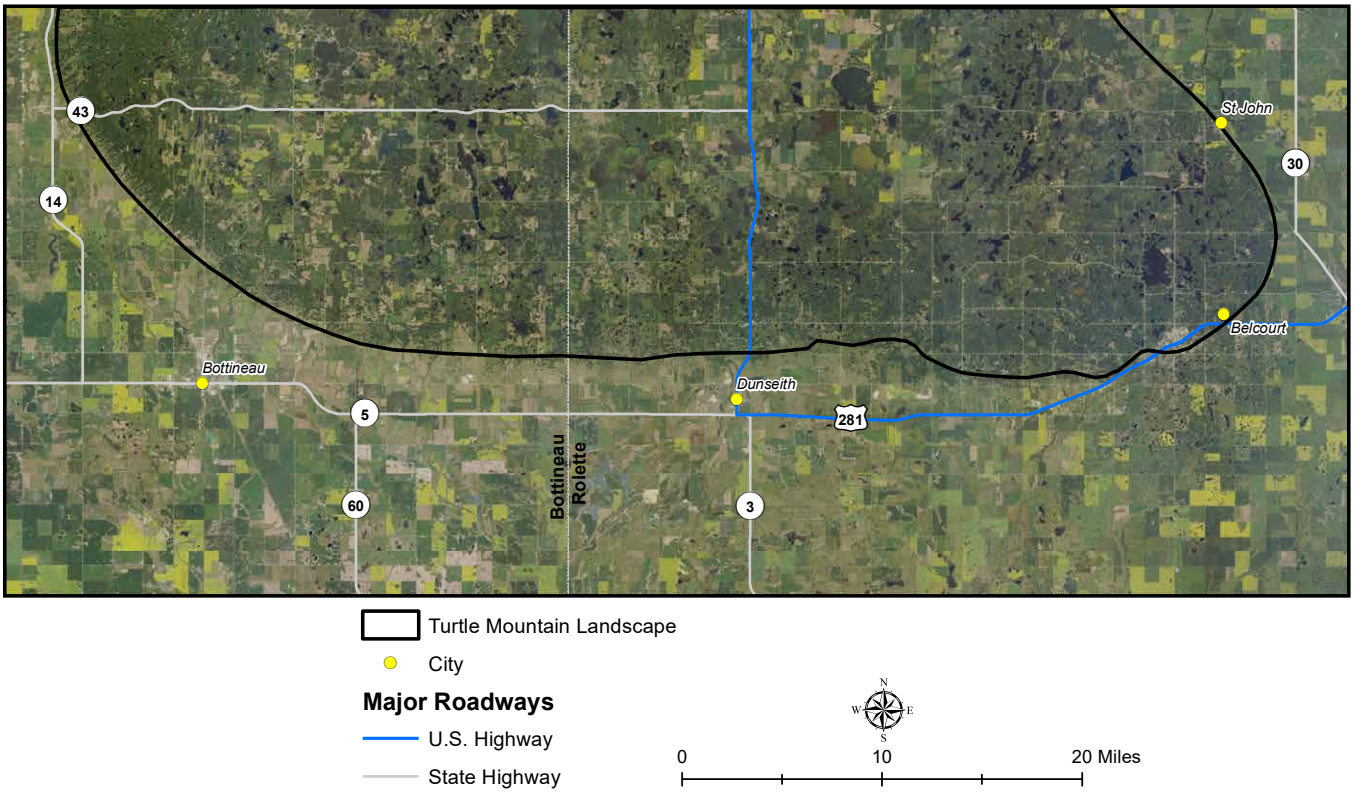


Figure 2: Location of the TML in relation to local cities and major roadways.

The TML is within two counties: Bottineau and Rolette. Neighboring cities in the foothills and immediately adjacent to the TML include Bottineau in Bottineau County and Dunseith and Rolla in Rolette County. The Turtle Mountain Band of Chippewa Indians (TMBCI) Reservation and Off-reservation Trust Lands comprise a significant component of the southeastern portion of the TML within Bottineau and Rolette counties. The area is sparsely populated and administratively dominated by townships and unorganized territories.

Access to the TML is through local roads, with Trunk Highway 281 being the primary route to the region from the east and south. The TML is crossed by State Highway 43, also designated as the Turtle Mountain Scenic Byway.

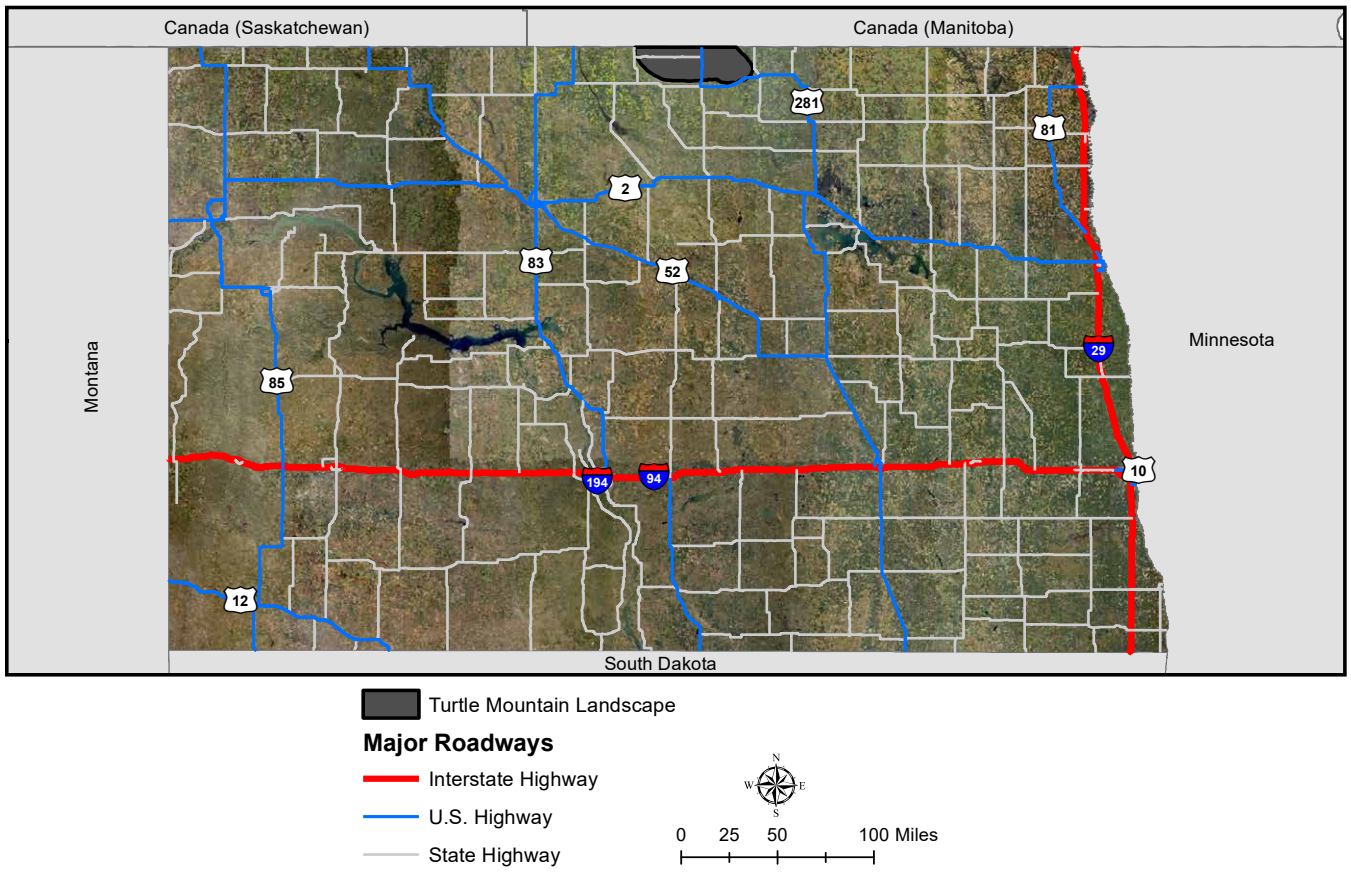


Figure 3: Overview of the TML relative to major roadways of North Dakota.

Ecological Context

The USEPA's Ecoregions of North America identifies and maps regions with similar ecological characteristics such as geology, vegetation, soils, and related components. Following this approach, the TML is located entirely within the Great Plains Level I Ecoregion, the Northern Glaciated Plains Level III Ecoregion, and the Turtle Mountain Level IV Ecoregion. Detailed descriptions of the ecoregions can be obtained from the USEPA's website (*https://www.epa.gov/eco-research/ecoregions*).

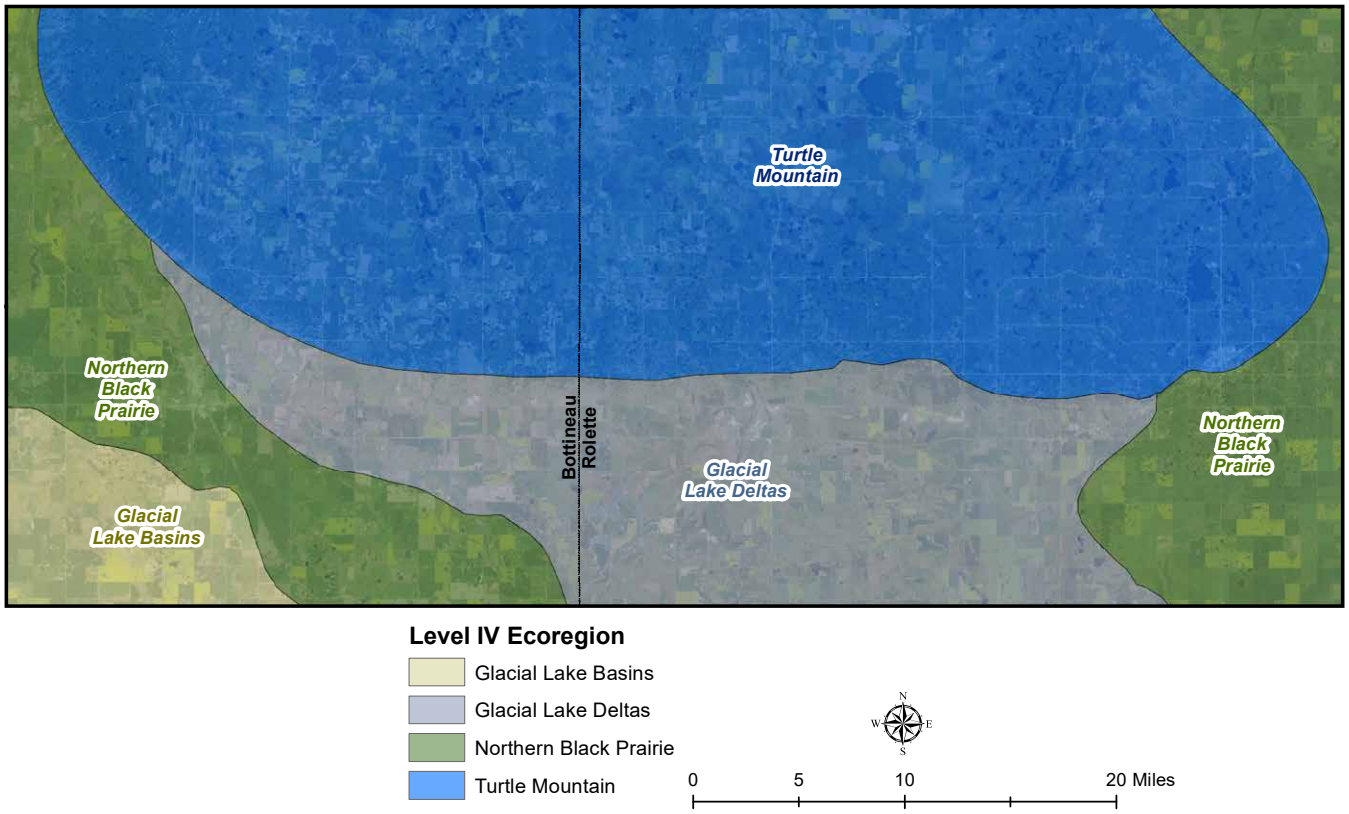


Figure 4: USEPA Level IV Ecoregion map showing the Turtle Mountain and surrounding ecoregions.

The Northern Glaciated Plains Ecoregion is characterized by a flat to gently rolling landscape dominated by grasslands. The TML is unique in this ecoregion because it is a plateau with relatively steep perimeter slopes by Great Plains standards and is forested. The hummocky, rolling landscape of the TML is underlain by moraine sediment left by the receding continental ice sheet, resulting in greater resistance to erosion than the surrounding landscape and, therefore, a higher elevation. The higher elevation of the TML results in greater precipitation compared to the surrounding grasslands. It is partially related to the greater amount of precipitation that forests comprised of hardwoods such as trembling aspen (*Populus tremuloides*), bur oak (*Quercus macrocarpa*), balsam poplar (*Populus balsamifera*), and green ash (*Fraxinus pennsylvanica*) dominate the landscape locally. This isolated woody landscape has led some to refer to the TML as an "island forest."

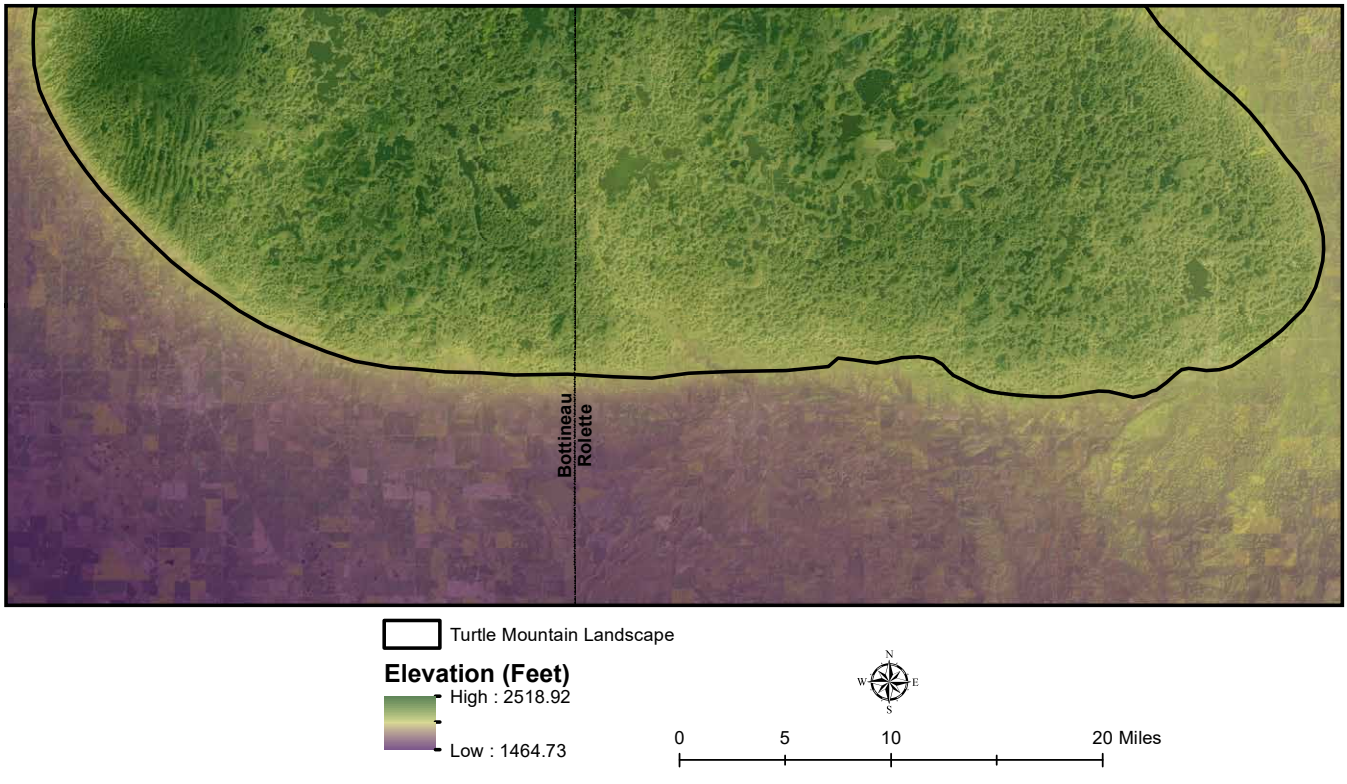


Figure 5: Elevation of the TML, shown in feet above sea level.

1.5 THE VALUE OF THE TURTLE MOUNTAIN LANDSCAPE TO ITS COMMUNITY

The TML forms not just a unique geographical or ecological landscape but a tapestry of community life derived from historical, ecological, and social ties. Cities such as Bottineau, Dunseith, Belcourt, Rolla, and St. John are meeting points of community life. Each of these cities has its unique story and downtown district, its Main Street, which has developed over time as people were drawn to the TML's unique forests, abundant water resources, and many outdoor recreational opportunities. Additionally, the TML has a rich cultural heritage rooted within the Turtle Mountain Chippewa community. The value of these communities is tightly interwoven with the unique natural resources of the TML.

Dakota College at Bottineau

Dakota College at Bottineau attracts many new college students interested in forestry or wildlife management. Dakota College at Bottineau opened its doors in 1906 as the North Dakota School of Forestry and offers several natural resource, forestry, recreation management, and wildlife and fisheries management programs. Dakota College at Bottineau integrates the TML into its studies and programs and utilizes this "living laboratory" as a source for education and research opportunities.

Turtle Mountain Community College

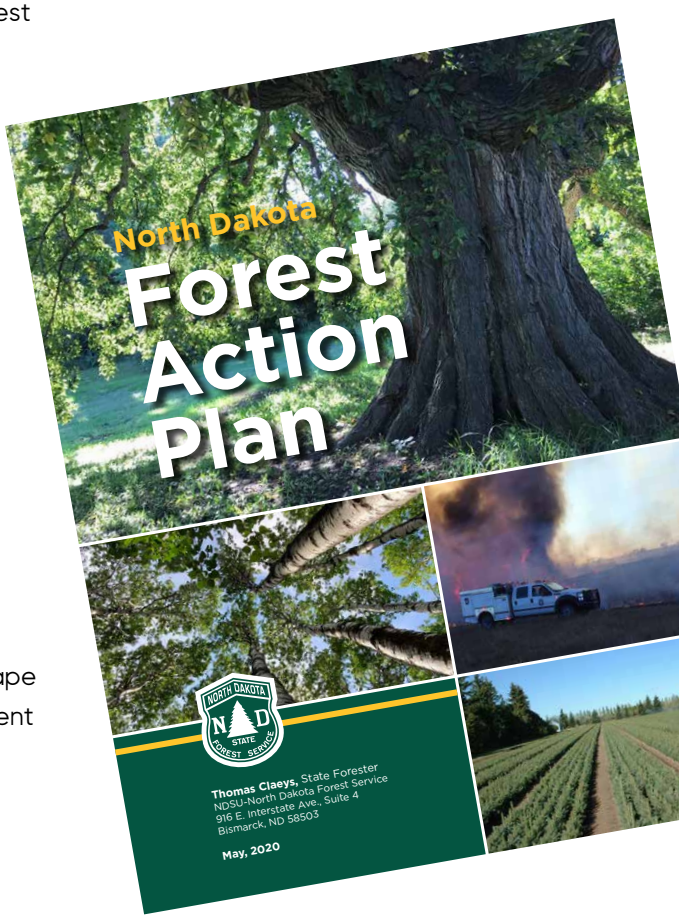
Turtle Mountain Community College (TMCC) near Belcourt is nestled within the boundaries of the TMBCI Reservation, providing a breathtaking view of the beauty of the reservation. "The Spirit Within Us" defines the TMCC approach to interactions with students, faculty, staff, and the community. TMCC is proud to offer a wide array of associate degrees, certificate of completion programs, and four-year degrees in Elementary Education and Secondary Science Teacher Education.

1.6 PAST AND ONGOING PLANNING EFFORTS

While the objective of the current effort is to provide a landscape-level plan specific to the TML, it is recognized that this is built from previous efforts that had larger or smaller areas of focus. The following is a summary of several key reports, groups, or sources of information that were considered in developing the LFSP.

North Dakota Forest Service and the 2020 State Forest Action Plan

The mission of the North Dakota Forest Service (NDFS) is to care for, protect, and improve forests and natural resources to enhance the quality of life for present and future generations. The NDFS operates the Forest Stewardship Program, a strictly voluntary program available to any nonindustrial private forest landowner. The program provides assistance to private forest landowners to encourage and enable active, long-term forest management to meet individual goals for the benefit of the forest resource. The program provides forest stewardship plans for private landowners free of charge.



The NDFS coordinated with the North Dakota State Stewardship Coordinating Committee, North Dakota Community Forestry Council, North Dakota State Technical Committee, North Dakota Game and Fish Department (NDGFD), USFS – Dakota Prairie Grasslands, tribal liaisons, and other land management agencies to develop the 2020 North Dakota State Forest Action Plan (SFAP). The SFAP serves as a strategic framework to outline priority forest resources, designate important issues, and identify strategies to address challenges and opportunities. SFAPs are intended to ensure that federal and state resources are focused on important landscape areas, with the greatest opportunity to address shared management priorities and achieve measurable outcomes.

North Dakota Forest Advisory Council

The purpose of the North Dakota Forestry Advisory Council (NDFAC) is to advise the State Forester and the NDFS on the implementation of the State's Forest Action Plan priorities addressing three program areas: Community Forestry, Forest Stewardship, and Forest Health.

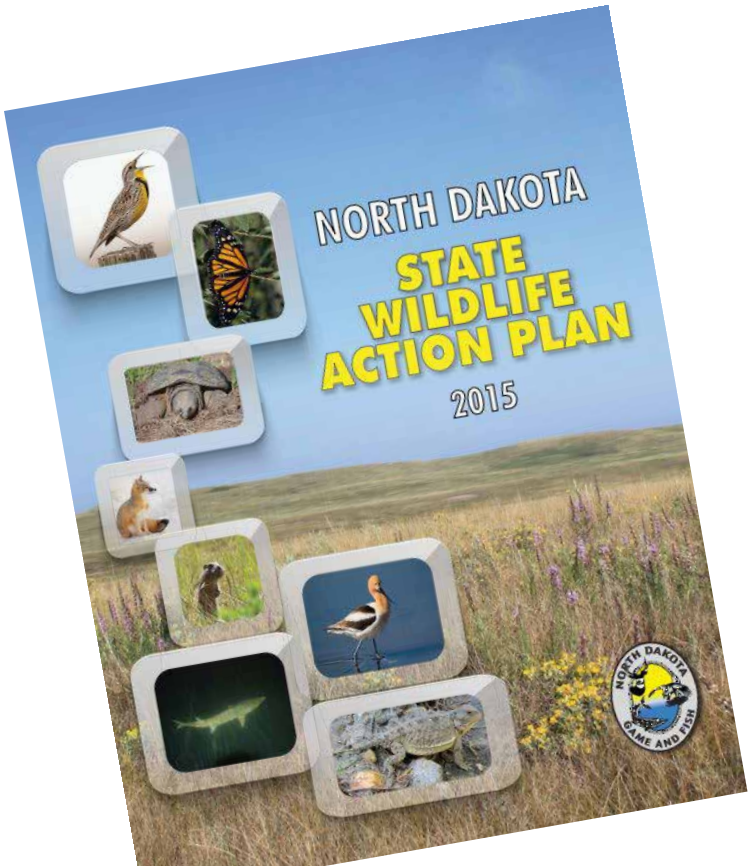
The Council also serves as a forum for the exchange of ideas and supports opportunities to work together to collaboratively address multiple issues of statewide importance. The Council intends to have balanced representation from among the three program areas (Community Forestry, Forest Stewardship, and Forest Health) and from across North Dakota. More information about the Council can be obtained from the NDFS website (*https://www.ag.ndsu.edu/ndfs/north-dakota-forestry-council)*.

Landscape Forest Stewardship Plan Working Group

In March 2022, the NDFAC convened a working group to develop the LFSP for the Turtle Mountain region. This LFSP is a product of the working group, which included staff from the NDFS, the NDGFD, the TMBCI, North Dakota State University (NDSU), and the Natural Resources Conservation Service (NRCS).

ND Game and Fish Department and the 2015 State Wildlife Action Plan

The 2015 State Wildlife Action Plan (SWAP) was completed by the NDGFD with the intention of outlining a strategic vision with the goal of preserving the state's wildlife diversity. Furthermore, it identifies wildlife species of greatest conservation priority, provides fundamental background information, strategic guidance, input from partners, and a framework for developing and coordinating conservation actions to safeguard all fish and wildlife resources.



Turtle Mountain Band of Chippewa Indians and the 2023 Forest Management Plan Environmental Assessment

The TMBCI has completed three forest management plans and a Forest Inventory Analysis (FIA) report. These plans and reports were specific to the lands within and/or owned by the Band. The most recent forest management plan was completed in 2023 and was, in part, informed by the results of the FIA report. The 2023 plan identified statutory objectives, goals, and forest management objectives for the forest land management practices.

Community Wildfire Protection Plans

Community Wildfire Protection Plans (CWPPs) are collaborative, community-driven frameworks that outline local priorities for wildfire risk mitigation. Bottineau County developed a CWPP, but it has expired.

North Dakota Parks and Recreation Lake Metigoshe State Park Master Plan

North Dakota Parks and Recreation Department (NDPRD) Master Plans are tangible, visionary tools used by the agency to be stewards of natural resources through sustainable management while embracing opportunities to enhance recreation opportunities. Master plans identify critical management and recreation priorities, industry and economic trends, and public needs. Using this information, the master plan is developed to act as a consistent guide that informs the decision-making around the long-term preservation, management, and development goals. Master plans are updated on a 10-year cycle; however, planners will continuously meet with Park Managers and Staff to reevaluate the master plans, ensuring they remain flexible, dynamic, and responsive to the ever-changing needs.

2 LANDSCAPE CONDITONS

2.1 FOREST LAND BASE

Generalized Land Cover

While the TML contains the most expansive and intact contiguous hardwood forest in North Dakota, it is more fragmented and has less tree cover than its pre-European settlement extent. Much of these land cover changes occurred from the conversion of forests to agriculture. This conversion may be driven in part by reduced productivity and vigor of the stands, coupled with a lack of a market for timber. As a result, some private landowners are inclined to clear low-production forests and use the land for agricultural purposes that generate marginal economic benefits. In 1980, an estimated 154,000 acres were in the aspen/birch forest type; by 2005, the area of aspen/birch had dropped to 116,000 acres, a decrease of approximately 25% (Haugen et al. 2009). The aspen/birch forest type accounted for 88,200 acres in the Turtle Mountains in 2017 (Paulson 2018).

Landcover within the TML was assessed utilizing the U.S. Geological Survey (USGS) National Landcover Database (NLCD). According to the 2021 dataset, an estimated 78% of the TML is terrestrial, of which 51% is forested. Agriculture forms the second major landscape component, comprising an estimated 27% of the total land base. Approximately 19% is comprised of aquatic habitats such as lakes, streams, and wetlands. Developed land is a relatively minor component, at an estimated 3% cover.

Forest cover within the TML was also evaluated using the NDFS High-Resolution Land Cover of North Dakota (2014) dataset to provide a second source of evaluating the percent tree cover. The dataset indicates that forests comprise approximately 49% of the TML, similar to the USGS data analysis.

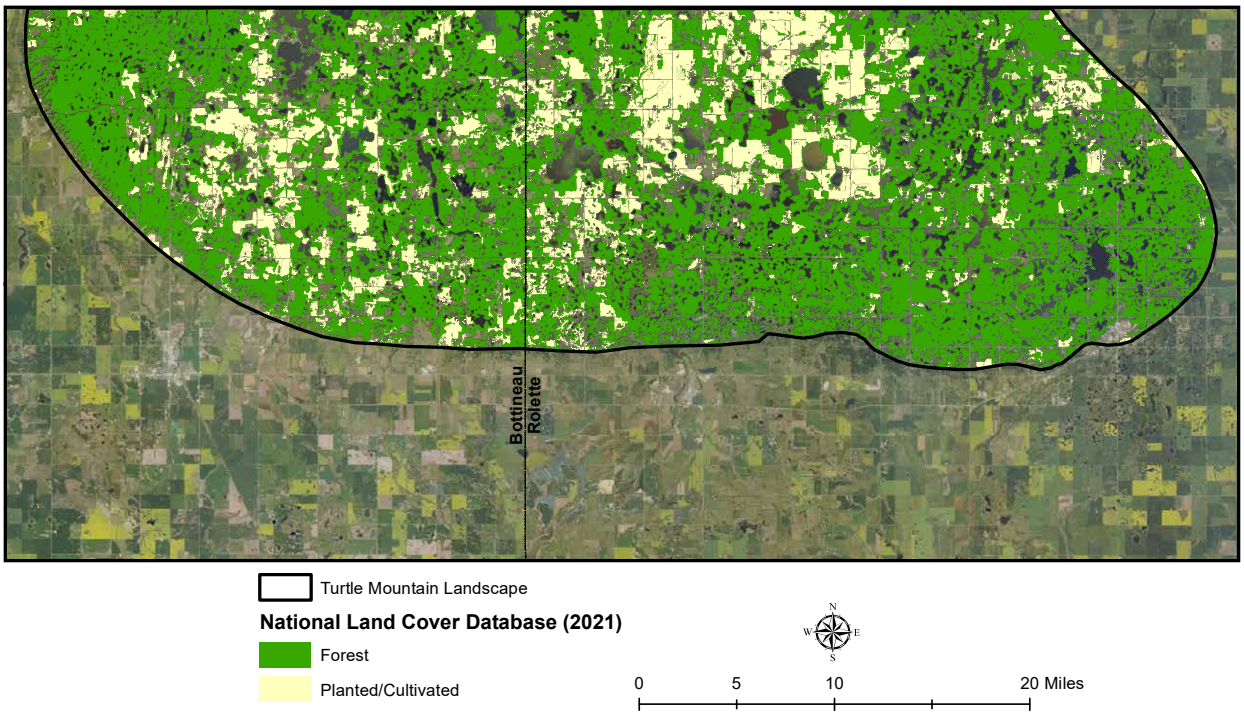


Figure 6: NLCD landcover classes (2021 dataset) within the TML.

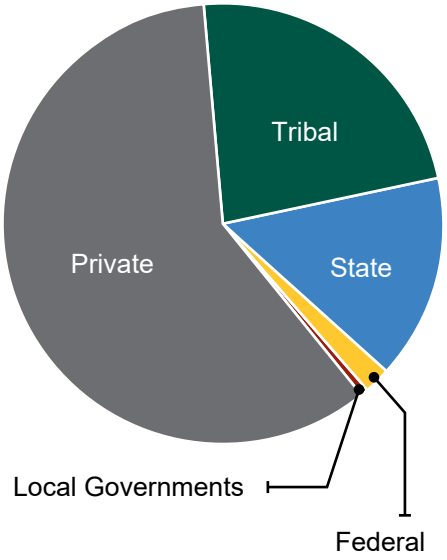
2.2 LAND OWNERSHIP AND MANAGEMENT

Land within the TML is owned by a variety of public and private entities, each with its own management goals and objectives.

Approximately 61% (156,506 acres) of the TML is privately-owned, making individual landowners the majority of the potential LFSP users. According to the USFS National Woodland Owner Survey (NWOS), the average owner of forest land in North Dakota owns 66 acres, with the median being 27 acres.

The TMBCI own 23% percent (59,161 acres, including Reservation and Off-reservation Trust Lands). Public land includes areas under state, federal, or local government (i.e., city or county) ownership. State of North Dakota ownership includes 15% (37,863 acres) within Wildlife Management Areas (WMAs), State Forest, State Parks, and mineral trust lands, which are managed by the NDFS, NDGFD, NDPRD, and others. Federal lands include 2% (4,939 acres) within National Wildlife Refuges (NWRs) and Waterfowl Production Areas (WPAs) that are managed by the U.S. Fish and Wildlife Service (USFWS).

LAND OWNERSHIP WITHIN THE TURTLE MOUNTAIN LANDSCAPE



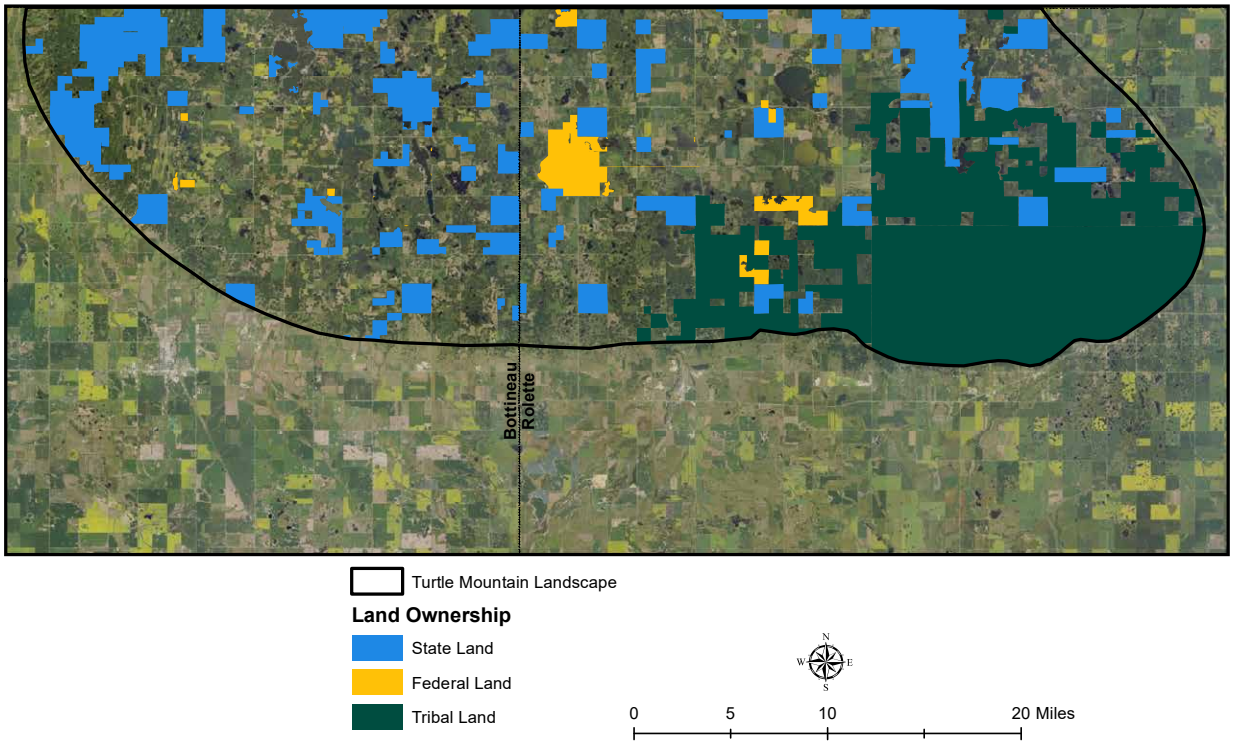


Figure 7: Land ownership within the TML.

North Dakota Game and Fish Department Wildlife Management Areas

The ND Game and Fish Department owns or manages over 12,000 acres of the TML across 12 WMAs within the TML. These include Black Lake, Nickelson, Rabb Lake, School Section Lake, Schuster, Thompson Lake, Turtle Mountain, Turtle Mountain-Brudwick, V.V. Bull, Wakopa, Redfield, and Willow Lake. The Department undertakes mechanical regeneration of aspen on sites between 2.5 and 50 acres in size to replace decadent (80-to-90-year-old) aspen stands with a biodiversity of age classes to improve forest health, diversity, and wildlife habitat. Most recently, the Department utilized a logging contractor to mechanically regenerate 115 acres of aspen at four sites on Wakopa and Willow Lake WMAs to create early successional and forest-edge habitat in support of ruffed grouse (*Bonasa umbellus*).

Lands and Waters Administered by the U.S. Fish and Wildlife Service

The USFWS maintains three National Wildlife Refuges (Rabb Lake, Willow Lake, and School Section Lake) and two waterfowl production areas (Bottineau County WPA and Rolette County WPA) within the TML. These are part of the J. Clark Salyer Wetland Management District and are managed to conserve fish and wildlife and their habitat for the continued benefit of the American people. Activities such as hunting, fishing, trapping, wildlife observation and photography, environmental education, and interpretation are generally allowed on these lands.

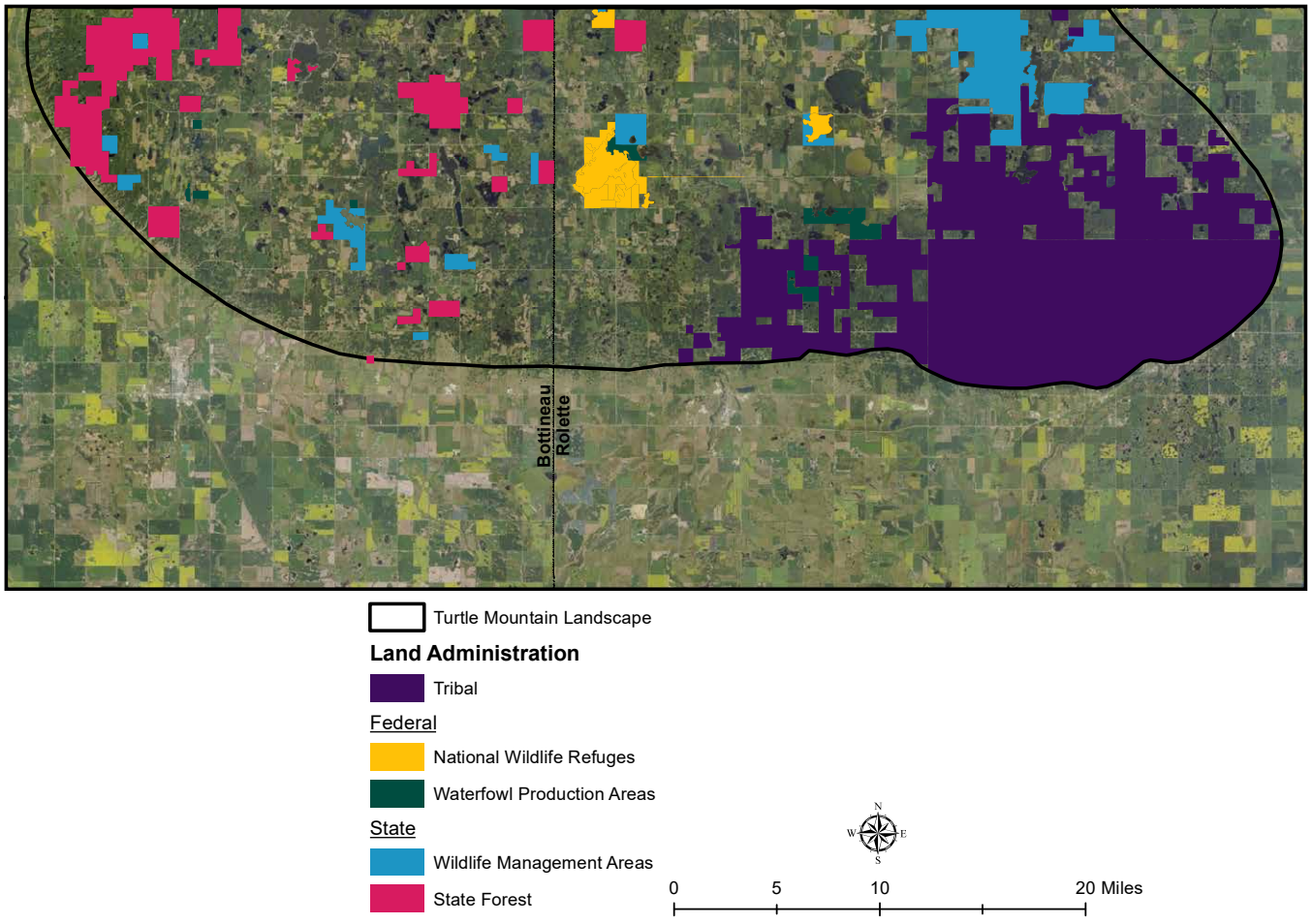


Figure 8: Detailed land administration within the TML.

Land cover and use in the TML was estimated using the USGS's 2021 NLCD dataset. Forests are the dominant land cover in the TML. An estimated 51% of the TML is forested. Most of this land is held by private landowners and not actively managed for forest products. Instead, this land serves as land for wilderness, wildlife habitat, recreation and hunting, and aesthetic appreciation.

Agricultural land use is the most common active use of land in the TML. An estimated 27% of the TML is comprised of agricultural lands, including pasture, hayfields, and cultivated crops. This number has remained relatively unchanged between 2001 and 2021. Development for residential, especially rural residential, or commercial space comprises approximately 3% of the landscape. The percentage of developed land has also remained relatively unchanged since 2001.

Courtesy of NDFS.

2.3 FOREST BIODIVERSITY: TERRESTRIAL VEGETATION AND WILDLIFE

Forest Types

The TML is unique because it is a forested landscape located entirely within the Great Plains ecological region. Its unique terrestrial vegetation relative to the surrounding grasslands results from its higher elevation and greater annual precipitation than the surrounding landscape. The TML's forests are characterized by a small number of tree species that comprise the aspen, oak, and mixed hardwood woodlands present throughout the TML. For practical purposes, forests in the TML are generally considered as being aspen-dominated or oak-dominated, although there are transitional areas where this distinction may not be readily apparent.

Detailed vegetation classification descriptions have not been specifically developed for the TML, but several overlap the TML. NatureServe's International Vegetation Classification classifies the vegetation of the TML broadly within the *Quercus macrocarpa - Populus tremuloides / Pascopyrum smithii* Woodland Division (i.e., the Bur Oak - Quaking Aspen / Western Wheatgrass Woodland Division). A detailed description of this Division can be found on their website (*https://explorer.natureserve.org/*).

The NRCS developed Ecological Site Descriptions (ESD) to provide a consistent framework for classifying and describing rangeland and forestland soils and vegetation, thereby delineating land units with similar capabilities to respond to management practices or disturbance. Two ESDs overlap the TML, including the Upland Hardwood Forest and the Loamy Savanna.

Plant Biodiversity

According to the 2017 Flora of North Dakota Checklist, North Dakota has at least 1,607 vascular plant species. Of these, 1,081 are known from Bottineau and Rolette Counties, which is a very high frequency for the size of the area, but reflects the inclusion of both grassland and forested habitats to support high biodiversity. Reflecting the unique setting and habitats present, eight (8) plants do not occur within North Dakota outside of the TML. These include:

- Creeping Sedge (*Carex chordorrhiza*)
- Round-leaved Sundew (*Drosera rotundifolia*)
- Bluntleaf Bedstraw (*Galium obtusum*)
- Vasey's Rush (*Juncus vaseyi*)
- Arrowleaf tearthumb (*Polygonum sagittatum*)
- Swamp Willow (*Salix maccalliana*)
- Scouler's Willow (*Salix scouleriana*)
- Pod Grass (*Scheuchzeria palustris*)

Many of these plants are associated with wetlands, specifically an acid peatland (i.e. bog wetland) that occurs within the TML and not within other locations of North Dakota.

A list of plant Species of Conservation Priority (SCP) was developed by the NDPRD Natural Heritage Program and may be used to complement the 2015 SWAP (*https://gf.nd.gov/wildlife/swap*).

The plan proposed 100 plant SPC and of these, 19 are known to be present within the TML.

Table 2: Plant Species of Conservation Priority and Rank within the TML.

Common Name	Scientific Name	State Rank
Mingan Moonwort	*Botrychium minganense*	S1
Foxtail Sedge	*Carex alopecoidea*	S1
Back's Sedge	*Carex backii*	S3
Spiny Sedge	*Carex echinata ssp. echinata*	S1
Blue Cohosh	*Caulophyllum thalictroides*	S1
Small Yellow Lady's-slipper Orchid	*Cypripedium parviflorum var. makasin*	S2
Large Yellow Lady's-slipper Orchid	*Cypripedium parviflorum var. pubescens*	S2
Round-leaved Sundew	*Drosera rotundifolia*	S1
Chamisson's Cottongrass	*Eriophorum chamissonis*	S2
Green Keeled Cottongrass	*Eriophorum viridicarinatum*	S2
Bog Bedstraw	*Galium labradoricum*	S3
Buckbean	*Menyanthes trifoliata*	S2
Naked Mitrewort	*Mitella nuda*	S3
Small-flowered Grass of Parnassus	*Parnassia palustris var. parviflora*	S3
Swamp Willow	*Salix maccaliana*	S1
Bog Willow	*Salix pedicellaris*	S3
Pod Grass	*Scheuchzeria palustris*	S1
Round-leaved Sphagnum Moss	*Sphagnum teres*	S1
Flat-leaved Bladderwort	*Utricularia intermedia*	S2

Blue Cohosh

Courtesey of MNW Info.

Small Yellow Lady's-slipper Orchid

Courtesey of SEH.

Mingan Moonwort

Courtesey of SEH.

Swamp Willow

Courtesey of MNW Info.

Round-leaved Sundew

Courtesey of MNW Info.

Wildlife and Wildlife Habitat

The forests of the TML provide habitat for many of North Dakota's amphibian, reptile, mammal, bird, and invertebrate species. Aquatic species, like fish, are also dependent upon the terrestrial forests as a component of their ecological function and resource inputs.

Muskrat

Canadian Toad

Smooth Green Snake

Western Painted Turtle

Courtesey of NDGFD. (All photos)

According to the NDGFD, TML ecosystems support **13** species of amphibians and reptiles, **21** fish species (includes 8 stocked species), **45** mammals, and **176** bird species, including 125 breeding birds with key breeding areas for 21 species (Table 3).

Table 3: Animal Species of Conservation Priority and Rank within the TML.

Mammals	
Northern Short-tailed Shrew	Red Squirrel
Arctic Shrew	Franklin's Ground Squirrel
Masked Shrew	Thirteen Lined Ground Squirrel
Pygmy Shrew	Least Chipmunk
Big Brown Bat	Eastern Chipmunk
Silver Haired Bat	Beaver
Red Bat	Northern Pocket Gopher
Hoary Bat	Meadow Jumping Mouse
Little Brown Bat	Western Jumping Mouse
Northern Long-eared Bat	Meadow Vole
Coyote	Southern Red-Backed Vole
Red Fox	Muskrat
American Marten	White-footed Mouse
Fisher	Deer Mouse
Short-tailed Weasel	House Mouse
Long-tailed Weasel	Norway Rat
Mink	Snowshoe Hare
American Badger	White-tailed Jack Rabbit
Striped Skunk	Eastern Cottontail
Racccoon	Moose
Northern Flying Squirrel	Elk
Eastern Gray Squirrel	White-tailed Deer
Fox Squirrel	

Reptiles and Amphibians	
Woodhouses Toad	Common Snapping Turtle
Canadian Toad	Plains Garter Snake
Northern Leopard Frog	Red-sided Garter Snake
Wood Frog	Red-bellied Snake
Boreal Chorus Frog	Smooth Green Snake
Tiger Salamader	Plains Hognosed Snake
Western Painted Turtle	

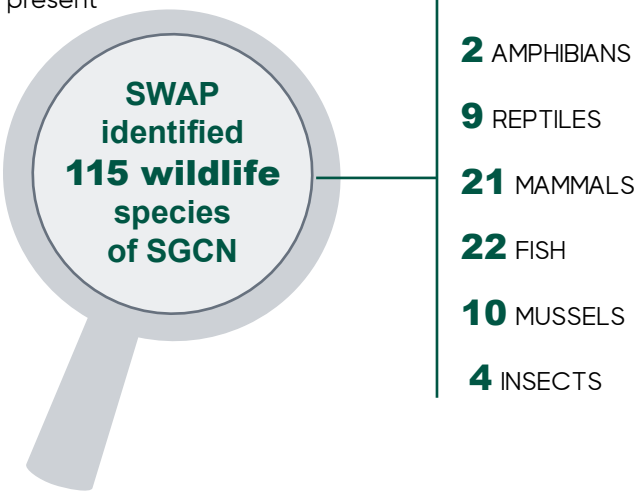
Fish	
Fathead Minnow	Brassy Minnow
Creek Chub	Longnose Dace
Northern Pike	Bluegill*
White Sucker	Largemouth Bass*
Yellow Perch	Rainbow Trout*
Western Blacknosed Dace	Cutthroat Trout*
Black Bullhead	Smallmouth Bass*
Brook Stickleback	Crappie*
Golden Shiner	Tiger Trout*
Common Shiner	Walleye*
Pearl Dace	
* Indicates stocked fish species	

A checklist of the birds of the TML, prepared by NDGFD, is available upon request from the NDFS or the NDGFD.

Two species that are protected under the Endangered Species Act (ESA) have potential to occur within the TML: the Dakota Skipper (*Hesperia dacotae*) and Northern Long-eared Bat (*Myotis septentrionalis*). The Dakota Skipper has been documented in mesic prairies within the TML. Habitat for the Northern Long-eared Bat (NLEB) is present within the forests of the TML.

Additional information on the region's wildlife species, associated habitats, and goals for sustaining species identified as Species of Greatest Conservation Need (SGCN), formerly referred to as Species of Conservation Priority, can be found in the 2015 SWAP on the NDGFD website.

The SGCN that are present within the TML include a wide variety of birds, amphibians, reptiles, mammals, and insects, as identified in the summary below. Many of these utilize forested habitat for portions of their life cycles, but this list includes many species that are also not forest-dependent and reflect the diverse habitat present overall within the TML.



SGCN FROM THE TML INCLUDE:

13 BIRDS
- Canvasback
- Lesser Scaup
- Horned Grebe
- American White Pelican
- Franklin's Gull
- Black Tern
- Wilson's Phalarope
- Bald Eagle
- Northern Harrier
- Swainson's Hawk
- American Kestrel
- Black-billed Cuckoo
- Nelson's Sparrow

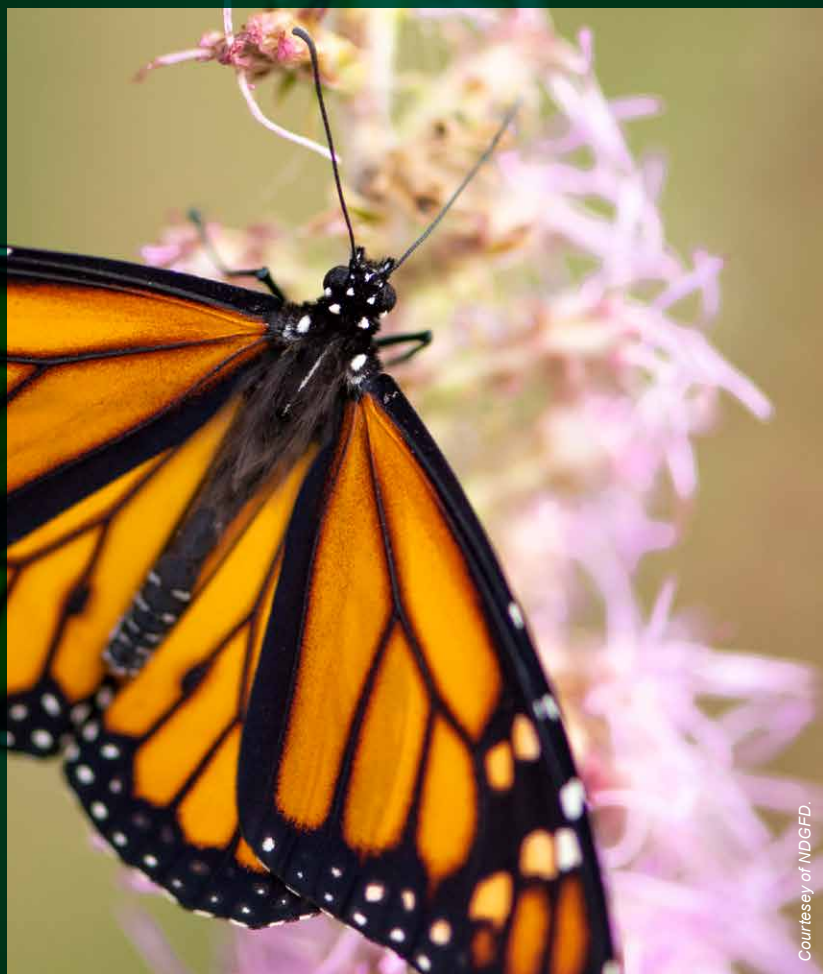
2 AMPHIBIANS
- Canadian Toad
- Snapping Turtle

2 REPTILES
- Smooth Green Snake
- Plains Hognosed Snake

7 MAMMALS
- American Marten
- Northern Long-eared Bat
- Big Brown Bat
- Little Brown Bat
- Townsend's Big-eared Bat
- Arctic Shrew
- Pygmy Shrew

2 INSECTS
- Monarch Butterfly
- Dakota Skipper

Monarch Butterfly



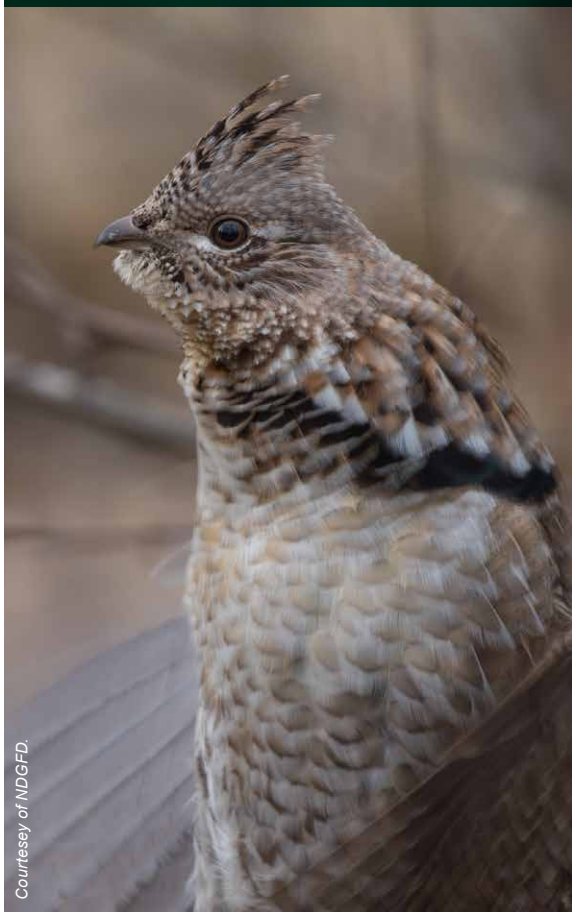
Courtesy of NDGFD.

Representative and/or Notable Wildlife

Ruffed Grouse: Characterized by their camouflage colored barred and spotted plumage and neck ruff, the ruffed grouse is integrally linked to aspen-dominated forests, of which the successional dynamics are pivotal. Early successional aspen-dominated forests, characterized by dense understory and sapling proliferation, provide optimal conditions for foraging and anti-predatory strategies. These young forests also foster a rich invertebrate community, which is essential for the protein requirements of the grouse chicks during the brooding phase. Late successional aspen forests, identifiable by their matured trees, offer critical roosting sites and refuge during inclement weather conditions. The spatial proximity of young and old aspen forests is critical for the ruffed grouse's life cycle. In recognizing this, conservation and management practices have been implemented by landowners, the NDFS, and the NDGFD. These practices include forest management practices, such as thinning and clear-cutting, with the goal of inducing aspen regeneration and creating a mosaic of young and old aspen forests.

Moose: In North Dakota, moose (*Alces alces*) were historically found in the Turtle Mountain and Pembina Hills areas. Moose are known to favor aspen-dominated or boreal forests, wetlands, and riparian zones. The NDGFD's management strategies for moose revolve around preserving and enhancing these habitats through efforts that include promoting forest regeneration, protecting wetland areas, and maintaining riparian buffers. Additionally, the NDGFD works with landowners to mitigate human-wildlife conflicts, such as those arising from agricultural activities, moose behavior during the breeding or calving season, or road traffic. Regulated hunting is part of the management strategy. Moose populations in the Turtle Mountain and Pembina Hills areas have been declining as a result of brain worm, i.e., the meningeal worm (*Parelaphostrongylus tenuis*), which is a parasite that is often found in white-tailed deer and spread through deer feces. Forest management practices specific to moose have not been implemented in the TML.

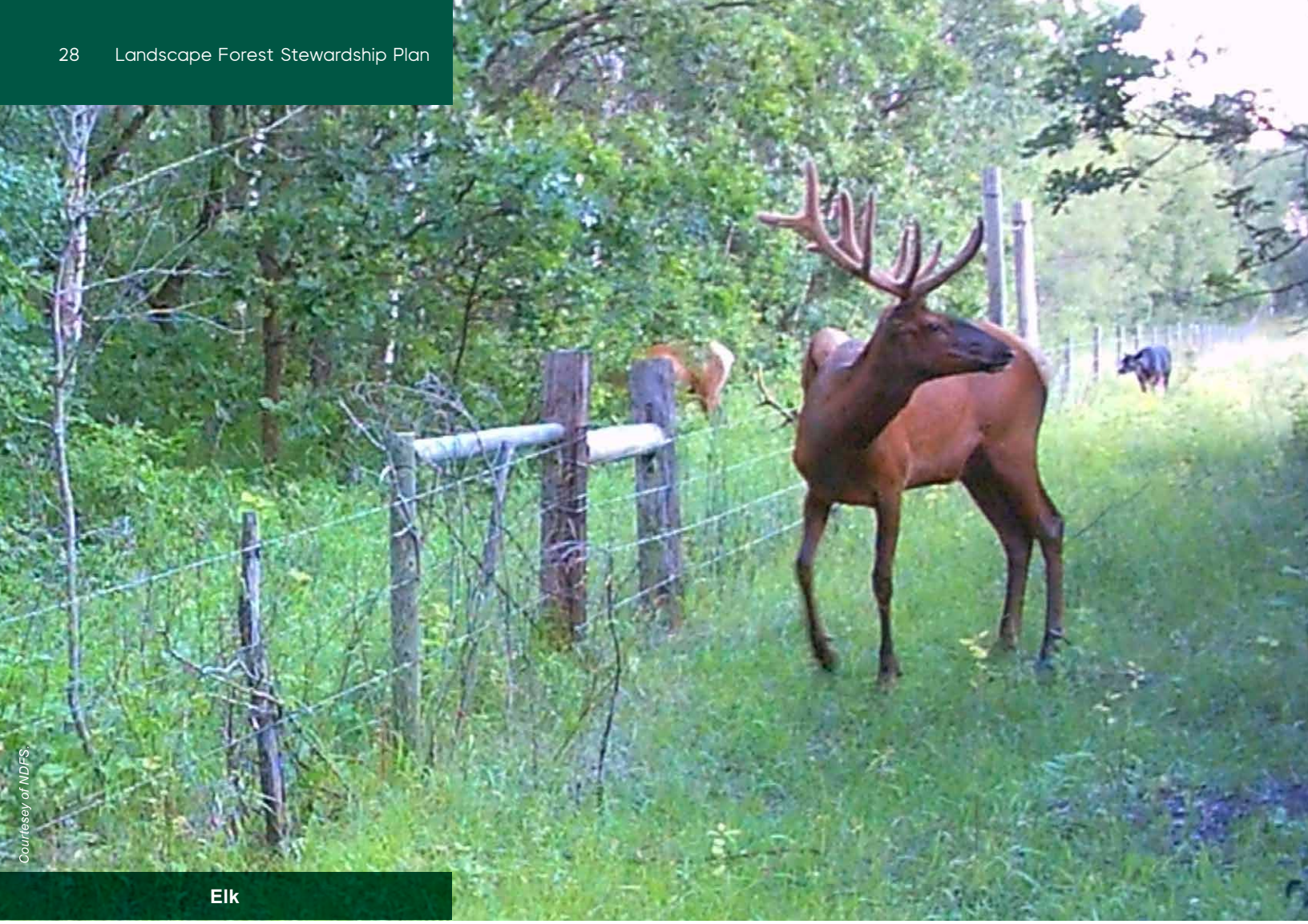
Ruffed Grouse



Courtesy of NDGFD.

Moose

Courtesy of NDGFD.



Courtesy of NDFS.

Elk

Elk: Elk (*Cervus elaphus*) were once the most widely distributed cervid (i.e., a mammal of the deer family) in North America before extirpation from most of their range in the late 1800s. Elk were extirpated from North Dakota in the early 1900s. In North Dakota, an elk herd naturally migrated into the Pembina Hills area in the early 1970s. In the late 1980s and early 1990s incidental observations of elk were reported in the TML. The population of elk in these two areas is considered stable to increasing, as measured by the NDGFD through annual population estimates. In the TML, the elk herd is considered international, with animals transitioning across the border between North Dakota and Manitoba, Canada. The NDGFD works to manage the population to address landowner tolerances to limit depredation on livestock feed supplies, crop damage, and so forth. Regulated hunting is part of the management strategy.

American Marten: The discovery of American Marten (*Martes americana*) populations in North Dakota was a significant outcome of the survey efforts conducted from 2006 to 2009. These surveys, aimed at assessing the presence of River Otters (*Lontra canadensis*) and other meso-carnivores, were facilitated by a State Wildlife Grant (T-12-R) awarded to Frostburg State University. This discovery is detailed in the SWAP, which also provides comprehensive management recommendations for this elusive species. To ensure the conservation and management of the American Marten, the SWAP proposes collaboration with the NDFS and private landowners to incorporate marten-friendly guidelines in land management practices. These guidelines emphasize the protection of riparian corridors, crucial for the movement and dispersal of marten populations. Further recommendations include the

avoidance of clear-cutting practices in forested areas to maintain habitat continuity. The preservation of large-diameter trees is underscored, as these serve as vital denning and resting sites for the species. Additionally, maintaining a woody understory is recommended to provide adequate cover and support for denning and resting. These management directives aim to foster a landscape conducive to the American Marten's survival and well-being, ensuring that this species remains an integral part of ND's biodiversity.

White-tailed Deer: The white-tailed deer (*Odocoileus virginianus*) is a prominent species in ND. Thriving across diverse habitats, the adaptability of the white-tailed deer allows them to inhabit mixed agricultural lands, forested areas, and grasslands. They are a highly valued game species, with hunting being a significant cultural and recreational activity. The NDGFD collaborates with landowners, conservation groups, and other stakeholders to mitigate human-wildlife conflicts. Educational programs raise awareness about deer behavior, particularly during rutting and fawning seasons, to reduce vehicle collisions and other conflicts. Regulated hunting plays a pivotal role in managing white-tailed deer populations by helping to control population density, preventing and limiting overbrowsing and limiting habitat degradation. No forest management practices specific to white-tailed deer have been implemented in the TML.

American Marten

White-tailed Deer

Courtesey of NDGFD.

American White Pelican

Courtesey of NDGFD.

Lesser Scaup

Courtesey of NDGFD.

National Audubon Society Important Bird Areas

As the U.S. partner for BirdLife International, the Audubon Society spearheads an ambitious effort to identify, monitor, and protect Important Bird Areas (IBAs). The TML is recognized as an IBA. These areas are crucial as, according to the U.S. North American Bird Conservation Initiative's 2022 U.S. State of the Birds report, many species of birds are declining.

2.4 FOREST HEALTH, SUSTAINABILITY, AND RESILIENCY

The NDFS is committed to working with landowners to identify new and emerging threats to forest health. Forest health is a crucial component of forest management. Forest age has been increasing and natural disturbances, such as large-scale forest fires, have largely been absent from the landscape since the early 1900s because of fire suppression efforts. This has resulted in high rates of mortality in aspen, an abundance of decadent aspen, and an increased susceptibility of aspen to rot and disease caused by aspen heart/trunk rot (*Phellinus tremulae*) and hypoxylon canker (*Hypoxylon mammatum*). For these reasons, a substantial amount of potentially harvestable aspen timber is being lost. Furthermore, stands of decadent aspen are generally not perceived by stakeholders in the TML to have an aesthetic benefit or a benefit to wildlife populations.

The collaborative NDSU and NDFS Forest Health Program complete statewide surveys to assess threats to our trees and forest resources, provides technical assistance and training for natural resource professionals, arborists/city foresters and educators, and provides timely reports documenting pests, infestations, and general forest health conditions. Their annual Forest Health Highlights report summarizes observations and activities of the Forest Health Program and includes an overview of notable forest health issues. Forest health surveys and reports, sick tree assistance requests, and personal communication with natural resources and forestry professionals form the basis of the information disclosed in this report. These reports often contain helpful information detailing health issues facing trees and how they can be recognized.

D-shaped exit hole from Emerald Ash Borer

Courtesy of NDSU.

Insects and Disease

Insects and diseases pose ongoing threats to forest health in the TML. The NDFS identified the following tree diseases and insects as having the greatest threat to forest health in the landscape:

- **Dutch Elm Disease** *(Ophiostoma ulmi and O. novo-ulmi)*: First detected in North Dakota in 1969 and has since been recorded in all North Dakota counties. Dutch Elm Disease has reduced the abundance of elm (*Ulmus spp.*) trees in the TML. Historically, mature elms were a major component of a late-successional forest.

- **Emerald Ash Borer** *(Agrilus planipennis)*: The Emerald Ash Borer (EAB) attacks and kills all ash trees regardless of vigor, size, or age unlike the native ash borers. The insect, at the time of publication, is not known to have an established population in the TML. However, efforts by NDDA and NDFS to educate the public and provide tools for reporting are being made. Green ash comprises a major component of conservation plantings and the forests of the TML.

- **Forest Tent Caterpillar** *(Malacosoma disstria):* This pest contributes to the defoliation of aspen trees within the TML. Defoliation reduces growth, predisposes trees to other damaging agents, and exacerbates the senescence of aging aspen stands.

- **Large Aspen Tortrix** *(Choristoneura conflictana):* In 2011, an estimated 20,500 acres of aspen forest in the TML were impacted by defoliation caused by the large aspen tortrix (LAT). Occurrences of large-scale defoliation are sporadic and may follow the boom-and-bust population cycle that often characterizes lepidopteran defoliators such as LAT.

- **Spongy Moth** *(Lymantria dispar):* A small number of isolated detections of Spongy Moth have been made in North Dakota over the past decade, though the pest is, at the time of publication, not known to have an established population in the TML. As a damaging defoliator, it poses a major threat to the health of oak and aspen trees.

- **Two-lined Chestnut Borer** *(Agrilus bilineatus):* This is a native beetle that attacks weakened oaks. Drought, defoliation, and/or disease contribute to the susceptibility of oaks to this insect. Oaks usually die after 2-3 years of infestation.

Adult EAB Beetle

Courtesey of NDSU.

Green Ash in Minnesota infested by EAB

Courtesey of NDSU.

Damage caused by EAB larvae

Courtesey of NDSU.

- **Aspen Heart/Trunk Rot** *(Phellinus tremulae):* The higher prevalence of aspen heart/trunk rot is a natural process associated with overmature stands of aspen. In the absence of periodic disturbances such as fire and harvesting, heart/trunk rot will develop in stands of aspen and is a natural component of forest succession. However, this limits the viability of aspen for forest products.

- **Hypoxylon Canker** *(Hypoxylon mammatum):* The Hypoxylon canker is a fungus that infects aspen and contributes to stem decay and breakage, limiting the viability of aspen for forest products.

NDInvasives.org **portal is a valuable source of information concerning invasive forest pests.**

The NDInvasives.org portal, jointly curated by NDSU and the NDFS Forest Health Program is a valuable source of information concerning invasive forest pests. Additionally, it features an online form to facilitate the reporting of sick trees, thereby fostering a proactive approach towards forest pest management. The initiative to educate and spread awareness about the Emerald Ash Borer is ongoing. A collective effort focusing on social media has been made to disseminate vital information and engage the community in proactive measures to assist with monitoring the forests of the TML for EAB.

To monitor and mitigate the threats posed by forest pests, a series of statewide surveys were conducted. Among these was a collaborative survey targeting bark and wood-boring insects, as well as an aerial detection survey aimed at identifying forest canopy damage. For example, an aerial detection survey was completed by the Minnesota Department of Natural Resources, assessing approximately 560 and 400 miles of the Sheyenne and Red Rivers, respectively. The findings from the aerial survey revealed that nearly 99 percent of the assessed damage was attributed to natural causes, primarily age and density-related decline, exacerbated by environmental stressors such as drought and flooding events.

Hypoxylon Canker

Courtesy of NDSU.

Aerial view of defoliation caused by forest tent caterpillar

Courtesy of NDSU.

Noxious Weeds and Invasive Plants

The forests of the TML are largely free of invasive plant species that could disrupt forest succession. The greatest threat to the TML is posed by common buckthorn (*Rhamnus cathartica*) as it can disrupt native forest succession and regeneration, resulting in "buckthorn forests." Common buckthorn is present within the TML, but large infestations, at the time of publication, are unknown. Other problematic invasive plant species in the TML include Siberian Peashrub (*Caragana aborescens*), leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*), smooth brome (*Bromus inermis*), and Kentucky bluegrass (*Poa pratensis*). A program focused on tracking the introduction, distribution, and spread of invasive plants in the TML has not yet been established.

The North Dakota Department of Agriculture (NDDA) coordinates the efforts of county and city weed boards and state and federal land managers to implement integrated weed management programs. County and city weed officers are charged with enforcing the noxious weed law in their respective counties and cities. NDDA also cooperates with the USFS for the detection, suppression, and control of non-native, invasive plants. The goals of the program are to:

- enhance education, planning, and monitoring efforts to prevent new weed invasions;
- implement early detection and rapid response to new invaders;
- control small infestations and contain the spread of existing infestations;
- promote the use of biological control agents; and
- to work cooperatively across ownership boundaries.

Cooperative Forestry funds contribute to increased weed control, cooperation, and a better public understanding of the need for an integrated weed management program.

Siberian Pea Shrub

Courtesey of MNW Info.

Leafy Spurge

Courtesey of MNW Info.

Buckthorn

Courtesey of MNW Info.

Abiotic Stressors

Abiotic stressors, such as weather/climate and human disturbances, can contribute to the susceptibility of trees to insects and disease. Studies into how the forests may respond to abiotic stressors in response to climate-induced changes are limited. North Dakota has experienced temperature increases, with annual average temperatures increasing 0.26 degrees per decade since 1900. Climate changes will affect disturbance regimes, insect and disease outbreaks, fire season length, recreational values, and productivity. Forests should be sustainably managed to help them adapt to anticipated changes. This could include researching drought-resistant aspen to plant in the TML. Practices such as afforestation and agroforestry, reforestation, lengthening forest rotation, forestland protection from conversion, and community and urban forestry offer opportunities for carbon offsets.


Courtesy of NDFS.


Courtesy of NDFS.


Courtesy of NDFS.

2.4 FOREST PRODUCTS

While the TML is characterized by an abundance of forested lands, the number of tree species native to the region is small and significantly limits the opportunity for the establishment of a forest products industry. Few jobs in the TML are supported solely by forest products from the landscape. Several small businesses and the Turtle Mountain Band of Chippewa operate small-scale sawmills that, in part, utilize forest products from the TML. Some landowners utilize their forests for firewood to heat buildings. The quantitative economic value of forest products in the TML is unknown.

Persistently low demand for aspen, the most common tree species in the TML, contributes to the absence of a robust forest products industry as it limits the economic viability of harvesting aspen. This issue is compounded as aspen timber becomes less useful for forest products once overmature and infected with heart/trunk rot or the Hypoxylon canker. To diversify tree species in the TML, the establishment of conifer plantations has been attempted, but these have also been of limited scale and economic value. The establishment of a forest products industry is unlikely to occur without significant changes in market demand for aspen and funding to support aspen regeneration projects.

2.5 AQUATIC RESOURCES

With approximately 260 lakes covering 16,753 acres and over 205 miles of streams and rivers, the TML is widely appreciated for its abundant and high-quality water resources. Major rivers/streams flowing through the TML are Indian Creek, Mineral Creek, Oak Creek, Ox Creek, Wakopa Creek, and Willow Creek. For the purposes of this document, major lakes are those greater than 500 acres in size. Major lakes include Metigoshe, Willow, Carpenter, Belcourt, and Lake Upsilon. The Willow Lake NWR surrounds Willow Lake.

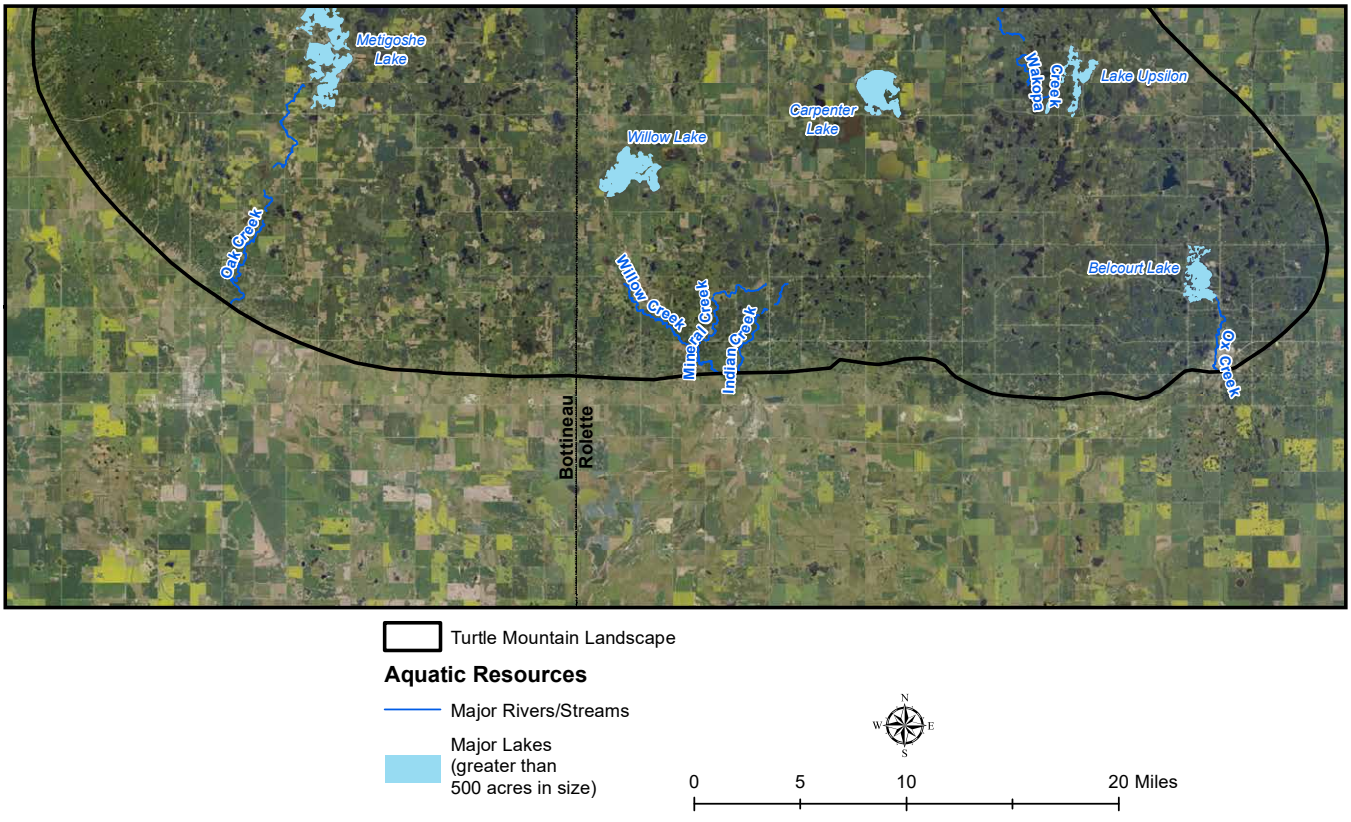


Figure 9: Major lakes and rivers within the TML.

According to the USFWS National Wetlands Inventory (NWI), there are at least 30,990 acres of wetland habitat within the TML. The majority of the wetlands are shallow marsh, most commonly represented by a cattail (*Typha* spp.) marsh, although other emergent species, such as sedges (*Carex* spp.) and wild rice (*Zizania palustris*), are also present. Table 4 is a summary of the wetland habitat present within the TML.

Table 4: NWI Wetlands within the TML.

Wetland Habitat Type	Area (acres)	Percent Cover
Deep Water	5,232	17%
Marsh	23,458	76%
Seasonally Flooded	1,043	3%
Shrub	1,226	4%
Forested	31	<1%
Total	**30,990**	**100%**

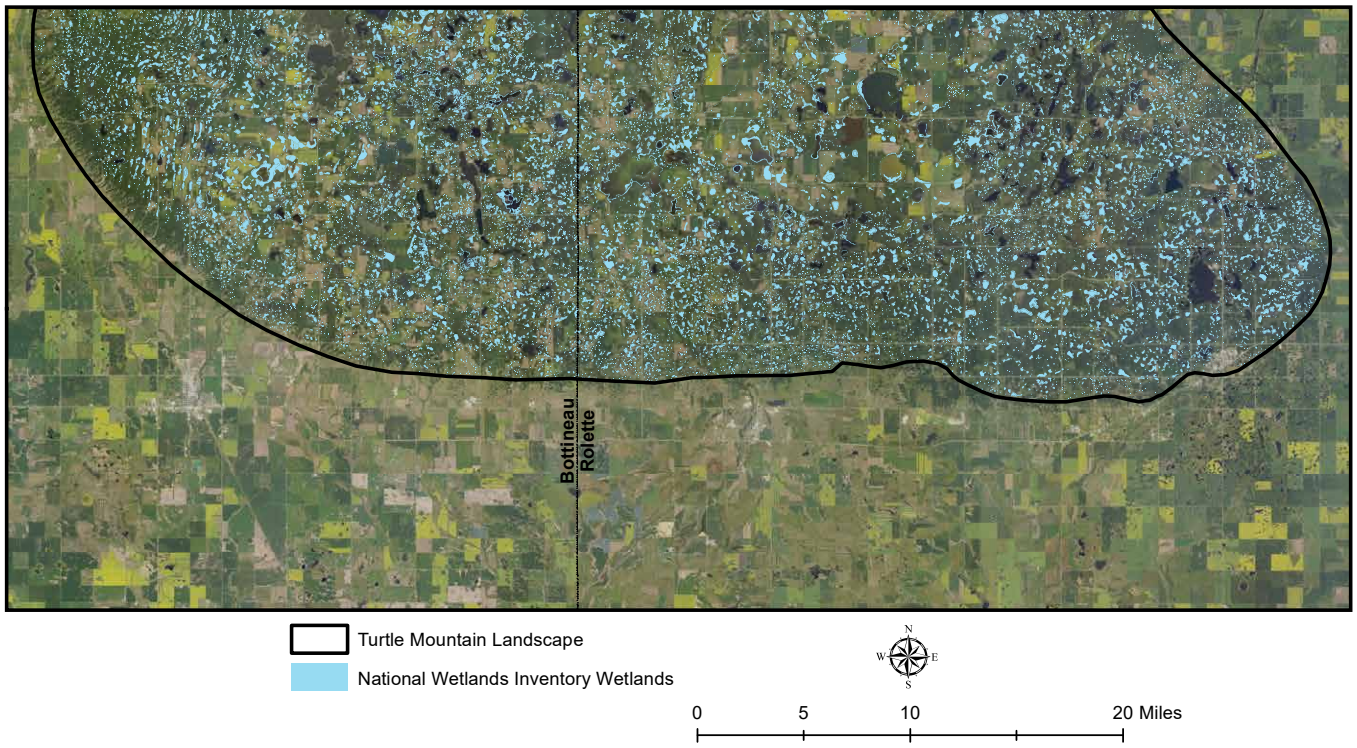


Figure 10: Wetlands identified by the NWI within the TML.

Watershed

The TML is part of the Souris River, Devils Lake-Sheyenne, and Lower Red River Basins, within the Willow River, Upper Pembina River, Lower Souris River, and Devil's Lake Watersheds. Water from these watersheds ultimately flows into the Mouse/Souris River, to the Assiniboine River in Manitoba, to the Red River, and into Lake Winnipeg.

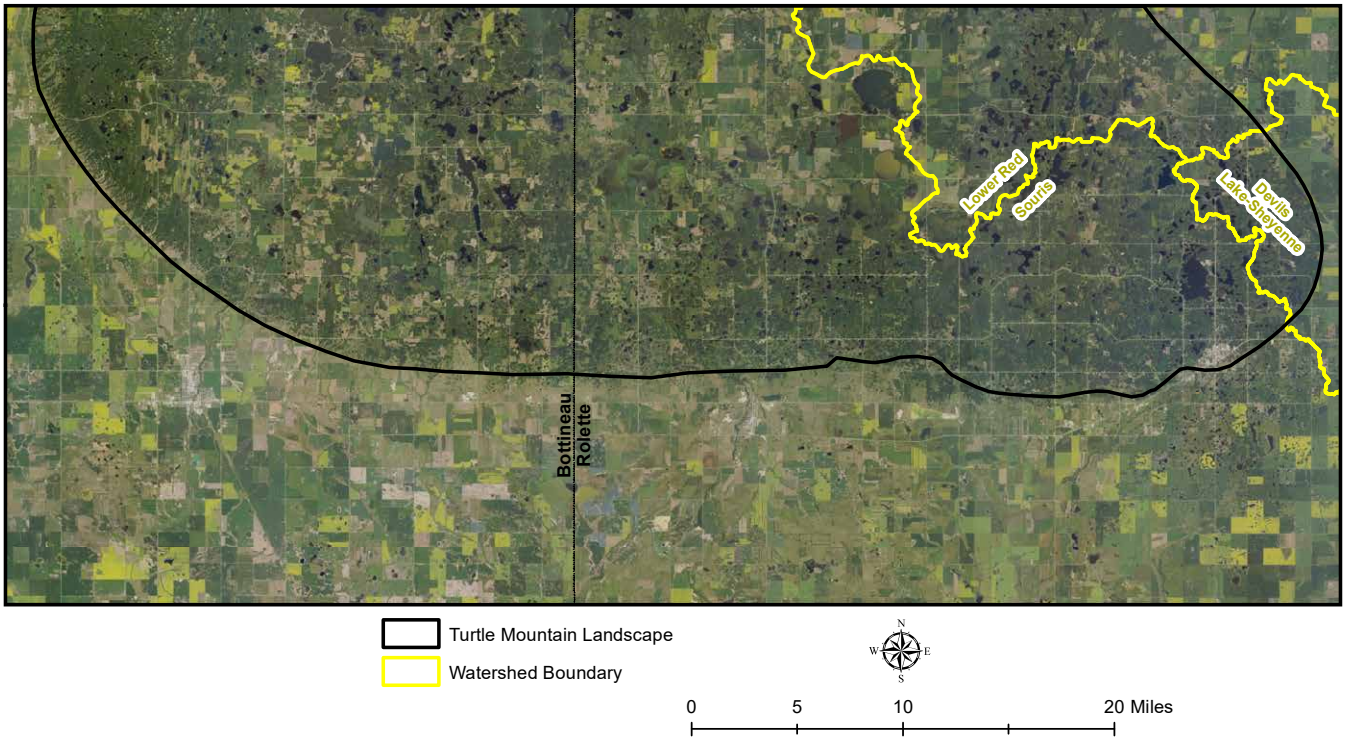


Figure 11: TML as compared to watershed boundaries.

Watershed health issues are rarely caused by forest management; however, forests are a key component in sustaining watershed health in the TML. Forests buffer rain and hold soil in place, allowing moisture to seep into the ground and reduce erosion and runoff. They also can influence water quality by affecting peak flows, turbidity, nutrient levels, and water temperatures.

The North Dakota Department of Environmental Quality's (NDDEQ) Division of Water Quality implements the Watershed Management Program (WMP). The WMP is primarily responsible for monitoring and assessing water quality in streams, rivers, lakes, and wetlands across North Dakota (*https://deq.nd.gov/WQ/3_Watershed_Mgmt/default.aspx*)

Water Quality

The NDDEQ also manages the Surface Water Quality Data for North Dakota. The TML has numerous surface water quality monitoring stations.

Several major surficial aquifers are located within and/or serve water to the communities of the TML. These include the Dunseith, Shell Valley, and Rolla aquifers as well as an unnamed aquifer. Of these, the Shell Valley Aquifer is monitored through the NDDEQ's Agricultural Groundwater Monitoring Program. Aquifers are sampled once every five years, and the results are published on the NDDEQ's Groundwater Monitoring Programs website.

2.7 AGRICULTURE

Within the TML, agriculture often occurs on land that was forested prior to European settlement. Agriculture forms the second largest land use of the TML, comprising an estimated 27% of the total land base, according to the 2021 USGS NLCD dataset. Detailed year-to-year tracking of forest conversion to agriculture has not been completed. Although agricultural lands are perceived to be expanding by many stakeholders, there are, as of writing, no specific programs/efforts tracking the conversion of forests to agriculture in the TML. Agroforestry and silvopasture are not widely adopted or are inconsistently implemented; however, landowners have expressed interest in adopting these practices.

2.8 SOCIAL AND CULTURAL USES AND VALUES

Indigenous Peoples' Cultural Traditions

The Turtle Mountain Band of Chippewa Indians reside within the TML. The TMBCI community includes traditions from the Ojibwe (Anishinaabe) and the Metis/Cree peoples, and has a long tradition of cultural uses of the forests and forest-dependent species in this region. The name Turtle Mountain ("Mekinauk Wudjiw") was attributed to the landscape by early Chippewa migrants. The Turtle Mountain Reservation is located in the northern half of Rolette County with smaller holdings elsewhere throughout the TML. Much of this land is forested. Traditional Ojibwe and Metis/Cree peoples relied on the forests of the TML for food, medicines, dyes, tools, construction, basketry, and transportation as well as spiritual and cultural identity.

Population

Most of the region is relatively rural with low total population and population densities. Bottineau County had less than four people per square mile, and Rolette County had less than 14 people per square mile. The highest population densities occur in the cities of Bottineau, Dunseith, Belcourt, Rolla, and St. John and the areas of rural development surrounding them. The TML's forests, water resources, and associated outdoor recreational opportunities are common reasons why people move to the TML and stay there. Bottineau County saw almost no change in population from 2010 to 2020. However, Rolette County saw a 13% decline from 2010 to 2020 and an additional 2.1% decline from 2020 to 2022. This is significantly different from the population change for the state of North Dakota, which saw a 13.6% increase from 2010 to 2020. According to the U.S. Census Bureau, 77.7% of the population of Rolette County is composed of people who identified as American Indian, whereas Bottineau County had 3.9%.

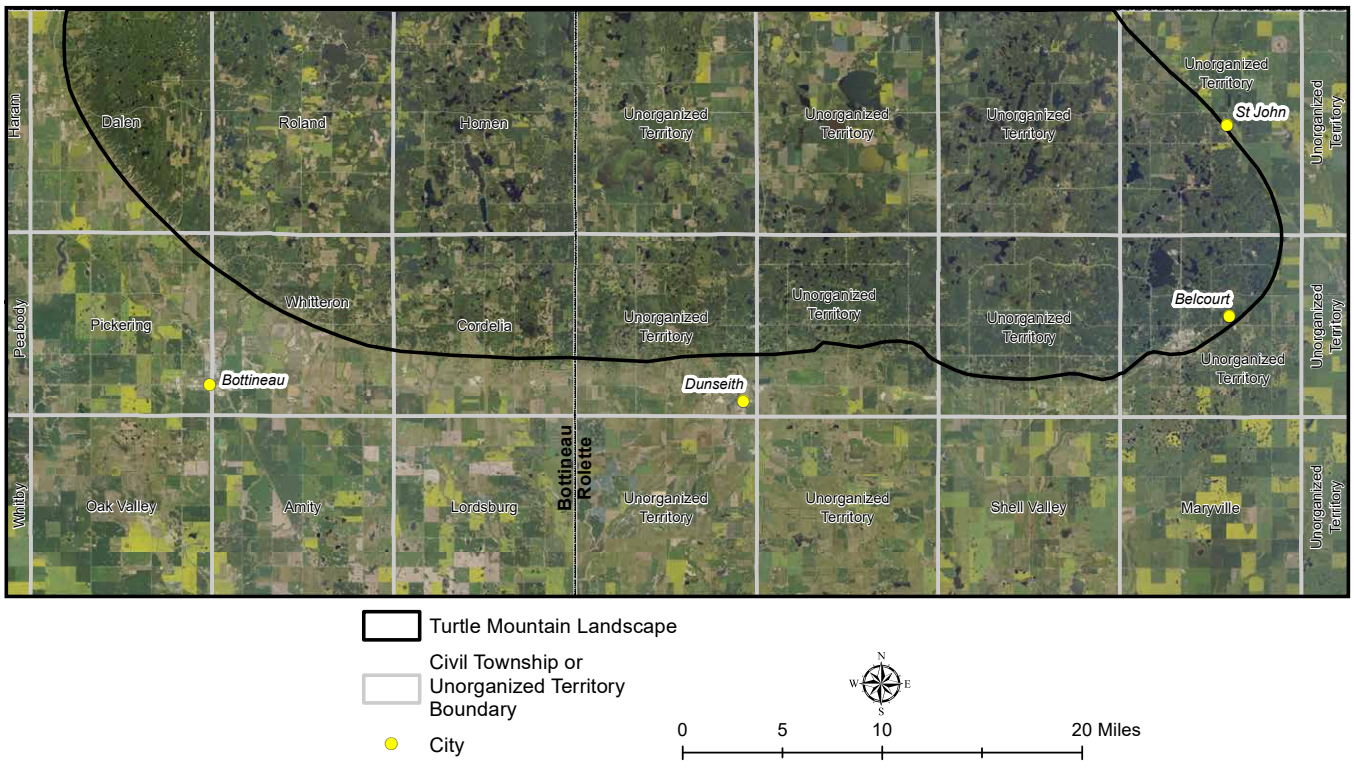


Figure 12: Detailed location map of the TML in relation to local cities, civil townships, and unorganized territories.

Courtesey of USFWS.

Forest/Wildland Fire Management

NDFS Fire Management Program supports 378 fire departments

The TML has a history of influence by fire that predates European settlement. The role of fire in the forests of the TML has greatly changed following European settlement. Large, intense fires spread across the region after a period of heavy logging in the late 1800's and early 1900's. These large fires, like much of the nation's approach to forest fires, resulted in policies and approaches to management favoring fire suppression over allowing fires to naturally occur. The NDFS and the TMBCI have recognized the value of prescribed burning as a tool of forest management in simulating the natural process of fire. Both organizations have been evaluating and developing best management practices for the incorporation of prescribed fire in forest management. The use of prescribed fire has the additional benefit of reducing the overall risk of catastrophic fires in the TML. While major catastrophic fires haven't occurred since the early 1900s, the risk of an uncontrolled wildfire that could threaten property and lives remains. Furthermore, a changing climate may result in more frequent fires with greater intensity. Because of the fire potential in the TML, there are several organizations and systems in place with experienced staff and equipment to supress wildfires.

The NDFS Fire Management Program focuses on the protection of lives, property, and natural resources from wildfire. This program supports the state's 378 fire departments, which are essential for enhancing firefighting capabilities and public safety. The program provides rural fire departments with cost-share funds for organizing, training, planning, and purchasing fire equipment. The TMBCI has implemented a Fire Management Plan. This Plan, in conjunction with the Turtle Mountain Agency Fire Prevention Program, provides tools to prevent and suppress fire with the goal of protecting life, property, and resources.

2.9 RECREATION

The TML is a major forest and water-based recreation destination with a wide variety of outdoor recreation opportunities. The hardwood forests provide a unique ecological setting that cannot be found elsewhere in North Dakota. The TML's unique topography in relation to the surrounding landscape provides numerous scenic views, such as those provided at Butte St. Paul State Recreational Area and Mystical Horizons. Abundant lakes provide numerous opportunities for water-based recreation such as fishing, boating, and waterfowl hunting. The dense hardwood forest provides a setting attractive to camping, hiking, backpacking, biking, riding all-terrain vehicles (ATVs), and other outdoor pursuits. Dramatic seasonal temperature changes and conditions allow for a change to winter-based recreation, including downhill and cross-country skiing, ice fishing, snowshoeing, and snowmobiling. The existing infrastructure, in terms of paved, graveled, and natural surfaced roads, as well as resorts, hotels, campgrounds, trails, trailheads, picnic areas, and other developments and businesses, allow access to a wide spectrum of recreational pursuits.

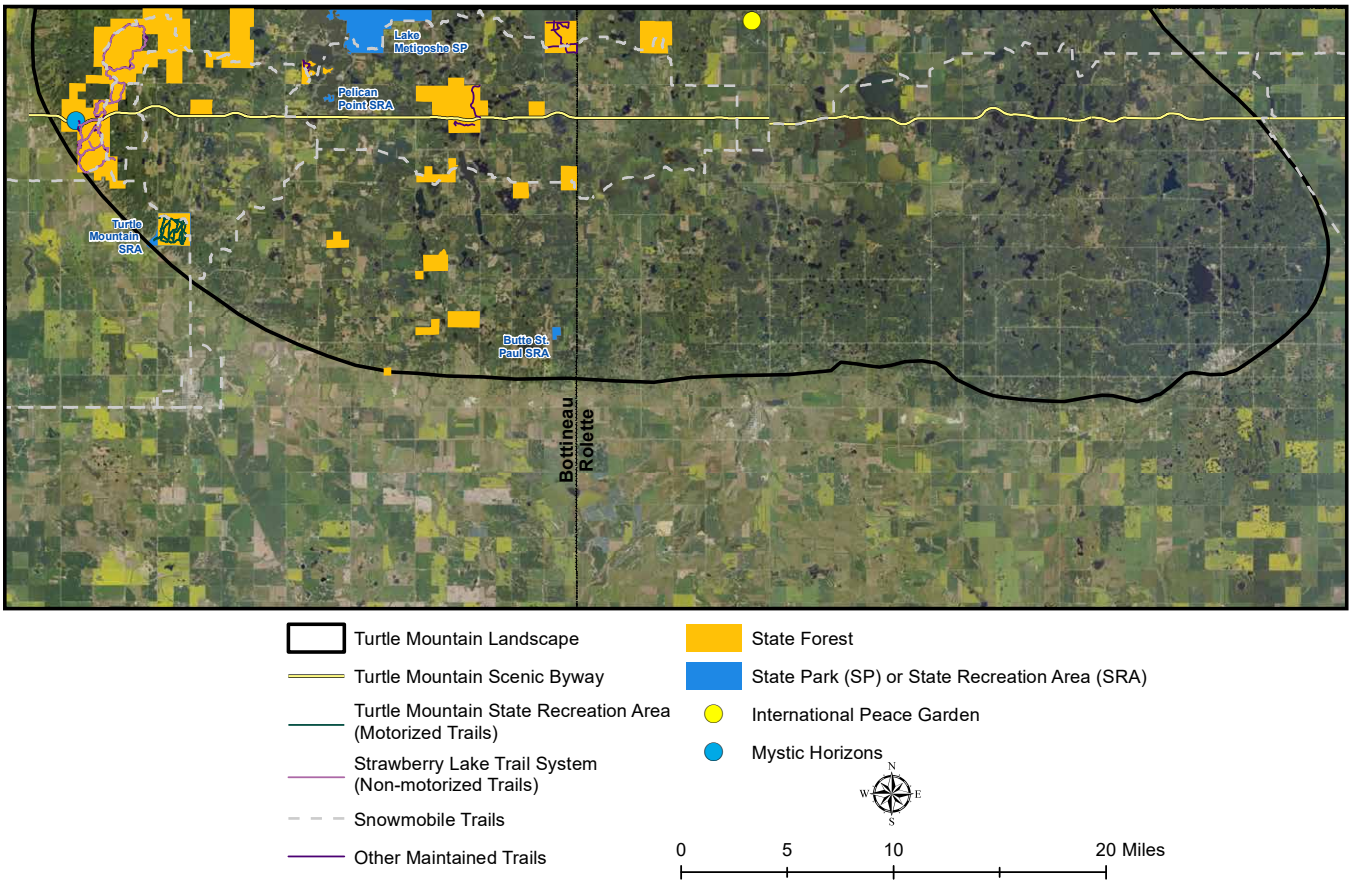


Figure 13: Recreation opportunities of the TML.

Public Lands for Recreation

There are numerous areas open to the public for recreation within the TML. The NDPRD oversees one state park and three state recreation areas within the TML. Lake Metigoshe State Park is a popular year-round destination. The small lakes within the park provide excellent opportunities for kayaking, canoeing, and birding. It has over 12 miles of hiking and mountain biking trails along with a three-mile self-guided interpretive hiking trail. The Park provides opportunities for lodging and camping.

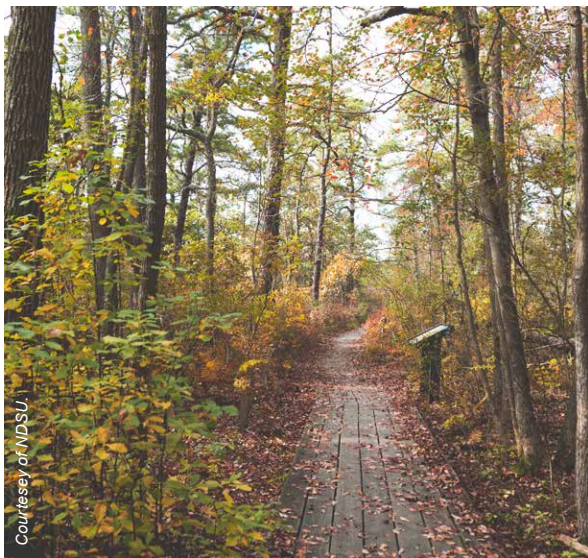
The Turtle Mountain State Recreation Area is located six miles northwest of Bottineau. This recreation area has over 12 miles of motorized trails open to off-highway vehicles (OHVs), hiking, biking, snowshoeing, and horseback riding.

The Butte St. Paul State Recreation Area is located 11 miles east of Bottineau and offers hiking trails and a scenic overlook. It also has historical significance, with a stone cairn and commemorative plaque for the missionary George-Antoine Belcourt on top of the peak. The Pelican Point State Recreation Area is located 10 miles northeast of Bottineau on Lake Metigoshe. It is an undeveloped recreation area with no formal trail system or amenities.

The Turtle Mountain State Forest, located in the western Turtle Mountain region of Bottineau County, encompasses over 7,500 acres of pristine forests, wetlands, and grasslands. Recreation areas include Hahn's Bay Recreation Area, Strawberry Lake Recreation Area, Twisted Oaks Equestrian Campground, and Mystical Horizons Scenic Overlook. The State Forest contains 18 miles of multi-use, non-motorized trails.

7,500+ acres available for a variety of recreational activities

Courtesy of NDPRD



Courtesy of NDSU

Turtle Mountain Scenic Byway

The Turtle Mountain Scenic Byway provides a scenic route along which many of the TML's attractions, such as Mystical Horizons, Lake Metigoshe State Park, and the Pelican Point State Recreation Area, can be visited. The route begins three miles north of Rolla to St. John and continues west on County Highway 43 to State Highway 281, then back onto State Highway 43 until it ends State Highway 14.

International Peace Garden

The International Peace Garden is a popular attraction within the TML. The garden encompasses 2,300 acres, two freshwater lakes, scenic hiking and driving trails, wildflowers, waterfalls, and many North American birds and animals. Modern and rustic camping facilities are available, as well as facilities for hosting weddings, conventions, and reunions. Additionally, it is home to one of the world's most diverse collections of cacti within its conservatory.

Bottineau Winter Park

The Bottineau Winter Park is a family-friendly winter resort located 10 minutes north of Bottineau. It offers eight alpine trails ranging from beginner to expert that bestows scenic views of the Turtle Mountain.

Tommy the Turtle

Mystical Horizons

3 LANDSCAPE-LEVEL DESIRED FUTURE CONDITIONS, GOALS, AND OBJECTIVES

3.1 PLANNING TERMINOLOGY

A series of nested terms were adopted from the Landscape Stewardship Guide to better organize the ideas suggested by stakeholders involved in the planning process. The terms are defined by the Landscape Stewardship Guide as follows:

Desired Future Condition:

Desired Future Conditions (DFC) statements describe preferred or desired conditions that a given geographic area or region will be like at the end of a given timeframe. DFC statements are very general and long-range in nature. They are intended to provide an initial starting point for agreement on what forests in the landscape should be like in the future.

Asset:

A benefit or strength that enables progress towards DFCs.

Issue: challenge, or unresolved conflict that requires resolution to improve progress towards DFCs.

Goal:

Goal statements outline the general aims of an organization that it intends to attain at some point in the future. Goals are intended to provide general direction for a given resource initiative (forest land base, vegetation and wildlife, water resources, etc.). Words such as encourage, protect, promote, preserve, and restore are commonly found in goal statements. The goals in this landscape plan represent what the Working Group thought needed to be pursued over the next 10 to 20 years to promote sustainable forest resources across the region.

Objective:

Statements that provide more specific direction on the efforts or strategies that are needed to implement each goal. Goals usually have more than one objective. Words like construct, plant, remove, and monitor are used to describe the specific direction. The initial descriptions of programs and projects are usually found in objective statements.

3.2 DESIRED FUTURE CONDITIONS, GOALS, AND OBJECTIVES

This section describes the common vision for future forest conditions across the TML by defining and articulating the DFCs and the approaches (goals and objectives) that stakeholders can take to achieve the vision. These goals and objectives are directions toward the DFCs for the TML and can be used to inform or adapt landowner-specific goals and objectives.

Eight resource topics were identified to organize and refine differing strategies:

1. Forest Land Base
2. Forest Biodiversity: Terrestrial Vegetation and Wildlife
3. Forest Health
4. Forest Products
5. Aquatic Resources
6. Agriculture
7. Social and Cultural Uses and Values
8. Recreation

Courtesy of NDFS.

1 FOREST LAND BASE

Forest land base refers to all forested land within the TML.

Desired Future Conditions:

Ensure that forests remain the predominant land cover in the TML by promoting sustainable forest management practices aimed at achieving no net loss of forest area and facilitating reforestation efforts where applicable.

Assets:

Natural Resources: The TML is rich in diverse natural resources like land, water, forests, and both aquatic and terrestrial wildlife, which are vital for local residents and attract tourists.

Forest Coverage: Much of the TML consists of intact forest land, comprising the majority of North Dakota's hardwood forests.

Ecosystem Services: Forests offer crucial services like soil formation, erosion control, nutrient cycling, rainwater filtration, carbon sequestration, and wildlife habitat, among others.

Forests of Recognized Importance: Forests of Recognized Importance (FORI) are considered critically important because of their unique combination of social, cultural, biodiversity and environmental values.

Issues:

Land Development & Forest Conversion to Agriculture: Developed lands may be expanding within the TML. Forests have been and may be converted to cropland.

Ownership and Parcelization: Most of the forestland is privately-owned, which can contribute to parcelization, the dividing of lands into smaller parcels for development. Parcelization often contributes to forest fragmentation and introduces more challenges to landscape-scale forest management.

Limited Tracking of Reforestation/Forest Conversion: Efforts to track reforestation of forest conversion within the TML are limited. Comprehensive tracking methods have not been developed or implemented.

Limited Tax Incentives: Property tax incentives, i.e., Forest Stewardship Tax Law, are not widely supported. Both counties that encompass the TML have not adopted the Forest Stewardship Tax Law. Taxation of forestlands may contribute to the development, parcelization, and/or clearing of forests for agriculture as landowners seek to generate income from their land.

Lack of Awareness of Conservation Programs and Incentives: Lack of awareness and diversity of economic incentives for forestland conservation. There is a perception by landowners that a rental program like the Conservation Reserve Program (CRP) should be available for forests.

Public Misperceptions: Misperceptions/misunderstandings persist about forest activities, including the extent of logging and agricultural conversions.

Goals and Objectives:

Goal 1: Encourage the retention, restoration, and management of forestland in planning and decision-making processes.

Objective A: Integrate forest issues into regional and local land use planning and zoning. Strengthen collaborative and large-scale planning at city, county, state, tribal, and federal levels. Ensure forest resources are represented on planning commissions by distributing information on forest resources to local governmental units for use in local land use planning and advocating for the use of such information in planning.

Objective B: Manage development to minimize conflicts with forests such as those caused by wildfires.

Objective C: Develop forestry programs and incentives that encourage and support the retention, restoration, and management of forestland. Advocate for the adoption of the Forest Stewardship Tax Law and/or other incentives. Advocate for the adoption of the Forest Legacy Program

Objective D: Advocate for the restoration of forestland and inclusion of forest restoration in local planning efforts. Develop a broad and continuous education and outreach campaign explaining the benefits of forest restoration.

Goal 2: Monitor no net loss of forestland.

Objective A: Develop and implement a methodology for annually tracking changes in forest land cover.

Objective B: Identify and monitor forest health in FORI.

Goal 3: Minimize forest fragmentation.

Objective A: Identify and protect core forested areas that are least fragmented and most ecologically valuable.

Objective B: Develop and implement land-use policies that limit the breaking up of larger forest areas into smaller, isolated patches.

Goal 4: Restore degraded or non-forested areas to forest.

Objective A: Identify and track forest lands that have been degraded or deforested that could be restored or converted back to forest.

Objective B: Implement targeted reforestation programs in degraded/deforested areas, using native plant species.

Goal 5: Continue fostering inter-agency and stakeholder collaboration for forest land management.

Objective A: Maintain forums for ongoing dialogue and coordination among government agencies, private landowners, and so forth.

Objective B: Develop collaborative projects and funding mechanisms that can leverage resources from multiple stakeholders to support sustainable forest land management.

2 FOREST BIODIVERSITY: TERRESTRIAL VEGETATION AND WILDLIFE

Desired Future Conditions:

Forests that are structurally, functionally, and compositionally diverse and consistent with the region's ecology capable of supporting native vegetation and game and nongame wildlife species.

Assets:

Wildlife Diversity: Diverse game and nongame wildlife and fish species.

Economically and Culturally Significant Species: Elk, moose, ruffed grouse, and white-tailed deer are examples of some of the wildlife species that are economically and/or culturally significant.

Interest by Stakeholders: Stakeholders are interested in managing forest for wildlife.

Identification of Species of Conservation of Need: The NDGFD 2015 SWAP and the North Dakota Natural Heritage Program 100 Species of Conservation Priority both identify species of conservation need that can better inform forest management for these species.

Ongoing Forest Management for Wildlife: Both the NDGFD and the NDFS are active in forest management for wildlife, particularly the ruffed grouse.

ND Game and Fish Department WMAs: Over 12,000 acres of WMAs can be found in the TML. The primary objective of a WMA is to enhance wildlife production, provide hunting and fishing opportunities, and offer other outdoor recreational and educational uses.

USFWS Administered Lands: Over 1,700 acres of WPAs and 3,100 acres of NWRs can be found in the TML to conserve some of the most threatened and productive migratory bird habitat in the nation.

Issues:

Limited Tracking of Terrestrial Vegetation and Wildlife Populations: Tracking/monitoring of terrestrial vegetation and wildlife populations has been limited such that population trends are not definitively known. There are no ongoing programs to track species of conservation need.

Proximity to International Border: Complex game management issues due to the TML's proximity to Canada and a Provincial Park necessitating cross-country collaboration, which has unique challenges.

Limited Evaluation of Forest Management Practices: Evaluation/monitoring of the benefits that forest management practices have on wildlife and terrestrial vegetation is largely qualitative and anecdotal. Long-term studies tracking/monitoring responses to forest management activities should be considered.

Goals and Objectives:

Goal 1: Protect, maintain, restore, and enhance terrestrial vegetation and wildlife habitat.

Objective A: Implement forest management practices that support different age classes, native forest species, and structural diversity.

Objective B: Protect and manage large contiguous tracts of forest to serve as core wildlife habitats.

Objective C: Partner with private landowners to foster forest management beneficial to a wide range of wildlife.

Objective D: Develop forestry programs and incentives that encourage and support the retention and restoration of forests with plant species native to the TML.

Objective E: Identify and protect regionally significant ecosystems.

Objective F: Develop and implement strategies to support species of conservation need and their habitats.

Goal 2: Evaluate the effectiveness of forest management practices.

Objective A: Collaborate with organizations dedicated to terrestrial vegetation and wildlife to study the impact of forest management.

Objective B: Investigate the potential interactions between federally threatened or endangered species, such as the NLEB, and forest management practices.

Objective C: Conduct research on other less-studied species of conservation need that could be influenced by forest management.

Objective D: Establish monitoring protocols to evaluate the effectiveness of forest management practices on species of conservation need. Tracking/monitoring such as camera traps, acoustic recording units, or exclosures could be implemented.

Goal 3: Enhance public awareness and engagement with terrestrial vegetation and wildlife.

Objective A: Develop and implement educational programs to increase public understanding of the importance of forests and forest management for terrestrial vegetation and wildlife conservation.

Objective B: Establish and support volunteer programs for habitat restoration and wildlife monitoring.

Objective C: Establish a broad and continuous education and outreach campaign, including the use of social media and other platforms to keep the public informed about ongoing projects, success stories, and ways they can contribute.

3 FOREST HEALTH

Desired Future Conditions:

Forests that are actively managed to encourage a diversity of native species, age classes, and ecological communities making them resilient to a variety of stressors, including, but not limited to, climate, pests, diseases, and invasive species.

Assets:

Contiguous Forests: Large areas of contiguous forest cover comprising most of the TML's total land area.

Natural Forest Succession: Relatively undisturbed natural forest succession, with minimal influence from woody invasives, diseases, or nutrient imbalances.

Stakeholder Support: Strong stakeholder support for forest land management and conservation.

NDFS Forest Stewardship Program: The Forest Stewardship Program provides assistance to private forest landowners to encourage and enable active, long-term forest management to meet their individual goals and for the benefit of the forest resource.

Issues:

Few Native Tree Species: Lack of tree species diversity, making forests more vulnerable to pests and diseases such as Emerald Ash Borer and Dutch elm disease.

Decadent Aspen: Presence of unmanaged, aging aspen stands that are declining in health and ecological functionality. Potential for decadent aspen stands to not be as productive in supporting wildlife.

Pests and Diseases: Numerous diseases emerging that could threaten forests including, but not limited to, Emerald Ash Borer, Dutch elm disease, aspen trunk/heart rot, Hypoxylon canker, forest tent caterpillar, and large aspen tortrix.

Emerging Invasive Plant Species: Invasive plant species pose threats to natural forest succession. Buckthorn could significantly alter forest succession such that forests are replaced by buckthorn.

Aspen Vulnerability to Climate Change: Uncertainties about how aspen forests would respond to climate change.

Overstocked Oak-dominated Forests: Overstocked oak stands, resulting in slow growth and diminished perceived value by stakeholders.

Financial: Paying for forest management activities to improve forest health is challenging. Few financial incentives.

Lack of Local/Nearby Forestry Contractors: Very few forestry contractors in the TML. Forestry contractors in surrounding states have generally been uninterested in traveling to ND for work.

Out of State/Region Forestry Equipment: Forestry equipment brought into the TML from other states/regions increases the likelihood of introducing and/or spreading invasive species and diseases. Equipment leaving the TML may similarly be transporting invasive species elsewhere.

Goals and Objectives:

Goal 1: Increase private landowner participation in sustainable forest management.

Objective A: Develop and launch targeted outreach programs to educate and engage stakeholders in sustainable forest management.

Objective B: Continue the NDFS Forest Stewardship Program.

Objective C: Continue advocating for the development and adoption of financial incentive programs that make sustainable forest management more economically appealing for private landowners.

Goal 2: Foster climate-adapted and resilient forests.

Objective A: Identify and implement silvicultural practices that increase forest resilience.

Objective B: Identify seed sources and species adapted to changing biotic and abiotic conditions of the state.

Goal 3: Identify, track, and control invasive species and diseases.

Objective A: Foster collaborations with organizations such as the USDA and County Weed Boards to improve control and tracking measures for invasive species and diseases.

Objective B: Develop and implement methods to ensure that land managers and contractors are implementing best management practices to control and prevent the spread of invasive species.

Goal 4: Increase public awareness and education about forest health.

Objective A: Continue developing and distributing informational handouts and hosting educational workshops with stakeholders.

Objective B: Develop community wildfire protection plans. Increase awareness of the benefits and significant hazards of prescribed fire and wildfire.

Objective C: Implement a citizen-science program to facilitate the identification and reporting of invasive species and diseases.

Goal 5: Optimize forest stand structure for ecological resilience.

Objective A: Conduct regular forest stand evaluations to assess age, density, and species diversity.

Objective B: Develop stewardship plans that aim for a balanced age structure and species mix, where appropriate, to enhance resilience against diseases, pests, and climate change.

Objective C: Develop/identify and implement silvicultural strategies for the management of decadent aspen.

Objective D: Maintain wildfire management and prevention programs.

4 FOREST PRODUCTS

Desired Future Conditions:

Promote a sustainably managed forest that meets the diversified forest product needs of the TML's inhabitants, businesses, and communities, ensuring continuity in harvesting practices.

Assets:

Tribal Sawmill: A tribal-operated sawmill catering to local demand for forestry products.

Hobbyists and Small Businesses: Forest products are utilized for niche and value-added products for numerous hobbyists and small businesses in the TML.

Sustainable and Local Harvesting of Firewood: Private landowners are able to meet heating demands by harvesting from their forests.

Non-Timber Forestry Products: Many stakeholders value and appreciate being able to harvest and produce products from non timber forestry products such as fruits and nuts.

Issues:

Aging Forests: Aging forests, especially stands of decadent aspen, which limit the availability of quality timber.

Few Native Tree Species: Limited tree species diversity constraining harvesting options and limiting the development of a robust forest industry.

Lack of Public Awareness: A general lack of knowledge and appreciation of the forest industry among the broader community.

Lack of Forest Product Markets: The lack of forest product markets contributes to a shortage of forestry professionals in the TML, which limits effective timber management and harvesting.

Aspen Heartrot: The prevalence of heartrot in aspen, which hinders economically viable harvests.

Goals and Objectives:

Goal 1: Enhance awareness of both traditional and innovative forest product opportunities.

- **Objective A:** Highlight the potential of harvesting fruits, nuts, medicinal plants, and other non-timber forest products.

Goal 2: Minimize forest mortality by targeting usable timber for harvesting before its decline.

- **Objective A:** Establish early detection systems to identify stands nearing the end of their economic utility and prioritize them for harvesting.

Goal 3: Promote the use of native species well-suited to the TML while discouraging the introduction of non-native woody species.

- **Objective A:** Develop educational programs and materials underscoring the ecological and economic benefits of native species.

Goal 4: Formulate and execute management practices geared towards nurturing healthy aspen stands devoid of heartrot.

- **Objective A:** Collaborate with forest health experts to develop strategies to reduce the occurrence of heartrot in aspen stands.
- **Objective B:** Regularly monitor forest health and implement timely interventions.

Goal 5: Develop a network of forestry professionals to work within the TML.

- **Objective A:** Contact forestry professionals annually. Host events/programs for forestry professionals.

5 AQUATIC RESOURCES

Desired Future Conditions:

Forests are sustainably managed to maintain or improve key aspects of water quality and watershed health such as soil quality, nutrient cycles, water quality, and riparian areas.

Assets:

Aquatic Resources: Numerous lakes, water bodies, waterways, riparian areas, and wetlands. The TML has an extensive network of lakes and wetlands.

Public Awareness and Appreciation: Public awareness and appreciation of the value of aquatic resources for recreation.

Issues:

Erosion and Sedimentation: Increased potential for erosion, runoff, and sedimentation, which negatively impact water quality, as forestlands are converted for development or agriculture.

Loss of Wetland Habitat: No goals for no net loss of wetland habitat in North Dakota.

Riparian Forest Abundance and Health: The area covered by and the health of riparian forests is not tracked or monitored.

Lack of Public Awareness: Lack of awareness of the value of clean water and healthy aquatic ecosystems and how forest health contributes to those.

Goals and Objectives:

Goal 1: Identify opportunities and develop strategies that combine forest and aquatic resource management and sustain the health of both.

Objective A: Develop and implement best management practices to prevent adverse impacts to aquatic resources during forest management activities.

Objective B: Develop methods to evaluate the health of riparian forests. Implement programs to identify and track riparian forest areas and health.

Goal 2: Promote forest management practices that will enhance biodiversity.

Objective A: Identify and implement forest management practices that protect and/or restore habitats for fish and other aquatic species.

Goal 3: Increase public awareness of the interconnectedness of forests and aquatic resources.

Objective A: Develop educational materials that emphasize the importance of aquatic resource protection and the role of forests in protecting aquatic resources.

Objective B: Incorporate education about the role of forests in supporting the health of aquatic resources into education materials and events.

Objective C: Advocate for the protection of riparian forests.

Goal 4: Encourage private landowners to consult professionals for the management of aquatic resources.

Objective A: Develop and promote programs and incentives for landowners to consult with natural resource professionals for the protection, management, or restoration of aquatic resources.

Goal 5: Foster collaborative watershed management in the TML.

Objective A: Coordinate forest management strategies and practices that promote the TML's water resource sustainability and watershed health. Involve natural resource professionals and stakeholders specialized in aquatic resources, such as staff from the NDDEQ and non-government organizations (NGOs), in forest management activities and planning.

6 AGRICULTURE

Desired Future Conditions:

Balance agriculture demands/needs, the need to support no net loss of forest, and the imperatives of forest conservation, health, resiliency, and sustainability.

Assets:

Engaged Landowners: Landowners are interested in learning about and implementing agroforestry and silvopasture practices.

Opportunities for Agroforestry and Silvopasture: There are numerous pastures that are wooded and have been grazed over time in the TML with different responses to their grazing practices.

Issues:

Undefined and Inconsistent Silvopasture Practices: Current silvopasture practices in the TML are not consistent and the results for sustainable forests are unknown.

Undefined and Inconsistent Agroforestry Practices: Landowners implement agroforestry inconsistently. Differing timing, duration, and intensity. This may require education about various agroforestry practices.

No Metrics of Success: Metrics to measure successful agroforestry and silvopasture practices have yet to be undefined.

Invasive Species: Agroforestry and silvopasture could contribute to the introduction and spread of invasive plant species.

Total Conversion of Forest to Agriculture: Conversion of lands to agriculture reduces forest cover and contributes to fragmentation.

Goals and Objectives:

Goal 1: Research the applicability of agroforestry and silvopasture within the TML.

Objective A: Support an approach to agroforestry and silvopasture in the TML.

Objective B: Develop or identify measures of success for agroforestry and silvopasture.

Goal 2: Increase public awareness of agroforestry and silvopasture BMPs.

Objective A: Develop and distribute educational materials pertaining to agroforestry and silvopasture BMPs.

Objective B: Educate landowners on potentials for reforestation of agricultural lands.

7 SOCIAL AND CULTURAL USES AND VALUES

Desired Future Conditions:

Forests remain an integral component of the quality of life enjoyed by current and future generations and maintain the TML as a place for recreational experiences and living opportunities. Stakeholders have a greater awareness of forests from ecological, social, and economic perspectives and actively and voluntarily engage in forest stewardship. Forests managed in a coordinated and collaborative manner.

Assets:

People: The communities, people, and stakeholders who live in the TML.

Turtle Mountain Band of Chippewa Indians: The TMBCI has a long tradition of cultural relationships with and uses for the forests and forest-dependent wildlife.

Stakeholders Eager to Learn: Stakeholders who are interested in learning about and addressing issues facing the forests.

Youth Engagement Opportunities: Programs aimed at youth engagement, such as the state-wide Eco Ed program and Envirothon.

Species of Cultural Significance: Numerous species of cultural significance are present within the TML.

Recreational Opportunities: Diverse and many recreational opportunities.

NGO/Nonprofit Support: Nonprofits like the Rocky Mountain Elk Foundation, Ducks Unlimited, Ruffed Grouse Society, and the North American Grouse Partnership that support, reinforce, and advocate for conservation efforts.

Collaborative Aspen Regeneration Projects: Collaboration between state and federal agencies and private landowners for aspen regeneration projects.

Collaboration on Wildfire Fighting and Management: NDFS supports and collaborates with rural fire departments with funding, federal-excess equipment, and training.

Educational Curriculums: Project Learning Tree and Project Wild teaches people how to implement educational curriculums for youth.

Issues:

Tribal Disconnect from Forests: Tribal loss of cultural heritage, identity, traditional ecological knowledge as youth are not engaged with or indifferent towards forests.

Few Educational Opportunities: Lack of educational institutions and research with natural resources programs.

Youth/Social Disconnect from Forests: Youth are increasingly not engaged or indifferent towards forests.

Limited Conservation Easement Opportunities: Misperceptions that conservation easements are difficult to implement or not sought after in the TML.

Climate-induced Changes: Climate-induced changes to the forests and forest species composition may change how people interact with the forests.

Limited Collaboration: Lack of strong collaboration/partnerships between local, state, tribal, and federal units of government.

Goals and Objectives:

Goal 1: Foster meaningful learning and recreational forest experiences for youth.

Objective A: Leverage social media, such as iNaturalist or Instagram, to create and/or deliver educational resources and opportunities.

Objective B: Develop educational programs that encourage youth to spend time in the forest. Organize forest-related events such as "bioblitzes," plant/wildlife identification workshops, or educational geocaches.

Objective C: Continue to maintain informational resources identifying recreational and educational opportunities.

Objective D: Work with local educational institutions to bring marketable forestry skills like arboriculture into course offerings.

Objective E: Continue implementing and expanding youth outdoor environmental education such as Project Learning Tree and Project Wild curriculums and Belcourt's Conservation Day Camp.

Goal 2: Promote forest-based experiences for people living, working, and visiting the TML. Enhance the quality of forest interactions for TML residents and visitors.

Objective A: Preserve cultural resources by collaborating with tribal stakeholders, community organizations, and similar groups to ensure forest management helps sustain their cultural traditions.

Objective B: Support community forestry by developing and implementing community forest projects.

Objective C: Support the development and implementation of projects that strengthen the awareness of and interconnectedness between forests and local communities.

Goal 3: Continue to develop public awareness about the importance and benefits of forests in the TML.

Objective A: Continue developing and distributing information about policies, programs, projects, and practices that support and sustain forests for the people living, working, and recreating in the Landscape.

Objective B: Consistently update and distribute information on policies and practices that benefit TML's forests and communities.

Goal 4: Advocate for the inclusion of sustainable forest management concepts into local governmental units and community planning.

Objective A: Continue to support the coordination and integration of planning efforts between public and private landowners and land management agencies.

Objective B: Support private forestland ownership and management through outreach, stewardship planning, and projects that increase the satisfaction and benefits private forestland owners perceive from owning and managing private forestlands.

Goal 5: Continue public outreach events/programs and continue surveying landowners on demographics, interests, objectives, issues, and so forth.

Objective A: Develop a consistent set of questions for use. Develop and maintain a central database of responses.

8 RECREATION

Desired Future Conditions:

Forests that offer a diverse range of forest-based recreation and experiences and provide a seamless, high-quality experience for users, while maintaining the natural beauty and cultural heritage of the TML.

Assets:

Forest-based Recreation: The forests of the TML provide a unique setting for many recreational opportunities.

Water-based Recreation: Access to numerous lakes and miles of streams provide many opportunities for water-based recreational activities.

Scenic Byway: The Turtle Mountain Scenic Byway provides a scenic route along which travelers will find many of the TML's attractions.

Issues:

Multiple Use Conflicts: Managing forests for multiple uses to maximize recreational opportunities while minimizing the potential negative effects of recreation on forests can be challenging.

Decadent Aspen Forest: Forests primarily composed of decadent aspen may be perceived as less visually appealing or suitable for recreational activities.

Goals and Objectives:

Goal 1: Create and enhance sustainable forest-based recreation and experiences.

- **Objective 1:** Work with local agencies and community members to develop recreation sites outside of fragile forest areas.
- **Objective 2:** Ensure sustainable access to public lands and waters for diverse uses.
- **Objective 3:** Support projects that enhance fish and wildlife populations for recreational needs.
- **Objective 4:** Maintain the region's visual quality, especially along scenic routes.

Goal 2: Improve visitor experience and awareness.

- **Objective 1:** Develop and distribute materials with the purpose of raising awareness about the plethora of forest-based recreation and experiences available.

Goal 3: Maintain the beauty, health, and resiliency of the forest as well as aquatic resources, wildlife habitats, and other terrestrial vegetation.

- **Objective 1:** Develop and implement methods to evaluate the impact of recreation on the forest and surrounding ecosystems. Share study results with stakeholders, including landowners, conservation partners, and local and state agencies.

4 LANDOWNER OBJECTIVES

Landowner objectives are crucial considerations for personalized forest management. Because most of the forests of the TML are privately owned, their consideration is crucial for achieving landscape-level desired future conditions, goals, and objectives.

4.1 CONSISTENCY AND SYNERGY WITH LANDSCAPE OBJECTIVES

Landowner objectives can either be identical to landscape objectives (e.g., forest conservation) or can complement them. For instance, a landowner prioritizing forest management for wildlife may inadvertently contribute to landscape-level goals such as wildlife habitat management, species conservation, fostering structural diversity, invasive species control, and so forth. By aligning personal and landscape objectives, landowners not only fulfill their objectives but also contribute to the broader landscape level desired future conditions, goals, and objectives.

Landowner objectives are crucial considerations for personalized forest management

4.2 IDENTIFYING LANDOWNER OBJECTIVES

Identifying a landowner's objectives can help guide forest management in formulating corresponding landscape-level goals. Data collected from surveys, interviews, and stakeholder engagement information regarding common issues, assets, goals, and objectives described by landowners were utilized to identify objectives that are commonly held by landowners across the TML.

Courtesy of NDSU.

The USFS NWOS identified issues and assets described by forest landowners from across North Dakota.

Top five issues identified by NWOS:

1. Keeping land intact.
2. Trespassing and/or poaching.
3. Pests and diseases.
4. Property taxes.
5. Dumping and/or vandalism.

Top five assets identified by NWOS:

1. Wildlife habitat.
2. Beauty or scenery.
3. Family legacy.
4. Nature protection.
5. Hunting.

Through surveys, interviews, and stakeholder engagement, the NDFS Forest Stewardship Program identified a number of commonly held and potential landowner issues and assets.

The top five landowner concerns identified by a survey distributed at the 2022 Turtle Mountain Region Tour included:

1. Limited wood utilization incentives; lack of forest industry.
2. Fire.
3. Forest conversion.
4. Social disconnect from forest.
5. Invasive tree pests.

This information aided in identifying eight categories of objectives commonly held by landowners:

1. Forest Conservation.
2. Forest Aesthetics.
3. Forest Health Management.
4. Wildlife Management.
5. Recreation.
6. Forest Products.
7. Conservation-based Estate/Legacy Planning.
8. Fire (Wild and Prescribed).

The proceeding sections summarizes the categories of objectives commonly held by landowners.

4.3 FOREST CONSERVATION

Many landowners adopt a forest conservation objective to ensure that their forest land remains intact, sustainable, and transmissible to future generations. Areas with high conservation value, such as FORIs or critical habitats, should be identified, protected, and when possible, enhanced. These sites can be recognized for their biodiversity, ecosystem services, landscape-level ecosystems, and cultural values. Forest conservation and legacy planning objectives often intersect, both aiming to ensure the future utility and quality of a forest. To achieve consistency between the two, landowners can employ forest management practices to mimic natural ecological processes for conservation while also implementing restrictions on human activities that diverge from their forest conservation objective. This is often achieved through multiple-use management, which balances the utilization and protection of various forest resources like forest products, wildlife, species of conservation need, recreation, and aquatic resources.

4.4 FOREST AESTHETICS

A prevailing objective for landowners is the pursuit of aesthetic value, which encapsulates the visual quality and "feel" of the forest. Aesthetics are not just about visual appeal; they also elicit a sense of pride, beauty, and stewardship among landowners. This objective extends beyond personal enjoyment to include the well-being of the community, neighbors, and even casual passers-by. Forest aesthetics can be

significantly influenced by the size of the forest, the scale and intensity of forest management practices, and the specific location of the property. Forestry professionals can guide landowners through various management practices to enhance the forest's aesthetic value.

While certain forest management practices, such as prescribed fires or timber thinning, may temporarily diminish the forest's aesthetic appeal, their consistent application can achieve long-term enhancements. For instance, the immediate aftermath of a prescribed fire may not be visually appealing, but within weeks the benefits in terms of species composition and the control of mid-story or nuisance plant species become evident. Similarly, timber thinning may initially alter the forest's visual character, but the long-term gains in spatial arrangement and visual balance far outweighs the short-term visual impacts.

The ultimate reward for landowners comes in the form of pride and fulfillment as they witness the aesthetic improvements that result from their investment in thoughtful and consistent forest management practices. Forest aesthetics can be effectively managed and enhanced through informed, long-term planning and the strategic use of forest management practices.

Courtesy of NDSU

Summary of Landowner Interviews about Forest Aesthetics

Feedback of forest aesthetics was received from landowners through interviews conducted by members of the Working Group during the development of this LFSP. Landowners all expressed an enjoyment and appreciation of their forests and the biodiversity therein.

There is generally a shared consensus that biodiversity should be conserved and/or enhanced without compromising forest health. The sight of aged, decaying aspen was often raised as a concern. Conversely, the grandeur of large, mature oak trees was revered with a widespread desire for their preservation. Landowners contemplating management practices frequently expressed their desire for the retention of oaks and advocated for thinning within aspen-dominated canopies to foster aspen regeneration.

The pervasive density of hazel shrubs in unmanaged forests was a common concern, particularly regarding its implications for aspen regeneration, forest succession, and forest longevity. Many landowners expressed concerns that dense hazel undergrowth prevents the regeneration of tree species without significant disturbance to allow sunlight to reach the forest floor. Furthermore, many landowners referred to hazel as a nuisance because it makes navigation through forests challenging unless on a trail and hampers visibility through the forest.

Among landowners who have completed forest management practices, the rapid aspen growth post-management has been a source of encouragement to continue practicing forest management. The discernible positive transformations shortly after management underscore the worthiness of the effort, fostering optimism for a thriving forest landscape with proactive management.

Words commonly used by landowners when interviewed about the forests of the TML.


Courtesey of NDFS.


Courtesey of NDSU.

4.5 FOREST HEALTH

Forest health is a foundational objective for landowners in the TML. Many landowners initiate consultation with forestry professionals and with the NDFS due to concerns about the health of their forests. A healthy forest is defined as one that can sustain its unique species composition and inherent ecological processes. By maintaining and enhancing forest health, landowners not only serve their individual objectives but also contribute to the TML's landscape-level goals and objectives. By supporting and developing awareness of potential threats and leveraging modern forest management practices, landowners can contribute meaningfully to the long-term health and resilience of these forests in the TML.

Active forest management plays a crucial role in maintaining and improving the health of the forest. Forest management practices are instrumental in reducing risks from wildfire, pests, and invasive species, thereby ensuring the forest's long-term health and vigor. Invasive species can severely disrupt the local ecosystem and pose a continuous threat to forest health. Additionally, pests, such as the EAB, and diseases are ever-present risks that can significantly affect various types of trees in the forest. Yearly inspections should be conducted by the landowner to check for signs of invasive plants, insect infestations, or diseases. These inspections are crucial for the active management of forest health, as they can inform the need for immediate response. Forest health protection is often directly linked to the active management of insects, diseases, and invasive plants.

Summary of Landowner Interviews about Forest Health

Feedback on forest health was received from landowners through interviews conducted by members of the Working Group during the development of this LFSP. Landowners indicated that their aspen forests are generally aging and are dominated by trees that appear weak and decadent. Several landowners noted that wind and ice storms fell numerous trees each year, and larger storms have turned large areas of their aspen forests into a forest of "candle sticks." The density of hazel is perceived as a forest health issue by landowners. It is believed that without disturbance to remove hazel their forests will not regenerate. Many landowners

expressed concern for the longevity of forests dominated by hazel. Some landowners voiced concern regarding impacts from neighboring properties as a result of activities outside of their control, such as regular utility corridor clearing, herbicide drift, or construction of cattle ponds damaging trees on their properties.

4.6 WILDLIFE MANAGEMENT

The TML's natural abundance of forest makes it a sanctuary for a wide variety of wildlife. These include numerous non-game wildlife species of conservation need as well as game wildlife such as the white-tailed deer to the ruffed grouse. Guiding the conservation efforts in this area is the NDGFD 2015 North Dakota SWAP. This strategic guide serves as the compass for preserving the state's wildlife. Many landowners want to play an active role in managing, conserving, and protecting wildlife species and their habitats. Concerns about forest conversion and habitat fragmentation are widely held. These concerns are often connected to concerns about the declining populations of specific species like the ruffed grouse. Because much of the forest of the TML is privately-owned, working with landowners to implement forest management practices that benefit wildlife may be crucial to achieving landscape-level goals and objectives for wildlife.

Summary of Landowner Interviews about Wildlife Management

Feedback on wildlife management was received from landowners through interviews conducted by members of the Working Group during the development of this LFSP. Many landowners expressed concern about whether or not decadent apsen, in combination with an understory of dense hazel, will ultimately change the forest composition and no longer support wildlife. The reduction in ruffed grouse population was a commonly voiced concern, and numerous comments were received regarding grouse observations in recent years as compared to historical observations. Landowners are generally pleased to see their forests supporting deer and other wildlife populations.

Courtesey of NDGFD

4.7 RECREATION

The forests of the TML provide a unique context not found elsewhere in ND for many of the traditional recreational activities. This is valued and appreciated by many landowners who enjoy many forest-oriented recreational activities in the TML. These range from walks or hikes through their forests, wildlife viewing or hunting, and to riding ATVs/OHVs. Additionally, many people travel to the TML to also partake in these forest-oriented recreational activities. A list summarizing the forest-oriented recreational opportunities enjoyed by landowners and tourists is provided below:

- Hunting and fishing
- Wildlife viewing and birding
- Equestrian/horseback riding
- Camping
- Environmental education
- Foraging and gathering
- Geocaching
- Walking and hiking
- ATVs or OHVs and leases
- Snowmobiling
- Snowshoeing
- Cross-country skiing


Courtesy of NDFS.


Courtesy of NDFS.

4.8 FOREST PRODUCTS

Many landowners are interested in exploring forest-based revenue generation. While financial gain is a common interest, many landowners also seek to balance or prioritize other objectives over forest-based revenue generation. The livelihood of few, if any, landowners is solely derived from forest-based revenue. This is partially attributable to the low demand for aspen and oak trees as timber, which has hindered the development of a robust timber industry that could drive forest-based economic activity. In lieu of this industry, some innovative landowners have pivoted towards alternative methods of generating forest-based revenue. These methods include harvesting timber for firewood or niche and/or value-added products like artisanal furniture and crafts, selling hunting leases, and selling forest-grown fruits or nuts. Each of these alternatives exemplifies a unique method through which landowners have derived economic value from products derived from their forests.

4.9 CONSERVATION-BASED ESTATE/ LEGACY PLANNING

Conservation-based estate/legacy planning is a commonly held objective among landowners. The overarching intent is to ensure that their forest land remains intact, sustainable, and transmissible to future generations. Although legacy planning and conservation share an overarching goal to ensure the long-term viability of forest resources, they differ in strategy and implementation. Legacy planning often focuses on restricting non-aligned human activities to preserve the land's character for future generations. Meanwhile, conservation-based planning uses management techniques to simulate natural ecological processes beneficial to the forest ecosystem. Legacy planning is more than just preserving forestland for future generations; it is about making informed, long-term decisions that benefit both the land and the community.

Legacy planning often focuses on restricting non-aligned human activities to preserve the land's character for future generations

According to the USFS's 2018 Family Forest (10+ Acres) Ownership Characteristics: North Dakota report, the average age of a family forest owner in North Dakota was 67 years old. With aging landowners, incorporating estate planning with forest management recommendations is key to achieving both landowner and landscape-level goals and objectives. The choices that these aging landowners make concerning the future use and ownership of their land can significantly influence landscape-level changes. Ensuring that sufficient forestlands, of adequate sizes, continue to flourish is not just about conserving forests but also preserving the numerous public benefits these forests offer.

The role of forestry professionals in guiding these decisions cannot be overstated, as they provide invaluable resources and expertise. Forestry professionals, such as those with the NDFS, can aid landowners in making informed decisions about their land's future use and ownership. Many forest stewardship practices, including specific management recommendations, require multi-year or even multi-decade commitments to achieve their objectives. It is crucial, therefore, to integrate these long-term forest management plans with estate planning to ensure continuity and accomplishment of legacy goals.

4.10 FIRE (WILD AND PRESCRIBED)


Photos is courtesy of USFWS.

Fire has been a natural occurrence in the TML and could play an important role in forest management and health in the TML. Historically, wildfires occurred within the forests of the TML and were a catalyst of forest succession. Post-European settlement, the prevalent approach among landowners was to suppress wildfires and not implement prescribed fires due to concerns surrounding the risk of fire to property and life. However, this approach is gradually changing in part due to outreach initiatives led by various agencies and organizations. Some landowners are beginning to view human-caused wildfires as a natural component of the TML and prescribed fires as a potentially useful forest management tool in some areas. The use of prescribed fire aligns with several forest management objectives as it, when employed in a safe and controlled manner by experts, can mitigate the risks associated with wildfires while also promoting forest health. Landowners interested in forest management and health have recognized this and are interested in exploring how prescribed fire could be safely integrated into their forest stewardship practices.

Summary of Landowner Interviews about Fire

Feedback on the use of prescribed fire as a forest management tool was received from landowners through interviews conducted by members of the Working Group during the development of this LFSP. Many landowners expressed support for use of prescribed burns in a controlled manner when conditions allow for low-intensity, slow-moving fires. The understanding that wildfires typically start under extreme circumstances and are difficult to control is a concern, and that using prescribed burns during optimal conditions to reduce fire fuel loadings is something that could be beneficial. Generally, landowners expressed a reluctance to implement controlled burns by themselves, especially for management of the forest floor, but were supportive of trained professionals using the management technique. More often landowners burn woody debris on a smaller scale in piles, during optimal conditions to reduce the likelihood of unintentional spread. Support for utilizing prescribed fire for invasive species management or converting agricultural fields from row crops to pasture was also expressed.

5 FOREST MANAGEMENT

Forest management can be completed at multiple levels, with the purpose and motivation determined by the landowner or agency that is completing the management activities to meet their goals. Forest management is typically completed to enhance the ecology and forest health, aesthetics, recreation and sporting, fire suppression, and to develop marketable timber or other forest-related commodities.

Since there has been little demand in the TML, there has historically been little interest in forest management to develop forestry products. Where forest product markets exist, the costs of managing forests can often be recovered, eventually, when the trees are harvested. The costs of forest management are borne by the landowner, perhaps with some cost-share assistance, and therefore, forest management recommendations must take that into consideration if the desired outcome is to provide forestry products. In general, forest management specific to timber harvest has not been a component of the TML, as the supply is small, the demand is small, and the economics are not favorable.

Because most of the forests of the TML are privately-owned, most forest management practices are recommended to landowners through collaborative planning efforts with the NDFS and forestry professionals through the Forest Stewardship Program. The NDFS, through its Forest Stewardship Program, bears the cost of conducting an inventory and developing a Forest Stewardship Plan (FSP), a forest management plan for nonindustrial private landowners. A management plan will help a landowner achieve their objectives efficiently and economically by helping the landowner make knowledgeable decisions and evaluating progress. Additionally, the NDFS has developed a set of forestry best management practices intended to protect the productivity and sustainability of forests. These are detailed in the 2010 North Dakota Forestry Best Management Practices document, which can be provided by NDFS staff on request or retrieved from their website (*https://www.ag.ndsu.edu/ndfs/documents/bmp-2010-final-doc-11-12-10.pdf*).

It is recommended that a landowner contact the NDFS for the development of an FSP. Ultimately, a forest management plan strives to provide recommendations for forest management practices that are rooted in broader landscape-level desired future conditions, goals, and objectives for the TML while balancing those needs with a landowner's specific objectives for their forest.

To request forestry technical assistance, including a forest stewardship plan, contact the NDFS. The following website includes a link to a survey to an online form to request assistance:

https://www.ag.ndsu.edu/ndfs/programs-and-services/forest-stewardship-1

5.1 COMMONLY RECOMMENDED FOREST MANAGEMENT PRACTICES

A number of forest management practices are available for landowners to utilize in ways that align with diverse landowner objectives. Before implementing any one forest management practice, it is recommended that a landowner contact the NDFS for an FSP. The planning process is voluntary and the resulting plan is non-binding. FSPs are intended to encourage good stewardship of North Dakota's private forestlands. FSPs also recommend proven management practices and the benefits extend beyond the immediate area.

The development of an FSP generally includes a site visit and forest inventory conducted by a forester, a review of landowner objectives, and an assessment of applicable management practices. Commonly recommended forest management practices for landowners to utilize include, but are not necessarily limited to, the following practices:

1. Clear-cutting or Regeneration Harvest
2. Patch and Mosaic Cuts
3. Forest Thinning and Forest Stand Improvement
4. Stump Sprout Management
5. Woody Waste and Residual Management
6. Reforestation
7. Forest Monitoring for Damage from Insects, Disease, and Weather

These practices can be utilized to fulfill one or multiple landowner objectives, contingent on the distinct timeline and budget allocated for the activities. Additionally, the selection of appropriate forest management practices is influenced by a number of factors including, local contractor or forestry professional accessibility, site-specific conditions, climatic conditions, wildlife habitat, and potential effects on water quality, among others. These elements collectively shape the forest stewardship planning process of both foresters and landowners when identifying the most efficient and economical tools to meet a landowner's objectives for their forest.

Below is a summary of the aforementioned most commonly used forest management practices and their applicability to the commonly held landowner objectives.

5.1.1 CLEAR-CUTTING OR REGENERATION HARVESTING

Clear-cutting, also known as regeneration harvesting or coppicing, serves as a pivotal forest management tool. This practice involves the removal of the above ground portion of the tree and allowing the re-sprouting from the stump and roots to provide replacement trees in a particular area such that an even-aged forest stand can regenerate. Within the TML, this practice is utilized in the management of aspen-dominated forests, as they can regenerate from the stumps quickly. This technique is also effective for regenerating oak dominated forests, which regenerate through stump sprouts.

Because aspen is shade intolerant and can vigorously regenerate through root sprouting, this practice is an effective method of removing a diseased/decadent aspen stand and creating the conditions for the regeneration of a robust even-aged stand of aspen. When implementing this practice, timing and technique are important to avoid excessive soil

Courtesy of NDGFD.

1 Year Post Aspen Regeneration Harvest

Courtesy of NDGFD.

10 Year Post Aspen Regeneration Harvest

Courtesy of NDGFD.

compaction and other adverse effects. This practice is best performed in the fall or winter when aspen have entered dormancy and their energy reserves have been transferred to the root system. Allowing this storage to occur will assist with ensuring vigorous regrowth in the spring. Oak trees over five inches in diameter should be left standing to provide mast production. Wet conditions should be avoided to prevent soil compaction, and techniques like mat logging may be employed in wetter areas to protect the soil and hydrological features from rutting and damage.

Aspen Regeneration on NDFS Managed Lands

Aspen regeneration efforts on NDFS managed lands in the TML have been a periodic, ongoing priority for natural resources managers since the 1980s. Past efforts included using a bulldozer with a specialty shear blade to encourage root suckering. This practice was effective but resulted in negative perceptions from the public.

In 2016, a new, less aggressive approach with less soil disturbance was employed with support from the NDGFD and the Rocky Mountain Elk Foundation. The NDFS began an aspen management program to regenerate decadent, declining aspen stands. The program entailed conducting forest stand inventories to identify high-priority stands that would benefit from treatment practices, delineating those stands, and conducting pre-treatment treatment inventories. Using a forestry brush cutter, the understory is cleared, and the overstory is felled. All other species found within the stand were macerated to ground level. Following treatment, stocking surveys are conducted two years post treatment to assess treatment effectiveness.

Aerial photograph showing aspen regeneration on the right versus mature aspen on the left.

Courtesy of NDGFD

5.1.2 PATCH AND MOSAIC CUTS

Patch cuts involve removing trees from small areas (i.e., patches) within a forest while preserving select trees like bur oak and snags for wildlife habitat. These patches, typically 2.5 acres in size, should be in a natural-looking pattern that will allow more sunlight into the center of the unit. Managing adjacent sites in 10+ year increments allows multiple age classes of aspen to be created within a small area.

Mosaic cuts are similar to patch cuts but have less defined perimeters, allowing the managing landowner to blend with the natural contours of the land, avoiding straight lines to maintain the landscape's aesthetic integrity. These cuts are typically greater than five acres in size, and resemble the effects of natural disturbances, such as windstorms or wildfires.

For aspen dominated forests, particularly those that are over-mature with low basal areas, understory removal and coppicing can serve as an effective regenerative treatment. Rarely, an aspen dominated forests will be so over-mature and have such a low basal area that an understory of other tree species will form. In this case, understory removal is not an effective regeneration treatment. The cut trees can either be repurposed as firewood or lumber, or left on-site to decompose naturally, returning nutrients to the soil, providing wildlife habitat, and supporting the stand's future growth. Because this practice is clear-cutting or regeneration harvesting but within a small area, the same timing and technique recommendations provided in that section apply.

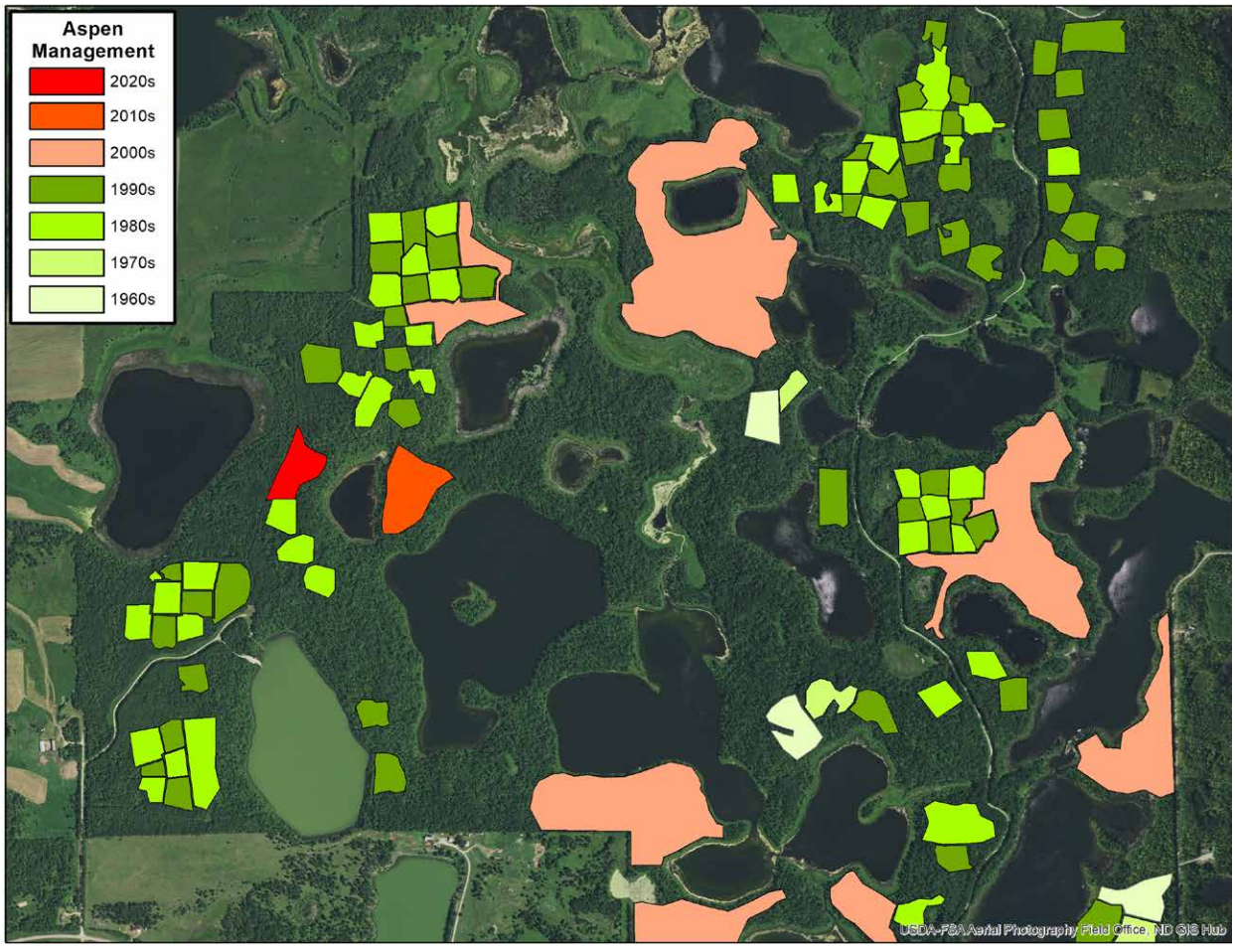


Figure 14: An example of patch and mosaic cuts completed by the NDGFD from the 1960s to the 2020s within the TML. Figure provided by the NDGFD.

5.1.3 FOREST THINNING AND FOREST STAND IMPROVEMENT

Forest stand improvement encompasses all cuttings apart from principal harvests (e.g., clear-cutting or regeneration harvest) directed at enhancing the composition, condition, health, and/or growth rate of a forest stand. These cuttings may yield commercial benefits if the trees are of marketable size, or they may be non-commercial in nature. To implement forest stand improvement effectively, it's critical to assess the current state of the stand and establish well-defined objectives. These objectives might include improving timber quality, eradicating trees affected by pests or diseases, removing invasive species, and conserving or augmenting wildlife habitat and visual appeal. Preventative measures against wildfire damage, such as the thinning of dense growth or removal of ladder fuels and the pruning of lower branches, can also form part of a forest stand improvement strategy. Forest stand improvement can be achieved through various harvesting methods:

- **Cleaning or Weeding:** Targeting saplings or shrubs with a diameter at breast height (DBH) of four inches or less, this method involves the removal of undesirable young trees to allow the preferred saplings space to grow, thereby improving stand quality.
- **Release Cutting:** Similar to cleaning, release cuttings free young saplings from competition by removing the overshadowing, older trees that hinder their development.
- **Thinning or Improvement Cuttings:** Conducted in maturing stands past the sapling phase, thinning is designed to accelerate the growth of the remaining trees by reducing competition for resources. This is a common practice in the management of oak stands as the removal of undesirable trees and shrub species can result in accelerated growth of young oak. During these operations, it is crucial to selectively remove competing trees and retain those with favorable traits, like larger DBH and straight form. It's essential to maintain a careful balance, as over-thinning may increase susceptibility to windthrow. When removing competing trees, avoid harming the trees left standing. Thinning can also lead to increased acorn production, offering substantial benefits to local wildlife. In stands that have progressed beyond the sapling stage, improvement cuttings are carried out to eliminate trees with poor form, condition, or undesirable species, thereby enhancing the stand's overall quality.
- **Salvage or Sanitation Harvest or Cuts:** Salvage or sanitation cuts are generally implemented in response to natural disasters such as wildfires, severe weather events, and the outbreak of disease or pests. It consists of the removal of dead or damaged trees and the harvesting of available trees before further deterioration occurs. Generally, the primary objective of salvage or sanitation harvesting is to make the best use of the affected forest resources to recover value from damaged timber before it loses its merchantability due to mortality or decay. However, within the TML, where the merchantability of timber is less of a concern, salvage harvesting can play a significant role in maintaining forest health and aesthetics. Additionally, it can reduce the accumulation of hazardous fuels, thereby lowering the risk of subsequent wildfires and pest infestations. This practice is particularly relevant in aspen forests, which are susceptible to damage from severe weather events and pest outbreaks.

To aid landowners in this complex process, a tailored management plan can be developed for specific areas within their forest. It's advisable to engage with the NDFS and forestry professionals for a thorough inventory and expert guidance on marking trees prior to undertaking any forest stand improvement practices. This approach ensures a detailed understanding of the stand's condition and informs the specific recommendations for its enhancement.

5.1.4 STUMP SPROUT MANAGEMENT

Most tree species in the TML will produce new sprouts from the stump after the tree is cut. These include trembling aspen, bur oak, balsam poplar, cottonwood, green ash, and paper birch. Following a harvest or thinning, a multitude of these sprouts will compete for limited resources such as sunlight and water. Although natural thinning will occur over time as the weaker sprouts die off, stump sprout management can enhance the forest's health and productivity. For cottonwood, green ash, paper birch, and bur oak, selectively retaining only the most vigorous one or two sprouts per stump approximately three years post-harvest, landowners can improve the growth rates and overall health of the regenerating trees. Additionally, the application of an approved herbicide to stumps can inhibit the emergence of or kill sprouts and the establishment of more desirable trees. This chemical application can be used to foster a forest composition that is more resilient and better suited to future conditions that meet a landowner's objectives.

Courtesy of NDFS

The timing of when trees are cut can further assist with stump sprout management. Trees cut in the fall or dormant season will have greater sprouting potential as there is an abundance of stored carbohydrates in the root systems. Trees cut in the spring/early summer will sprout less as carbohydrate reserves will be depleted following leaf out. The timing of tree removal should be factored into the landowner's desired stand condition.


Courtesy of NDFS

5.1.5 WOODY WASTE AND RESIDUAL MANAGEMENT

Forestry management practices often yield a considerable volume of woody debris. Given the limited timber market in the TML and the nominal commercial value of the trees and shrubs to be removed, creative strategies may be necessary to manage the resulting biomass aesthetically and effectively. For brush, mulching can facilitate decomposition and minimize visual impact. Brush with a DBH over one inch can be processed with a forestry mulcher. Alternatively, spreading the woody waste across the site can encourage natural breakdown, especially when pieces are in direct contact with the soil and moisture. This material typically breaks down within a couple of years. The organization of the woody debris into burnable piles for disposal by fire, following a drying period and ensuring adherence to local fire regulations, can be an effective way to dispose of woody waste. The utilization of larger woody debris for firewood or milling into slabs may be viable. Local hobbyist sawmills might express interest in oak. If heavy machinery is involved, it's prudent to stack woody debris soon after harvesting to avoid damage to the regenerating forest. Overall, the management of woody debris requires a balance between practicality, aesthetics, ecosystem benefits, and potential future uses. Landowners are encouraged to consider these options carefully and to consult with forestry professionals to ensure the chosen methods align with their long-term land management goals.

Green ash infested with EAB

Courtesey of NDSU

Aspen stem break

Courtesey of NDFS

5.1.6 REFORESTATION

Reforestation stands as a cornerstone of sustainable forestry, supporting the long-term health and productivity of forests. Reforestation strives to re-establish tree species that naturally occurred and are well-suited to a given site. This practice requires careful planning and decision-making across several critical areas: choosing between artificial and natural regeneration methods, selecting appropriate species and seedlings, determining optimal planting densities, preparing the site, deciding on the best planting techniques, and implementing post-planting management strategies. Each decision in the reforestation process is influenced by a confluence of factors, including but not limited to the landowner's specific objectives, the unique characteristics of the site, anticipated market conditions for timber and non-timber forest products, and available financial resources.

Because there has been little demand for traditional forest products, there has been little economic incentive to implement reforestation in the TML beyond allowing stands to naturally regenerate. Furthermore, aspen's ability to naturally regenerate in response to coppicing further limits the economic incentive.

Artificial means of reforestation in the TML have been limited to planting monocultures of non-native conifers, primarily Black Hills spruce (*Picea glacua* var. *densata*) and blue spruce (*Picea pungens*). This was done for various reasons including seed orchard establishment, future timber harvest opportunities, and aesthetics. Conifer plantations are not considered an effective form of reforestation. Such plantations are prone to insect and disease and are not well suited for the TML. Reforestation efforts should emphasize naturally occurring forests and the ecological services they provide. Conifer plantations can provide species diversity, winter cover for wildlife, and aesthetics. Conversion to or establishment of conifer plantations is generally not recommended for landowners as it requires costly investment and long-term planning that has limited potential for economic return.

5.1.7 FOREST MONITORING FOR DAMAGE FROM INSECTS, DISEASE, AND WEATHER

Landowners play a pivotal role in safeguarding the health and resiliency of their forests. Vigilance against pests and diseases is essential, as these can pose significant threats to forest ecosystems. The most effective strategy for pest and disease management is regular and

thorough monitoring. Prompt identification of issues can significantly reduce both the impact of the problem and the costs associated with its resolution. When conducting inspections for insects and diseases, landowners should be attentive to several indicators:

- **Dead Trees:** Look for any patterns or clusters of mortality. Are the affected trees of the same species, age, or in a particular area?
- **Foliage Conditions:** Examine leaves for signs of damage such as holes, deformities, discoloration, or unusual spotting.
- **Limb and Branch Health:** Check for abnormalities like swellings, discoloration, or the presence of sap or other fluids, which may indicate stress or injury.
- **Insect Activity:** Note the presence of insects, their location, and the type of damage they may be causing.

Should there be any suspicion of insect infestation or disease presence, it's crucial to gather comprehensive information. Document the nature and extent of the damage, any discernible patterns, potential contributing factors, and any other information that the landowner feels is pertinent. For expert guidance and diagnosis, landowners are encouraged to reach out to the NDFS or the NDSU Extension agent. These professionals can provide valuable assistance in identifying the problem and recommending appropriate management strategies to protect the forest's health and longevity.

Courtesey of USFS.


Courtesey of USFWS.

5.2 FOREST MANAGEMENT PRACTICE NOT COMMONLY UTILIZED OR CURRENTLY RECOMMENDED IN THE TML

The following forest management practice can be utilized to achieve varying objectives in forests but is not commonly utilized or currently recommended within the TML.

5.2.1 PRESCRIBED FIRES

Prescribed fires should not be utilized without coordination with local fire departments, local governmental units, and forestry professionals. NDFS currently has no role in prescibed fires in forests. While, when utilized correctly and safely by professionals, prescribed fire can be a useful and cost-effective forest management practice, the improper use of prescribed fire can result in uncontrolled wildfires that often

require immense cost to regain control of and extinguish and can threaten property and lives. The use of prescribed fire can result in criminal and/or civil penalty.

The success of prescribed burning heavily depends on planning and execution. Key planning elements may encompass but is not limited to:

- comprehensive development of burn prescriptions,
- objective of the burn,
- time of year,
- astute weather forecasting and monitoring,
- effective smoke management and dispersion modeling,
- notifying neighbors, the community, and local emergency responders, and
- establishing a robust contingency plan.

Landowners are encouraged to maintain thorough documentation of burn planning and activities, as this aids in ensuring legal compliance and enhancing the efficacy and safety of prescribed burning operations.

Advantages of Prescribed Fires

A well-planned and executed prescribed fire can be utilized to meet numerous landowner objectives. It can reduce fuel loads to mitigate the intensity of potential wildfires, control and/or remove invasive plant species, control brush/understory growth, and stimulate aspen or oak regeneration. Fire can be used in oak forests to reduce tree numbers when encouraging savanna conditions and in oak sawtimber (i.e., trees over 11 inches DBH) stands to assist with regeneration in conjunction with a sawtimber harvest.

Disadvantages of Prescribed Fires

While prescribed fires are beneficial, they must be applied with caution to prevent adverse effects such as growth reduction, disease or pest outbreak, or tree mortality. For example, fire in oak forests with oak trees that are smaller than 11 inches DBH has been found to reduce tree vigor for many years and tree quality for the life of the stand (Dey and Schweitzer 2015). Excessive heat from fires can lead to crown scorching and root damage, potentially exacerbating the risk of disease or pest outbreaks. The adverse effects can extend beyond the forest and lead to uncontrolled wildfires, incurring significant costs, property damage,

and endangering lives. To mitigate these risks, strategies like cool, dormant season burns, careful selection of firing techniques that consider various environmental factors, burn objectives, and collaborative partnerships should be implemented.

Prescribed Burning Partnerships/Cooperatives

Prescribed burning necessitates close collaboration and partnerships in order to better ensure that they are employed in a safe and efficacious manner. Partnerships can help ensure that the right qualifications and experience are present to ensure the safe, efficacious implementation of prescribed fires. As of writing, no partnerships have been formed for the TML. Examples of partnerships in ND but outside of the TML include:

- The North Dakota Prescribed Fire Cooperative (NDPFC) was initiated in 2019 to revive and advocate for this vital land management strategy. The cooperative's formation reflects a concerted effort to bring together fire practitioners, agencies, non-profit organizations, landowners, and policymakers to foster a comprehensive understanding of prescribed fire's role in invasive species control, wildlife habitat enhancement, grazing land improvement, and the preservation of native grasslands. The Co-op collaborated with Pheasants Forever, Audubon Great Plains, The Nature Conservancy, North Dakota Natural Resource Trust, NRCS, NDSU Extension Office, NDGFD, and the North Dakota Wildlife Federation. This coalition pledged to provide support to landowners and affiliates through the allocation of equipment, educational resources, and strategic guidance for executing prescribed burns.
- The USFS Dakota Prairie Grasslands fire management team was joined by partners from the USFWS, The Nature Conservancy, and the Lisbon and Kindred Rural Fire Departments in completing a 1,019 acres prescribed burn at Sheyenne National Grassland. While this is outside of the TML, it serves as a clear example of the value of collaboration and partnerships when implementing this practice.

6 FUNDING AND SUPPORT FOR FOREST MANAGEMENT

Because funding and support opportunities for forest management are variable, fluctuate based on the source of funding and services included, and can change frequently, it is important for landowners to stay connected with the relevant sources to be able to participate and benefit from these opportunities as they become available. These funding sources, while subject to change, provide a foundation for understanding the types of support available for forest management in North Dakota. A summary of organizations that have supported forest management either by providing funding or technical assistance is included below. Landowners are encouraged to reach out to these organizations for the most up-to-date information about funding opportunities or support that is available.

NDFS: Provides technical support to private forest landowners to encourage and enable active, long-term forest management to meet their individual goals and for the benefit of the forest resource. The program provides a Forest Stewardship Plan to private landowners free of charge.

NDFS and NDGFD: These agencies offer cost-share assistance and training and equipment to private contractors specifically for aspen regeneration through the Private Land Aspen Regeneration Project. Through this Project, NDFS, and NDGFD work with private landowners to restore declining aspen forests.

NDGFD: Provides funding for wildlife habitat development and hunting access agreements.

Soil Conservation Districts: A Soil Conservation District is present within each county in North Dakota. They provide technical assistance to landowners to conserve and promote healthy soils, water, forests, and wildlife. They offer cost-sharing and assistance with planting trees and shrubs for windrow establishment and maintenance.

Outdoor Heritage Fund: North Dakota's Outdoor Heritage Fund was established in 2013 as a multi-million-dollar program to provide grants to state agencies, tribal governments, political subdivisions, and nonprofit organizations, with higher priority given to projects that enhance conservation practices in this state by supporting one or more statutorily identified directives.

USFWS Partners for Fish and Wildlife Program: Offers both technical and financial support for landowners and organizations aiming to restore and enhance wildlife habitats on their lands.

Ducks Unlimited: Works with landowners to with the goal of for restoring, enhancing, or protecting wetland habitats. They may provide funding or technical assistance for wetland enhancements or restoration projects.

North Dakota Natural Resources Trust: The mission of the North Dakota Natural Resources Trust is to promote the retention, restoration, creation and wildlife friendly management of wetlands, grasslands, and riparian areas by presenting practical opportunities throughout North Dakota. Offers assistance and funding for various habitat and natural resource concerns through multiple programs.

Audubon Great Plains: Audubon Great Plains is the regional office of the National Audubon Society for Nebraska, North Dakota, and South Dakota. They support practices promoting healthy forests and landbird populations, particularly in areas like the TML, which is recognized as an Important Bird Area (IBA).

North American Grouse Partnership: Provides support and outreach for practices beneficial to specific wildlife populations focusing on grouse species, such as the ruffed grouse.

Rocky Mountain Elk Foundation: Provides financial support to eligible hunting heritage and conservation outreach activities and programs through their State Grant Program. Financial support for eligible habitat enhancement, wildlife management, and research projects is provided through our Project Advisory Committee (PAC) Grant Program. Both grant programs leverage dollars raised by volunteer committees and generous donors across the country with partner dollars to amplify our on-the-ground impact for elk, other wildlife, and their habitat and to ensure the future of our hunting heritage.

NRCS Environmental Quality Incentive Program:

Administered by the NRCS, the Environmental Quality Incentive Program (EQIP) provides financial and technical assistance to implement structural and management conservation practices that optimize environmental benefits of working agricultural land. Through EQIP, cost share and technical assistance for timber management, such as forest stand improvement, riparian buffer forests, and forest management planning may be provided.

Several other programs and incentives exist but are not currently available to landowners in the TML. These include:

NRCS Agricultural Conservation Easement Program:

Administered by the NRCS, Agricultural Conservation Easement Program (ACEP) protects agricultural and nonindustrial private woodlands from development through agricultural conservation easements. The easements can be temporary (30 years) or permanent. The program also offers wetland conservation easements that are purchased and then maintained by NRCS. Easement plans are required. Permanent easements are not allowed by state law in North Dakota.

USDA Regional Conservation Partnership Program (RCPP):

The Regional Conservation Partnership Program (RCPP) is a partner-driven approach to conservation that funds solutions to natural resource challenges on agricultural land. By leveraging collective resources and collaborating on common goals, RCPP demonstrates the power of public-private partnerships in delivering results for agriculture and conservation. RCPP projects fall under two categories:

- RCPP Classic
- RCPP Grants

RCPP Classic projects are implemented using NRCS contracts with producers, landowners, and communities in collaboration with project partners. Through RCPP Grants, the lead partner must work directly with agricultural producers to support the development of new conservation structures and approaches that would not otherwise be available under RCPP Classic.

North Dakota Forest Stewardship Tax Law:
Established initially as the Native Woodland Tax Law in 1967 and evolving into the Forest Stewardship Tax Law in 1991. This legislation in North Dakota offers a property tax incentive for forest landowners. Participants in this program, available in certain counties, pay a reduced property tax rate of $0.50 per acre annually, conditional on preserving their forest lands and adhering to specific requirements. Notably, Rolette and Bottineau Counties are not participants in this program.

USFS Forest Legacy Program: The Forest Legacy Program (FLP) is a national program administered in partnership with the USFS. The program is intended to conserve and protect private forests that provide economic, recreational, and economic benefits to the state and its citizens. Providing economic incentives to landowners to keep their forests as forests encourages sustainable forest management and supports strong markets for forest products. Landowners may participate in the FLP by either selling their property outright or by retaining ownership and selling only a portion of the property's development rights; both are held by state agencies or another unit of government. The use of a conservation easement, a legal agreement between a landowner and a non-profit land trust or governmental agency, allows the land to remain in private ownership while ensuring that its environmental values are retained. Conservation easements are permanent and easement rights are either purchased or donated. However, North Dakota is the only state not participating in this program. Additionally, permanent easements are not allowed under current state law in North Dakota.

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