

East Central Landscape Plan



A Regional Plan to Guide Sustainable Forest Management

MFRC East Central Regional Landscape Committee
July 20, 2021



Minnesota Forest Resources Council (MFRC)

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Content: MFRC East Central Landscape Planning Committee (for a list of the Planning Committee Members see [Appendix A](#))

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Please cite this document as:

Minnesota Forest Resource Council. 2021. East Central Landscape Forest Resources Plan. Minnesota Forest Resource Council, St. Paul, Minnesota.

Available online at <http://mn.gov/frc>.



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Part 1. Purpose and Context:

Where have we been and where are we today?

Section 1 Introduction



The Minnesota Forest Resources Council (MFRC) is a 17-member organization working to promote long-term sustainable management of Minnesota's forests as directed by the Minnesota legislature in the Sustainable Forest Resources Act of 1995. Through its Landscape Program and the six regional committees, the MFRC develops and supports the implementation of regional forest resource plans (aka landscape plans) for Minnesota's six major forested regions. This section summarizes the statutory foundations for landscape management in Minnesota.

A. Sustainable Forest Resources Act

The Minnesota State Legislature enacted the Sustainable Forest Resources Act (Minn. Statutes, Chapter 89A) in 1995, which established the Minnesota Forest Resources Council (MFRC) and formalized the state's policy to:

- pursue the sustainable management, use, and protection of the state's forest resources to achieve the state's economic, environmental, and social goals;
- encourage cooperation and collaboration between public and private sectors in the management of the state's forest resources;
- recognize and consider forest resource issues, concerns, and impacts at the site and landscape levels;
- recognize the broad array of perspectives regarding the management, use, and protection of the state's forest resources and establish processes and mechanisms that seek and incorporate these perspectives in the planning and management of the state's forest resources.



The purpose of the MFRC is to develop recommendations to the Governor and to federal, state, county and local governments with respect to policies that result in sustainable management of forests in the state. The policies must:

- acknowledge the interactions of complex sustainable forest resources, multiple ownership patterns, and local to international economic forces;
- give equal consideration to the long-term economic, ecological, and social needs and limits of the state's resources;
- foster productivity of the state's forests to provide a diversity of sustainable benefits from the site to landscape levels;
- enhance the ability of the state's forest resources to provide future benefits and services;
- foster no net loss of forest land;

- encourage appropriate mixes of forest cover types and age classes within landscapes to promote biological diversity and viable forest-dependent fish and wildlife habitats;
- encourage collaboration and coordination with multiple constituencies in planning and managing the state's forest resources;
- address the environmental impacts and implement mitigations as recommended in the *Generic Environmental Impact Statement on Timber Harvesting and Forest Management*. This includes MFRC Voluntary Site Level Forest Management Guidelines which help sustain forest resources.

B. MFRC Landscape Program

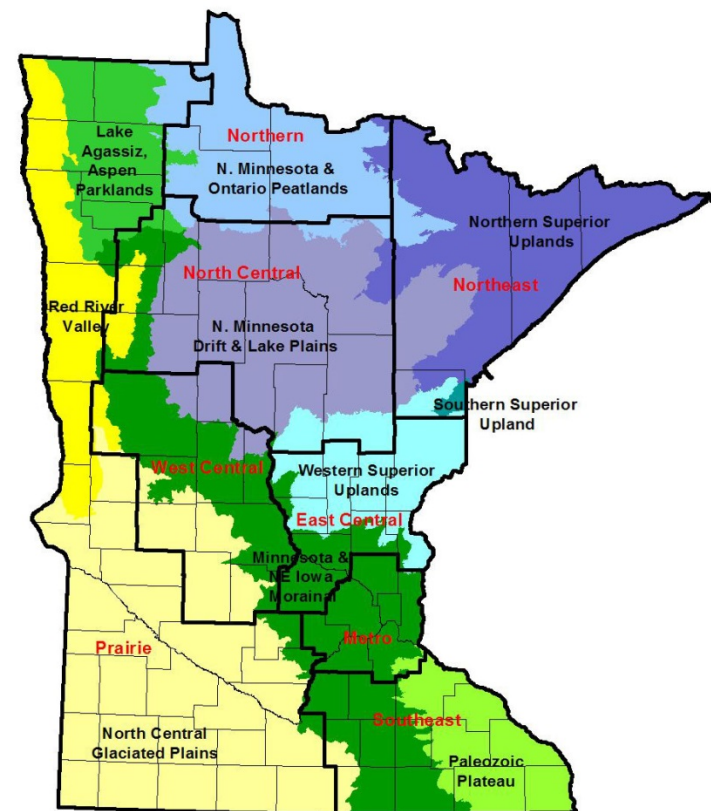
The Sustainable Forest Resources Act (SFRA) provided authorization for the establishment of regional landscape committees to foster landscape-based forest resource planning and coordination. This legislation defined landscape-level planning as “long-term or broad based efforts that may require extensive analysis or planning over large areas that may involve or require extensive coordination across all ownerships.” It charges regional committees to:

- include representative interests,
- serve as a forum to discuss issues,
- identify and implement an open and public process whereby landscape-level strategic planning can occur,
- identify sustainable forest resource goals for the landscape and strategies to achieve those goals, and
- provide a regional perspective on forest sustainability to the Council.

The MFRC established the Landscape Program in June 1997 to organize and support the regional Landscape Committees. Following direction from the SFRA, the Council divided the state into eight Landscapes as shown in the figure to the right. They established six regional committees to solicit the input of diverse forest resource interests within particular forested “Landscapes”. These Landscapes are based on broadly defined ecological units, yet recognize existing political and administrative boundaries for delineation. These regional committees provide an opportunity to involve private citizens, natural resources professionals, and members of various interest groups in developing and implementing landscape-level plans that promote forest sustainability.

The MFRC Landscape Program provides an ongoing means of addressing regional issues through local partnerships that help to develop and accomplish citizen-identified short-term and long-term sustainable forest

Figure 1.1. MFRC Landscapes and ECS Boundaries.



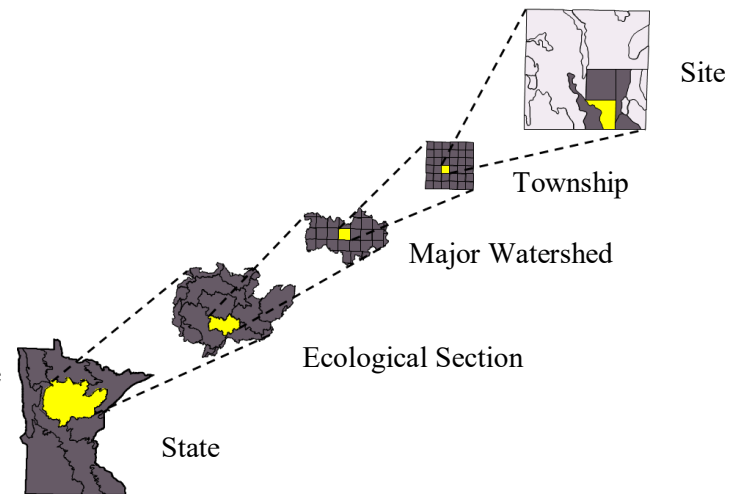
management goals and projects for the broader landscape region by bridging land ownership and forest types. Find more about Minnesota's forested Landscapes, the process of Landscape-level forest management, and the regional volunteer committees here: <http://mn.gov/frc/landscape-level-management-program.html>

C. Landscape Planning Scales and Contexts

Forest resource planning takes place on many scales based on administrative (e.g., township) or ecological boundaries (e.g., watershed) (Figure 1.2). MFRC Landscape Plans are designed to be strategic in purpose and cover all ownerships in a region. As planning scales decrease to the sub-landscape and eventually to the site-level, forest resource plans typically become more tactical in nature and cover fewer ownerships. Yet all scales are connected, and landscape-level plans can broadly help to guide plans which occur at a smaller scale, whose collective accomplishments help to achieve landscape-level goals and objectives.

The East Central Landscape Region includes Benton, Chisago, Isanti, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, and Wright counties (approximately 3.7 million acres). Its borders also roughly correspond to the Western Superior Uplands Section (Figure 1.1).

Figure 1.2. Landscape to Site Level Planning.



D. Regional Forest Resources Committees

As described above, the SFRA provided authorization for the establishment of regional landscape committees to foster landscape-based forest resources planning and coordination, and the MFRC Landscape Program has established regional committees to implement this state policy at the landscape-level throughout the State. The SFRA requires the regional committees fulfill and/or address many functions and activities in landscape planning and coordination. The following summarizes these functions:

- include representative interests in a particular region that are committed to and involved in landscape planning and coordination activities;
- serve as a forum for landowners, managers, and representative interests to discuss landscape forest resources issues;
- identify and implement an open and public process whereby landscape-based strategic planning of forest resources can occur;
- integrate its report with existing public and private landscape planning efforts in the region;
- identify and facilitate opportunities for public participation in existing landscape planning efforts in the region;
- identify sustainable forest resources goals for the landscape and strategies to achieve those goals;
- provide a regional perspective to the council with respect to council activities;
- facilitate landscape coordination between existing regional landscape planning efforts of land managers, both public and private.

These volunteer, citizen-based regional landscape committees are central to carrying out landscape management processes. Regional landscape committees provide an open public forum for diverse interests to cooperatively promote forest sustainability. By bringing together

representative interests from landscape regions, the committees serve as springboards for effective forest management activities that address specific needs and challenges in each region. Regional committees meet on a regular basis to guide implementation of landscape plans and coordination of land management activities.

The East Central Landscape Regional Committee (the Committee) was initially organized in March, 2004. Since then, the Committee has been working to build agreement on how best to achieve long-term forest sustainability through landscape planning and coordination. According to Committee members and participants, the landscape management process has:

- developed useful scientific approaches, information, and valuable tools for landscape assessment;
- fostered working relationships with a diverse set of people;
- produced landscape direction for agencies and other landowners on a voluntary basis;
- developed strategies for implementing this landscape direction;
- facilitated better communication among diverse groups.

Also, landscape management planning has helped land managers and other partners recognize that individual forest and related natural resources management choices must be viewed in the context of those of their neighbors and that the multiple management objectives of the various land managers can provide for a diverse and balanced landscape condition in terms of ecological, economic, and social conditions.

Section 2

Landscape Planning Process



Landscape planning is a voluntary, consensus-based process that brings together people who have an interest in the long-term health and vitality of a particular region. It is a process that helps landowners and resource managers better understand how the lands that they manage, from an individual site to a portfolio of agency lands they are responsible for, fit into the larger region or ‘landscape.’ This section describes the overall context for forest resource planning in the state and an overview of the process used to develop this Plan.

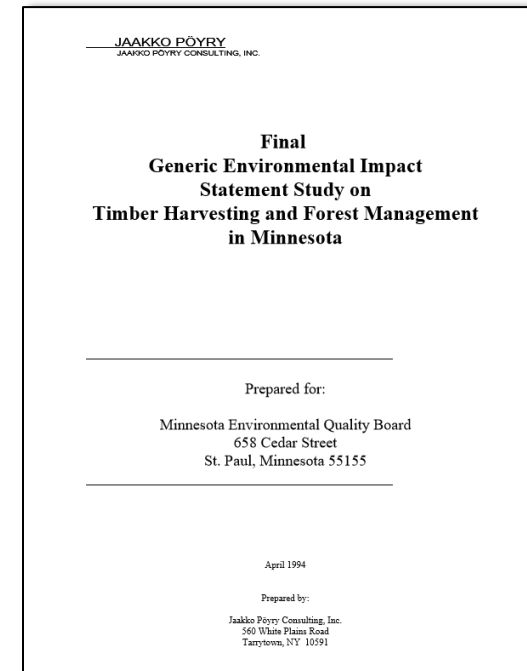
A. Forest Resources Planning in Minnesota

Landscape planning in Minnesota was conceived by the Generic Environmental Impact Statement (GEIS) on Timber Harvest and Forest Management (1988-1994), enacted into statute by the Sustainable Forest Resources Act (SFRA) in 1995, and made operational by the MFRC starting in 1996.

By Minnesota statute, MFRC landscape plans were designed to provide broad, strategic guidance to all land managers across all ownerships in a given landscape region. The MFRC landscape plans provide guidance to a range of more specific and actionable planning efforts including: 1) forest management plans for specific land managing entities, 2) agency programmatic plans, and 3) funding development plans. The MFRC landscape plans provide guidance to the following:

Forest Management Plans

- USDA Forest Service land and resource management plans – ten to fifteen year plans developed for the Chippewa and Superior National Forests. They cover approximately 3 million acres of federal lands in northern Minnesota.
- Tribal land and resource management plans – there are eleven tribes in the state. Tribal forestry organizations have developed plans to cover over 600,000 thousand acres of tribal forest land in northern Minnesota.
- MN DNR Forestry Section Forest Resource Management Plans – plans that guide the management of vegetation including timber harvest on state owned lands within ecological units, for 3.8 million acres of state forest land managed by DNR Forestry and Wildlife Divisions.
- County tax forfeit land management plans – Fifteen northern and central Minnesota counties manage approximately 2.8 million acres of forest land. These plans guide land management including timber harvest on most of these acres.
- Industry forest management plans – forest industry and timber investment companies have plans for about 1.0 million acres of forest land.



- Woodland stewardship plans – some of Minnesota’s 150,000 family forest owners have woodland plans covering 10 to 15 percent of the 6.0 million acres of family-owned private forest land.
- Other private land plans – there are a number of other private plans related to forest management in Minnesota and related conservation activities undertaken by various environmental organizations, land trusts, and others.

Program Plans

- Forest for the Future Plan – the plan used to create and manage the MN DNR’s forest conservation easement and acquisition program.
- Private Forest Management System Framework – the plan developed to guide the delivery of planning and implementation services to Minnesota's family forest landowners through the MN DNR Forestry Private Forest Management (PFM) Program.
- Urban and Community Forestry program plan – the plan developed to direct efforts by DNR Forestry to promote urban forestry projects and practices in communities throughout the state.
- Landscape stewardship plans – plans developed through the DNR PFM Program to increase collaborative efforts by all service providers to promote the implementation of landscape stewardship approaches at sub-landscape scales (Camp Ripley Landscape Stewardship Plan, Pine River Watershed Landscape Stewardship Plan).
- Community wildfire protection plans – locally based program plans to promote collaborative efforts to help landowners be properly prepared for wildfire protection.
- Watershed Restoration and Protection Strategies (WRAPs) reports – reports developed by the Minnesota Pollution Control Agency (MPCA) and partner organizations which provides detail on water quality issues in major watersheds (8-digit HUC) and identifies ways to prioritize projects to protect or restore water quality in those watersheds.

Funding Development Plans

- State Forest Action Plan (FAP) – federally required plans that all states must prepare to receive federal funding for forestry projects through the US FS State & Private Forestry.
- Forest Legacy Assessment of Need (AON) – a federally mandated plan that provides direction for investing of federal funds for fee title acquisitions and conservation easements through the Forest Legacy Program.
- 25-Year Lessard-Sams Outdoor Heritage Council (LSOHC) Forest Habitat Implementation Vision – a framework for the LSOHC to use in advising the legislature about funding for forest projects that improve fish and wildlife habitat for game and nongame species.

B. First and Second Generation Landscape Plans

2005 East Central Landscape Plan

The East Central Landscape Committee was organized in March of 2004 with 32 people expressing interest in participating and 14-20 people remaining active throughout the development of the original East Central Landscape Plan. The East Central was the last of the six regional committees to develop a landscape plan.

The Minnesota Forest Resources Council approved the first generation East Central Landscape Plan on March 16, 2005. Partners in the region have been actively implementing the plan ever since.

Decision to Revise the 2005 East Central Landscape Plan

While the SFRA did not establish a process for maintaining or updating the landscape plans, over time the six regional committees began to recognize that the first generation of plans did not address some issues they were facing in their coordination and implementation efforts. The Coordination Committee (the group organized to oversee the coordination, implementation, and monitoring of the plan after it was approved) identified a range of issues and concerns that were not addressed in the 2005 Plan. Some of the topics included: climate change, connection of forest and water quality, change in forest composition, change in the industrial landscape, decreased harvest levels, changes in forest sector capacity, watersheds and water resources and related methodologies, changes in policy and funding structures, tribal interests and treaty rights.

Parallel with the work by the Coordination Committee, there were some key research and coordination initiatives underway that could support the development of the revised plan. These initiatives included the US Forest Service Northern Minnesota Climate Change Response Framework Project, Natural Resource Research Institute's Potential Native Plant Community Modeling Project, Minnesota Department of Natural Resources Fish Habitat Conservation Framework and Watershed Health Assessment Framework. Products and information from these parallel efforts have been integrated into this second generation planning process.

C. Formation of the Second Generation East Central Landscape Planning Committee

Following the Council's decision to revise the 2005 Plan, an invitation letter was sent to a broad range of organizations and interests throughout the region asking for their participation on the second generation planning committee. The members of the Planning Committee and the organizations and interests they represent are provided in [Appendix A](#).

D. Planning Process Overview

General Steps in the Planning Process

The general process that was used by the Planning Committee to develop this Plan included the following major steps:

- Develop an inventory and assessment of the resources in the landscape.
- Gather and inventory existing policies relating to forest management from plans adopted by local, regional, and state organizations.
- Brainstorm and prioritize forest resources management assets and issues in the region.
- Identify and synthesize resource trends and key findings.
- Develop guiding principles and define the long-term desired future conditions.
- Establish a comprehensive policy framework of goals, objectives, and action items to address the issues and sustain the assets that were identified.
- Begin clarifying the appropriate roles and responsibilities of stakeholders in coordinating and implementing this Plan.

E. Committee Input

A total of 20 Planning Committee meetings were convened to prepare this Plan and Planning Committee members provided direction and input throughout the planning process. A series of methods and approaches were used in gathering committee input including small and large group discussions, draft document reviews, and ad-hoc workgroups.

Planning Committee and Landscape Advisory Committee Review

Based upon information provided by members of the Planning Committee and presentations by invited experts, the contracted plan writer drafted sections of the plan to reflect the discussion, decisions, and ideas of the Planning Committee. These draft sections of the plan were then shared with the Planning Committee for review. During this time period the Planning Committee was able to provide comments on specific sections. These suggestions were integrated into the draft document and presented it to the Landscape Advisory Committee (LAC) on April 14, 2021 where the LAC approved the draft plan and recommended opening the public comment period.

F. Public Review and Comment Process

The Sustainable Forest Resources Act (SFRA) provides the following guidance on the public review requirements for landscape planning: “(3) identify and implement an open and public process whereby landscape-based strategic planning of forest resources can occur”.

The following public review process was used for approving the Plan:

- An email notice announcing the public review process was sent to interested persons and entities in the region.
- A notice was posted in the EQB Monitor.
- Press releases were sent to newspapers in the region announcing the public review period.

- The public review draft Plan and supporting materials were posted on the MFRC website.
- The public review and comment period lasted for 30-days.
- Comments were reviewed by the Planning Committee.
- Review / approval of the Plan by the Council.

G. Council Approval

The Minnesota Forest Resources Council reviewed and approved this Plan on July 20, 2021.

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Section 3

Context of the East Central Landscape



This section of the plan provides context for the East Central Landscape, including a geopolitical overview of the counties within the region; a summary of the Ecological Classification System (ECS) sections within the landscape; the local hydrology; and the region's land ownership and management.

A. Geopolitical

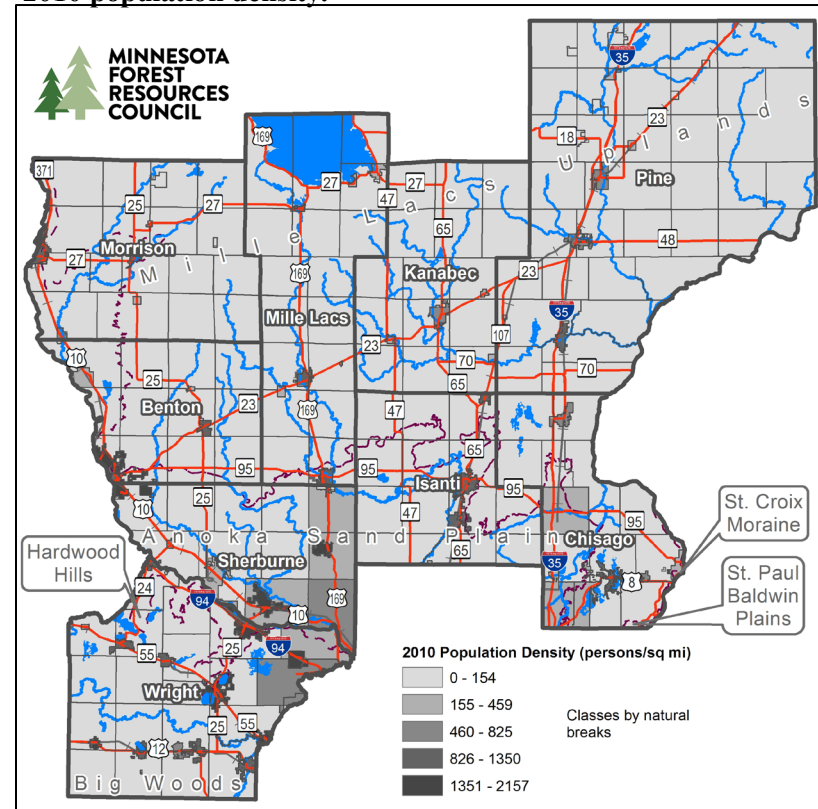
The Minnesota Forest Resources Council defines the East Central Landscape as the following nine county area: Benton, Chisago, Isanti, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, and Wright counties. According to 2010 U.S. Census data, the region's population is more concentrated in the southern half of the region, while in the northern counties most of the area has a relatively low population density.

Table 3.1. Area of East Central Landscape counties.

County	Area	
	Acres	% of Region
Benton	264,245	7.2
Chisago	283,043	7.7
Isanti	288,811	7.8
Kanabec	341,250	9.3
Mille Lacs	435,754	11.8
East Morrison	406,807	11.0
Pine	917,457	24.9
Sherburne	288,373	7.8
Wright	456,982	12.4
Total East Central Region	3,682,722	100.0

Source: US Census.

Figure 3.1. East Central Landscape political boundaries and 2010 population density.



Source: US Census and MN Geospatial Commons.

B. Ecological Classification System

The East Central Landscape can be described using the Ecological Classification System (ECS), which defines areas that have similar ecological characteristics such as geology, vegetation, soils, etc. The East Central Landscape is primarily located within the Laurentian Mixed Forest Province, but about a third of the landscape intersects with the Eastern Broadleaf Forest. (Figure 3.2).

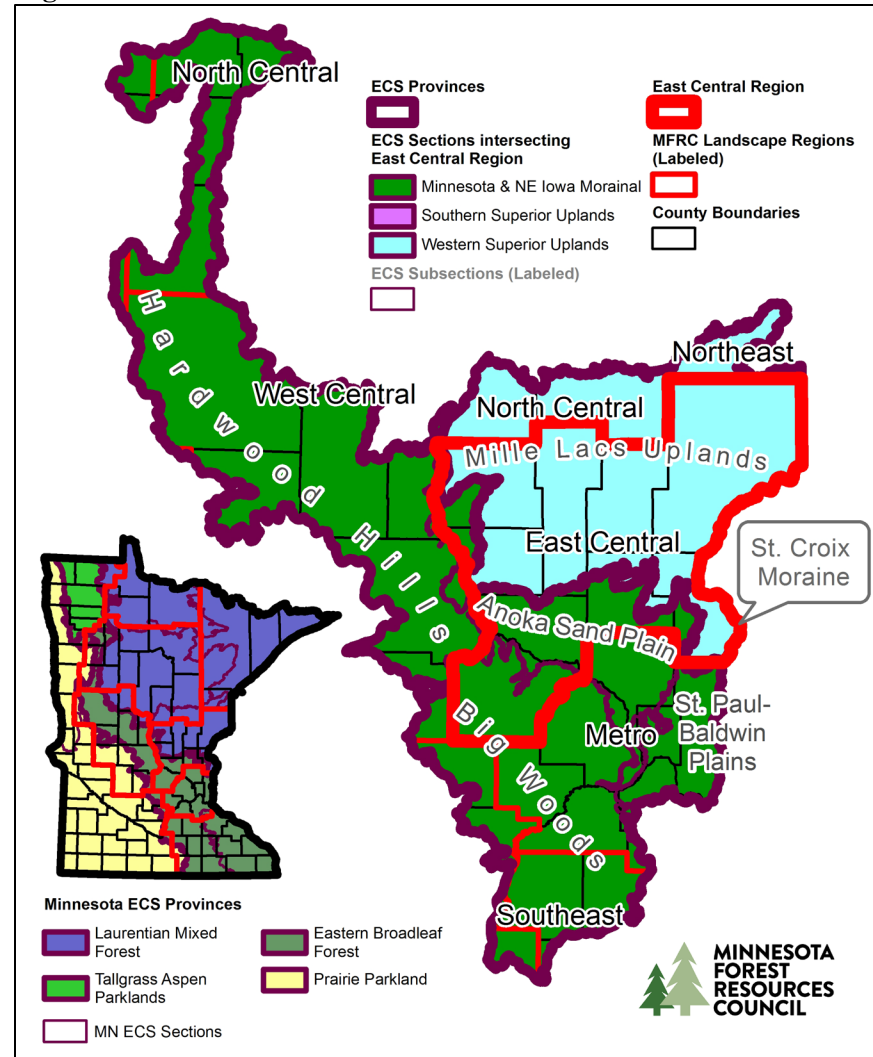
Of the smaller ECS units in the region there are three ECS Sections and a total of six ECS Subsections. Within the six subsections, there are 41 Land Type Associations (LTAs) and the average area of an LTA is approximately 90,000 acres. Find more information about ECS and Minnesota's ECS units here: <http://www.dnr.state.mn.us/ecs/index.html>

Table 3.2. ECS Sections in the East Central Landscape.

ECS Sections	Code	Acres in Region	% of Region
Minnesota & NE Iowa Morainal	MIM	1,160,130	31.5
Southern Superior Uplands	SSU	2,946	0.1
Western Superior Uplands	WSU	2,517,760	68.4
Total East Central Region		3,680,836	100.0

Source: MN Geospatial Commons.

Figure 3.2. ECS Provinces and Sections.



Source: MFRC and MN Geospatial Commons.

C. Hydrology

The East Central Landscape is moderately rich in water resources and straddles the Upper Mississippi River and St. Croix River Basins. The region also contains a small portion of the Lake Superior Basin in its northeast corner. According to the DNR Watershed Health Assessment Framework (WHAF), the more heavily forested watersheds in the northeast portion of the region generally scored higher than the other watersheds in the landscape. Conversely, watersheds in the southwest corner of the landscape scored lower than the other watersheds in the region.

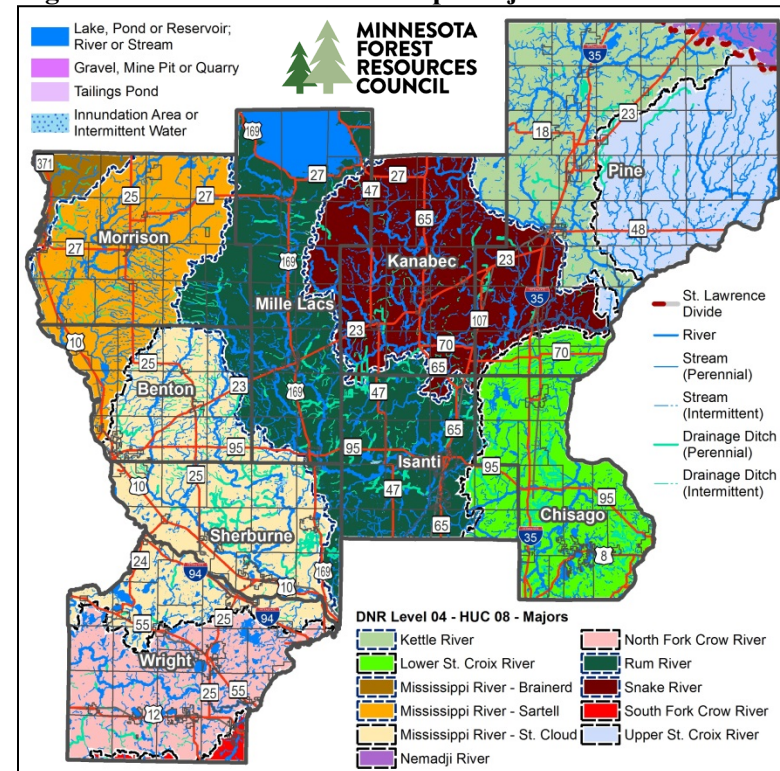
A unique attribute of the region is that it contains four of the six designated rivers in Minnesota's Wild & Scenic Rivers program (St. Croix, Kettle, Rum, and Mississippi). These are rivers identified as having outstanding natural, scenic, geographic, historic, cultural, and recreational values. Furthermore, the upper 200 miles of the St. Croix River is a federally-designated Wild & Scenic River and is one of eight original rivers designated by Congress when the National Wild & Scenic Rivers Program was established in 1968.

Table 3.3. Watershed Health Assessment Framework (WHAF) scores and area, 2015. WHAF scores range from 0 (unhealthy) to 100 (best condition).

Major Watershed	WHAF Score	Acres	% of Region
Kettle River	64	374,412	10.2
Lower St. Croix River	59	370,392	10.1
Mississippi River - Brainerd	63	44,747	1.2
Mississippi River - Sartell	58	359,844	9.8
Mississippi River - St. Cloud	49	577,881	15.7
Mississippi River - Twin Cities	42	176	0.0
Nemadji River	64	33,311	0.9
North Fork Crow River	50	300,824	8.2
Rum River	61	736,736	20.0
Snake River	62	513,427	13.9
South Fork Crow River	45	21,367	0.6
Upper St. Croix River	67	347,720	9.4
Total East Central Region	--	3,680,836	100.0

Source: MNDNR WHAF.

Figure 3.3. East Central Landscape major watersheds.



Source: MNDNR and MN Geospatial Commons.

D. Land Ownership and Management

Ownership and management of forests in the East Central Landscape is shared between many different private and public entities (Table 3.4 and Figure 3.4). This area is dominated by private lands, which cover over 3.2 million acres or 87.7% of the region. Of the remaining 12.2% which is public land, 10.6% is owned by the State of Minnesota and most of that is owned by the Divisions of Forestry (5%), Fish and Wildlife (2.2%), and Parks and Recreation (1.5%).

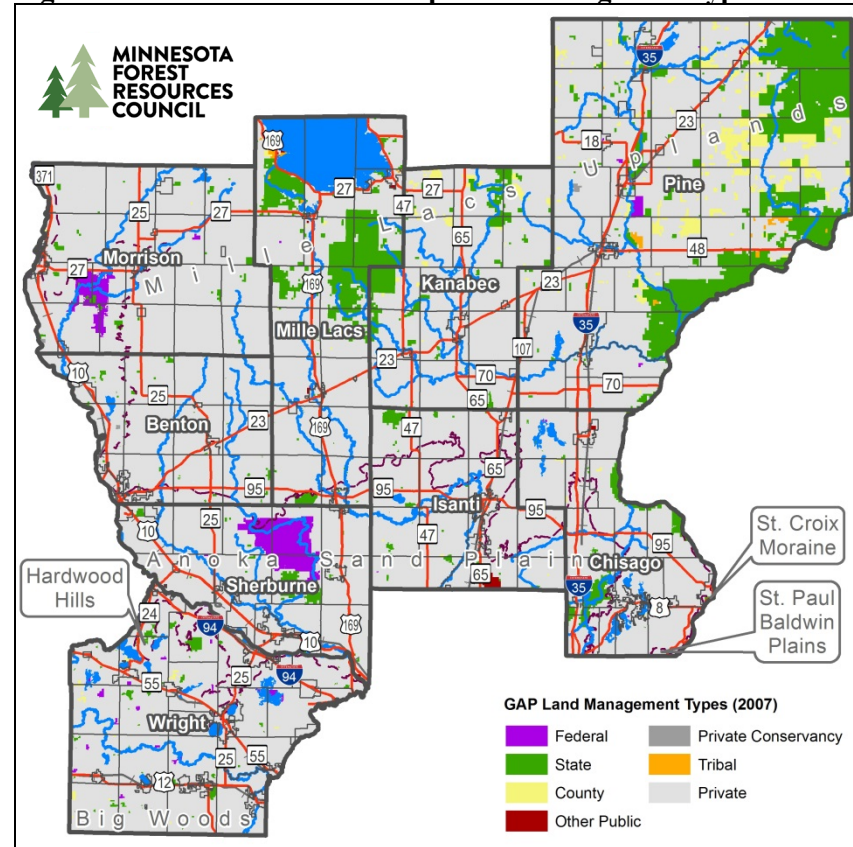
In many cases land ownership and management or administration is the same; however there are several situations where this distinction can make a difference in understanding trends on the landscape. For instance, ‘County Administered State Owned’ tax forfeit land is owned by the State of Minnesota, however, it is managed by the counties changing the relative importance of counties in the East Central Landscape from 0.1% to 1.7% of the total land area when based on management responsibilities.

Table 3.4. Land ownership and management in the East Central Landscape.

Type	Ownership		Management	
	Acres	% of Total	Acres	% of Total
Federal	49,836	1.4	49,836	1.4
State	390,097	10.6	331,593	9.0
County	4,678	0.1	63,183	1.7
Other Public	3,406	0.1	3,406	0.1
Private Conservancy	1,067	0.0	1,067	0.0
Tribal	4,975	0.1	4,975	0.1
Private	3,226,776	87.7	3,226,776	87.7
Total East Central Region	3,680,836	100.0	3,680,836	100.0

Source: GAP Land Ownership.

Figure 3.4. East Central Landscape land management types.



Source: GAP Land Management and MN Geospatial Commons.

E. Native American Reservations and Treaties

There is one Band of Chippewa (Ojibwe) in the region, and that is the Mille Lacs Band. This band has a long tradition of cultural uses of the forests and forest-dependent fish and wildlife species in this region. The Mille Lacs Reservation is located primarily near the south end of Mille Lacs Lake.

The Mille Lacs Band maintains off-reservation hunting, fishing, and gathering rights in the 1837 Ojibwe Ceded Territory. This territory covers most of the East Central Landscape, except for the southwest corner, which is covered by the 1837 and 1851 Sioux (Dakota) Ceded Territories. Minor amounts of other treaty boundaries also intersect with the East Central Landscape (Table 3.5 and Figure 3.5). Tribal resources in these territories are maintained by the Bands and regional treaty organizations.

Table 3.5. Native American reservations and treaties in the East Central Landscape.

Reservation	Acres	% of Region
Mille Lacs	2,930	0.1
Total Reservation Areas	2,930	0.1
Total East Central Region	3,680,836	--

Treaty	Acres	% of Region
1837 – Chippewa	2,831,540	76.9
1837 – Sioux	286,661	7.8
1847 - Chippewa of the Mississippi and Lake Superior	992	0.0
1851 - Sioux (Sisseton and Wahpeton bands)	464,547	12.6
1854 - Chippewa of the Mississippi and Lake Superior	96,175	2.6
1855 - Winnebago	992	0.0
1864 - Chippewa	35,202	1.0
Total Treaty Areas	3,716,110	101.0
Total East Central Region	3,680,836	--

Source: US Forest Service.

Figure 3.5. Native American reservation and treaty boundaries in Minnesota.



Source: Leech Lake Band of Ojibwe, Division of Resource Management.

F. State Land and Mineral Ownership and Management

The State of Minnesota is one of the largest landowning entities in the United States. Within the state there are about 51.2 million acres of land and 2.6 million acres of water. About 25 percent of the land is owned by governmental units. The federal government owns about 7 percent of the land area, or 3.4 million acres, while the state government owns about 17 percent of the land area, or 8.4 million acres. Over 95 percent of the state-owned land was granted or donated to the state by the federal government.

The history of the transfer of land to the state is long and complicated. The federal and state laws that created the various types of state lands established specific directions and mandates on the development and use of the state lands, and directly impacts how those lands are to be managed including forest management. The DNR Division of Lands and Minerals generally groups state lands into the following:

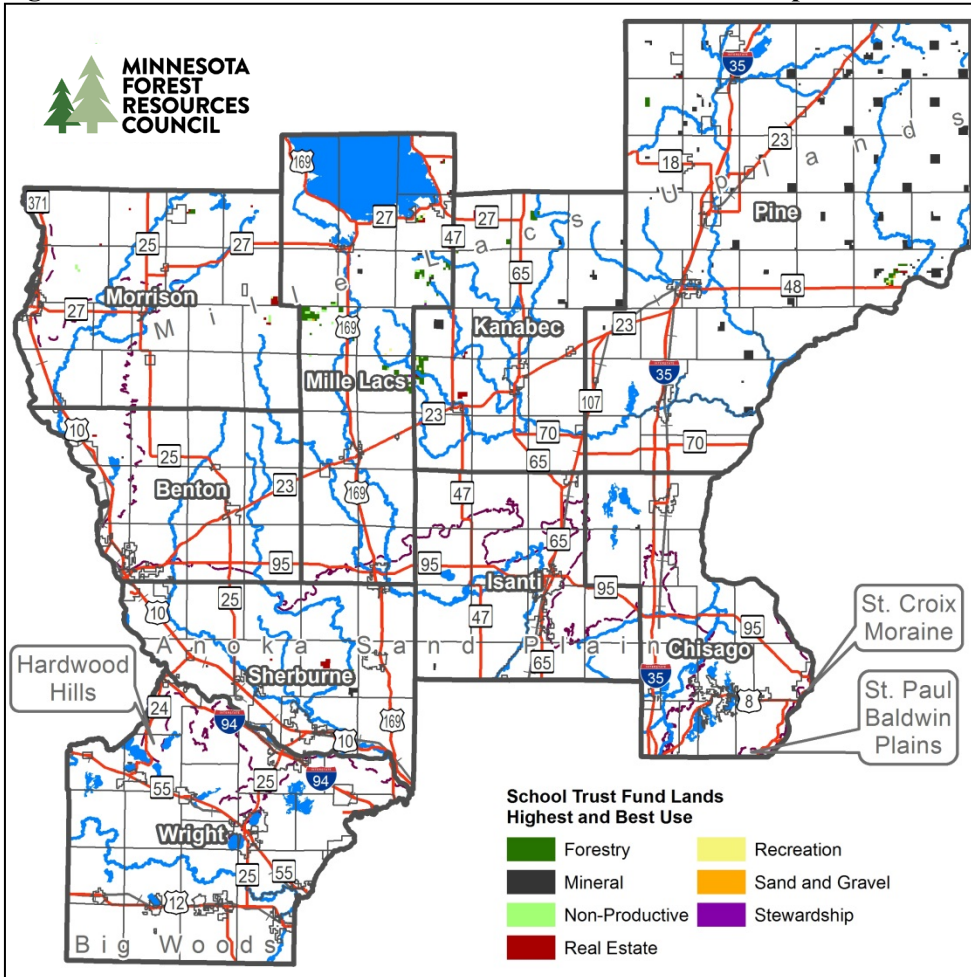
- Lands granted by the federal government.
- Federal and state land acquisitions.
- Lands acquired through forfeiture.

The following narrative provides general information regarding school trust lands and mineral rights, both of which directly affect forest management on large portions of in the landscape. For more detailed information on the history of state land ownership and their management, please refer to the following website: http://www.dnr.state.mn.us/lands_minerals/index.html

School Trust Lands

When Minnesota became a state in 1858, Congress granted to Minnesota sections 16 and 36 of every township to support public schools. Alternative sections, referred to as Indemnity School Lands, were granted in lieu of sections 16 and 36 when those sections had already been claimed or were reserved for a federal reservation, or were under water. The original school trust land grant ultimately resulted in 2.9 million acres being granted to the state for the use of the public schools. Also included in school trust lands today are remaining lands from two other federal land grants, which were redesignated by the state legislature to support schools: the 1860 Swamp Act granted approximately 4.7 million acres, and the 1866 Internal Improvement Acts grant of 500,000 acres. By 1900, much of this land had been sold to raise an endowment for public schools. The trust relationship established between the federal government and the state requires the state to act with undivided loyalty as it manages the school lands to support public schools. Today, the DNR manages 2.5 million acres of school trust lands and an additional 1 million acres of mineral rights for long-term revenue generation. School trust lands cover 41,157 acres of the Landscape or 1.1 % of the 3,680,836 acre region and are scattered largely across the northeast portion of the region (Figure 3.6).

Figure 3.6. School trust fund lands in the East Central Landscape.



Source: MNDNR and MN Geospatial Commons.

Mineral Rights

Mineral ownership in Minnesota also has a long and complex history, and there are many different variations on mineral ownership. Sometimes the mineral rights associated with a tract of land are wholly owned by the same owner. In other cases, the mineral rights have been separated from the surface ownership and retained by a former owner, creating split estates. Generally, land ownership transfer documents, such as deeds, indicate ownership. These records are contained in each county's land records office.

The State of Minnesota is the largest single owner of mineral rights, controlling around 24% of all rights and managing these for the benefit of the permanent school and university trust funds and local taxing districts. The vast majority of mineral rights in the state, however, are owned by private parties.

In 1901, the state legislature passed a law requiring that the state retain the mineral rights upon the sale of any land that had been acquired by the state, except for the lands granted to aid in the construction of railroads. The policy of reserving mineral rights has now been extended to most of the other lands owned by the state, such as tax forfeited lands and consolidated conservation area lands.

The state's policy of reserving mineral rights when it sells the land means that the state owns more mineral rights than surface rights. It is estimated that the state owns approximately 12 million acres of mineral rights. The exact amount of mineral rights owned by the state is not known due to the lack of clarity in some tax forfeiture records and the lack of a comprehensive state inventory of all lands that have ever been forfeited for taxes.

For managers of mineral estates one of the highest priority items for landscape planning is access to land so that surveys and samples can be collected to evaluate the mineral estate, and to reduce the uncertainty of where mineral resources might be located in the landscape. However, since state mineral ownership is anchored in place by law, consolidation of surface lands does not result in consolidation of mineral estate. Instead it results in the creation of split estate ownership which can increase difficulty of access for mineral evaluation. So there is some challenge in balancing a desire for surface consolidation, and a desire to retain surface and mineral estate in a united title. Mineral managers would prefer to retain united estate in areas of higher mineral resource potential, and minimize restrictive designation that limits access, discovery, and development.

Section 4

Resource Assessment and Trends



This section summarizes an assessment of the forest resources in the East Central Landscape. It highlights resource trends and key findings made by the East Central Landscape Committee relating to forest resources in the region. It has been organized into four areas or resource initiatives including: 1) Ecological, 2) Economic, 3) Social, and 4) Administration/Coordination/Financial. This section is intended to serve as a foundation for the development of the strategic policy framework including desired future conditions, goals, and objectives provided in Section 6.

The Committee recognized that while topics in this section are categorized by ecological, economic, social, and administrative resource initiatives, the interconnected nature of these issues means that many topics can potentially be addressed under more than one heading. The following narrative starts with the list of assets and issues identified by the Committee. A summary of resource assessments and trends for each of the four resource initiatives follows the list of assets and issues.

A. Ecological Assets and Issues

Assets

- **Diverse ecological landscape.** Home to a variety of forest types, habitats, and many Species in Greatest Conservation Need (SGCN). The forests provide a wide range of ecosystem services such as source water protection, rainfall filtration, cool water temperatures, carbon sequestration, and nutrient cycling.
- **Significant water systems.** This landscape is home to regionally and locally significant lakes, wetlands, and rivers, such as the Mississippi River, St. Croix River, Rum River, and Mille Lacs Lake.
- **Healthy water resources.** Lakes, streams, and groundwater with higher water quality are in the most forested areas of the landscape.
- **Good data.** Available data and information about natural features, native plant communities and ecologically based forest management greatly enhance decision making.
- **Significant public lands.** Numerous large federal, state and county owned and managed tracts of forest land, parks, and wildlife areas.
- **Numerous family forests.** Large numbers of family forests with the potential for supporting the ecological resources.
- **Remaining oak savanna.** This landscape holds some of the last remaining oak savanna in the state.

Issues

- **Forest parcelization.** Forest parcelization results in reduced management due to operational difficulties. Parcelization is usually a precursor to conversion and fragmentation.

- **Habitat conversion and fragmentation.** Primarily urban development is impacting large areas of forests, wetlands, and savannas and shrinking blocks of intact habitat. The consequences of forest fragmentation include constrained movement of species, reduced forest interior habitat, and increased likelihood of invasive species, insects, and disease.
- **Threatened water quality.** Parts of the landscape have lower water quality, especially those areas with less forest cover.
- **Forest health threats:**
 - Climate change – Climate change is expected to have widespread effects on forest ecosystem health and resilience in Minnesota. Many of the important factors that influence forest composition and distribution are expected to change, including seasonal temperatures, the timing and type of precipitation, soil moisture patterns, the severity and frequency of natural disturbances such as blowdowns, and the abundance of pests and diseases.
 - Disease and pests – oak wilt, gypsy moth, emerald ash borer.
 - Invasive or exotic species – buckthorn, garlic mustard, honeysuckle.
 - Deer – browsing pressure from high deer populations is negatively impacting tree regeneration and understory plant growth.
 - Imbalance of age and forest type – past and current forest management practices and reduced harvesting have resulted in an imbalance of age-classes and forest types across the landscape.
- **Change in disturbances, both natural and managed:**
 - Lack of fire – fire is a critical component of fire-dependent communities such as oak savannas, although conducting prescribed burns is often difficult.
 - Lack of harvest disturbance – though not applicable everywhere, reduced levels of harvesting on private lands is reducing areas of early successional habitats.
- **Loss of brushlands.** Without periodic disturbance large areas of brushlands are aging and converting to other cover types.

B. Economic Assets and Issues

Assets

- **Highly-valued wild areas.** Large intact blocks of public forests and river corridors, such as those found in state parks and designated ‘wild and scenic’ rivers are major economic assets.
- **Forest lands close to high population areas.** Local economies are enhanced by the close proximity of the region’s forests to large metropolitan areas.
- **Ecosystem services.** Forests provide multiple economic services, such as water purification and carbon sequestration, which provide cost savings and potential revenue.
- **Private working forests.** Significant amounts of private working forests provide important ecosystem services and materials for the forest products industry.
- **Technical assistance.** Private landowners may receive technical assistance from any of several sources, including the DNR, SWCDs, NRCS, and private consultants.
- **Forest stewardship incentives:**
 - **Forest property tax programs.** Sustainable Forest Incentives Act (SFIA) and 2C Managed Forest tax classification helps to cover costs of forest land ownership, improve forest stewardship, and curbs parcelization and conversion of habitat.
 - **Availability of cost-share.** Both federal and state cost-share programs are available to help private landowners improve their forests.
- **Remaining forest product industries.** The remaining forest product industries provide some opportunities for forest management to be economically feasible.
- **Forest product industries.** Although there is untapped potential and opportunity for growth in some regions, primary and secondary wood product industries are sometimes available to help make forest management economically feasible.
- **Conifer plantations.** Pine and spruce plantations on both public and private lands are especially productive sources of valuable timber products, such as sawlogs and poles.
- **Non-timber forest products.** Non-timber forest products provide added economic opportunities such as maple syrup operations, hunting, and other non-timber uses.

Issues

- **Changing land ownership patterns.** Forest parcelization results in reduced management due to operational difficulties. Parcelization is usually a precursor to conversion and fragmentation.
- **Changing landowner values.** Other reasons for owning property such as recreation, scenic beauty, wildlife habitat, etc. are more highly valued than economic returns. Today’s forest landowners may require more education and outreach on the role that timber management can play in achieving multiple values.
- **Increasing property values.** Increases in property value often result in increases of taxes and divestiture of ownership, use of forest lands for purposes other than forest management, and makes it more financially difficult to transfer forest lands to heirs.
- **Globalization.** National and global competition makes it more challenging for Minnesota forest products industries to compete.

- **Reduced harvesting:**
 - Loss of industry: the loss of forest-based industries and forest operators make it more difficult for landowners to commercially manage their forests.
 - Fewer operators: The remaining industries and forest operators are fewer, and larger and less able to undertake smaller harvests on private lands.
 - Low timber quality: many of the stands available for harvest are older, decadent, and have low volumes and quality.
 - Less management for timber: many private landowners are less interested in actively managing their forest land for timber.
- **Lack of market for underutilized species.** Some species, such as tamarack and lowland hardwoods (ash), are not being sold at auctions and are at risk for converting to less productive forest types. This issue applies to both public and private lands.
- **Access.** Access issues are created by parcelization/patchwork ownerships, changes in weather patterns and other variables that create operational challenges for resource managers.

C. Social Assets and Issues

Assets

- **Outreach and education.** Many resources exist for promoting healthy and sustainable forests, including Master Woodland Owner, Minnesota Women’s Woodland Owner Network, American Tree Farm System, Master Gardener, Master Naturalist, MFA chapters, and school forests.
- **Diverse recreation opportunities.** Given the close proximity to the large metropolitan areas, the East Central forests are popular outdoor recreation destinations for a variety of opportunities in all seasons. Examples include a significant recreational trail system in the northeastern part of the landscape, state and county park systems, and multiple river corridors.
- **Highly valued rural/natural landscapes.** There is a strong desire by communities and individual landowners/users in the region to protect open space and rural character.
- **Non-profit organizations.** Potential for collaboration with organizations possessing an existing deep knowledge base.
- **Governmental organizations.** Federal, state, county, and local government bodies provide many resources to help people access and enjoy the outdoors.
- **Technology.** While the effects of technology on people’s daily lives have resulted in less time outdoors, technology can create new recreation opportunities. How can we use technology to help get people to enjoy more outdoor activities?
- **Groundwater recharge areas.** The East Central Landscape is home to key state groundwater resources, such as the Anoka Sand Plain, but land development can negatively impact them.
- **Substantial urban and community forest programs.** Urban and community forest programs, such as Tree City USA, are reminders about the importance of maintaining healthy trees in the communities.

Issues

- **Changing recreation preferences.** Pressure on public and private forest lands by many groups is increasing. Because of the close proximity to the major metropolitan area, there has been an increased interest and demand for one-day trips. Outdoor recreational pursuits can result in conflicts, such as between motorized and non-motorized uses.
- **Lack of awareness.** There is a lack of awareness about the importance of sustainable forest management by the public. Need for more education and assistance to private landowners.
- **Changing attitudes.** New people are moving into the region. They have non-traditional expectations about the natural resource base, forest, and outdoor recreation.
- **Shoreland/riparian development.** The continued demand for shoreland development continues to impact riparian forests, open wetlands, and lakes and stream water quality.
- **Expanding urban development.** Expanding development from urban centers continues to occur. This has implications for natural resources near development sites.
- **Challenges for networking and collaboration.** Other than through the MFRC East Central Landscape Committee, no organizing structure exists to draw together forest management stakeholders and encourage collaboration, information sharing, etc.

D. Key Resource Trends

The East Central Landscape Committee identified the following trends as having the greatest impact on the forest resource in the region.

Climate Change

- Climate change is impacting Minnesota’s forest in the form of warmer average annual temperatures, longer growing seasons, intermittent drought, more frequent freeze/thaw cycles, and more frequent and extreme storm events.
- Winters are becoming shorter and warmer, which creates operational difficulties for forest operators.
- A vulnerability assessment of the forest ecosystems in the Laurentian Mixed Forest Province determined that wet forest, forested rich peatlands, and acid peatland systems are among the most vulnerable forested native plant community systems to climate change, see Table 4.1.
- Climate impact models indicated that in a changing climate, the “winner” tree species in the East Central Landscape include American elm, bitternut hickory, black cherry, black oak, black willow, eastern cottonwood, eastern redcedar, eastern white pine, hackberry, shagbark hickory, silver maple, slippery elm, white ash, and white oak. The “loser” species include commercially and ecologically important species such as aspen/poplar and spruce species, birch, tamarack, and black ash.

Table 4.1. FEVAS vulnerability determination summaries.

Forest System	Potential Impacts	Adaptive Capacity	Vulnerability	Evidence	Agreement
Fire-Dependent Forest	Negative	Moderate-High	Moderate	Medium	Medium
Mesic Hardwood Forest	Moderate	Moderate-High	Moderate	Medium	Medium
Floodplain Forest	Moderate-Positive	Moderate	Low-Moderate	Limited-Medium	Medium
Wet Forest	Negative	Low	High	Limited-Medium	Medium
Forested Rich Peatland	Negative	Low	High	Medium	Medium-High
Acid Peatland	Negative	Low	High	Medium	Medium-High
Managed Aspen	Moderate-Negative	Moderate	Moderate-High	Medium	High
Managed Red Pine	Moderate-Negative	Moderate-Low	Moderate-High	Medium	Medium

Source: Handler et al. 2014; Forest Ecosystem Vulnerability Assessment and Synthesis (FEVAS).

Forest Health

- Native biodiversity is trending downward and competition from invasive species is a contributing factor. Common invasive plants in the East Central Landscape include spotted knapweed, European buckthorn, and exotic bush honeysuckles.
- Oak wilt continues to spread northward and remains among the most concerning plant pathogen in the East Central Landscape.
- Emerald Ash Borer (EAB) is another serious pest, and it has been identified in the Twin Cities Metro area and communities bordering the East Central Landscape. The region has thousands of acres of black ash communities that are at risk to EAB.
- In recent years flooding has damaged thousands of acres of forest in Minnesota, a significant portion of which are in the East Central Landscape.
- Urban forests are becoming more diverse as communities implement strategies to manage for resilience against pests and pathogens.

Habitat

- According to Forest Inventory and Analysis (FIA) data, since 1977 the forests in the East Central Landscape have been steadily accruing more acres in the 61+ age-classes, especially among private forest lands. Most of these 61+ age-class forests are in the oak/hickory group.
- The oak/hickory forest type group has significantly increased over the past 40 years and FIA estimates indicate that it has recently surpassed the aspen/birch forest type group as the most abundant group in the East Central Landscape (Figure 4.3).
- The amount of oak savanna in the East Central Landscape has decreased from 547,000 acres prior to European settlement to under 4,000 today. The remaining oak savanna covers just 0.7% of its former range (Figure 4.4)
- The quantity and quality of brushland habitat is decreasing.

Figure 4.1. Known high-risk range of oak wilt in Minnesota, May 2019.

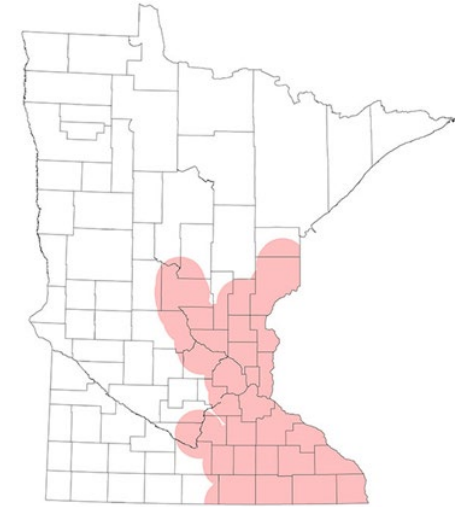


Figure 4.2. Forest land age class distribution in the East Central Landscape, 1977-2018.

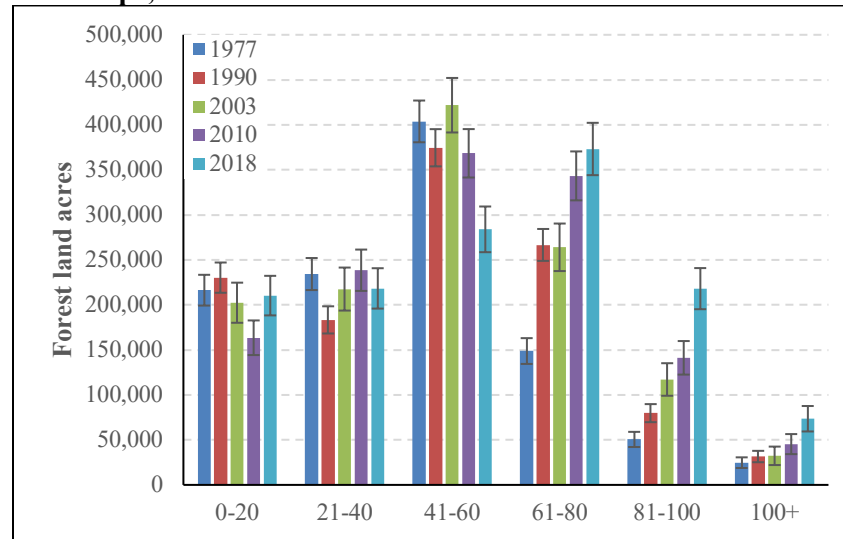
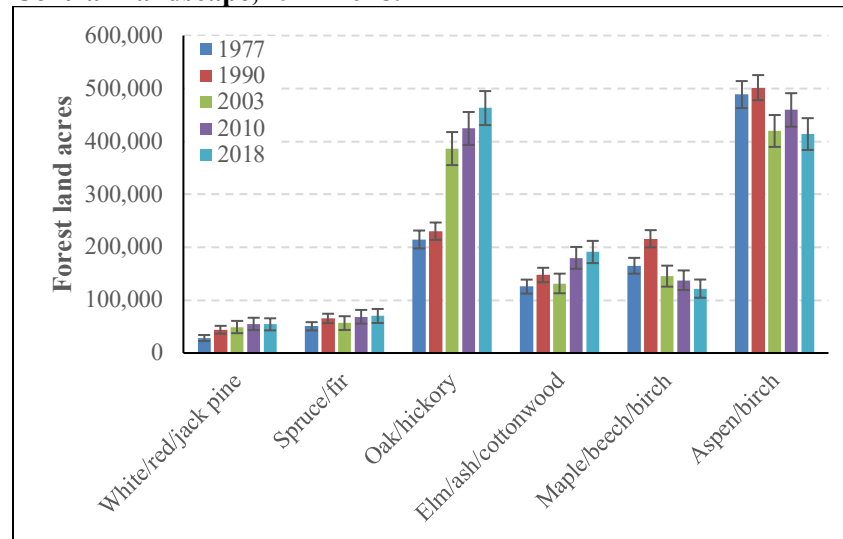


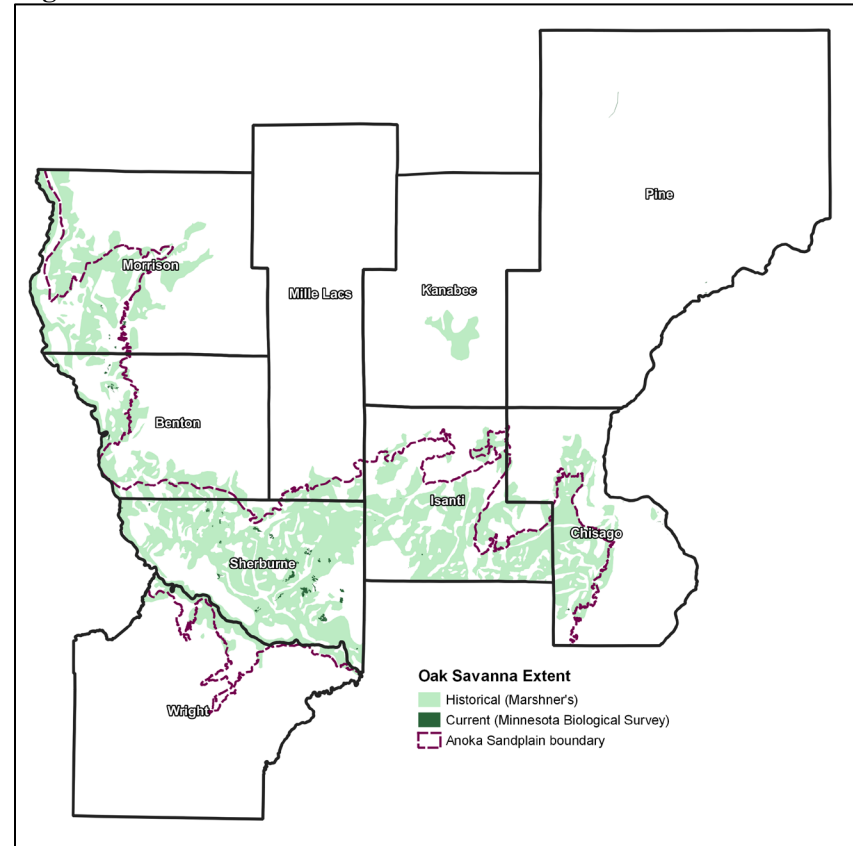
Figure 4.3. Forest land acres by FIA Forest Type Group in the East Central Landscape, 1977-2018.



Sources: Forest Inventory and Analysis.

Note: Error bars represent a 68 percent confidence interval around the estimated mean.

Figure 4.4. Historical and current extent of oak savanna.

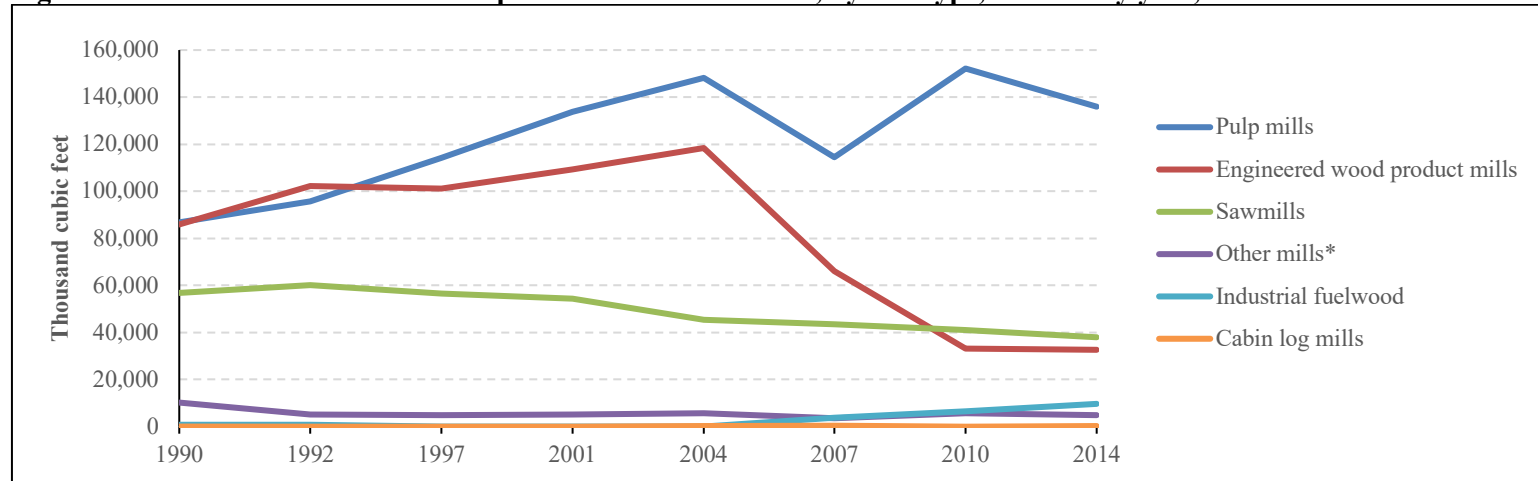


Land Ownership

- In Minnesota, 20% of National Woodland Owner Survey respondents indicated that they were ‘extremely likely’ or ‘likely’ to sell or give away their forest land in the next 5 years. This percentage jumps to 43% among respondents 75 years old or greater.
- [Some studies indicate](#) that younger cohorts of landowners are more likely than their older counterparts to think that cost-sharing programs are helpful and are more open to receiving advice on woodland management. The younger cohorts are also more interested in owning forest land for privacy and recreational opportunities.
- An estimated 37% of wooded acres in 10+ acre parcels in Minnesota fall within ownerships that are more than one mile from the owner’s home. According to the [Sustaining Family Forests Initiative](#), 85% of these landowners are classified as Prime Prospects. This means they have good stewardship attitudes but are not highly engaged in managing their land. Their largest reasons for owning the land are beauty and wildlife, and their largest concerns are keeping land intact and property taxes.
- Due to the significant extent of private forest lands, East Central forests have been and will continue to become more fragmented and older.

Forest Products Industry

- Wood mills surveys in Minnesota indicate that most mill types are consuming less industrial roundwood than they had in recent decades.
- Many mills, including those in and near the East Central Landscape, have downsized or permanently shut down over the past several years. The loss of these mills not only impacted the local wood market, but also the employment and income of hundreds of workers in a part of the state where good paying jobs are sorely needed.
- Benson Power, which was a biomass power plant near the East Central Landscape, closed in 2018. The loss of biomass plants and other mills that accept lower quality wood has a significant negative impact on the ability of landowners to manage their forests.

Figure 4.5. Industrial roundwood receipts in thousand cubic feet, by mill type, and survey year, Minnesota.

Source: FIA Northern Research Station, Timber Products Output.

*Other mills include veneer, excelsior/shaving mills, cooperage mills, post and pole mills, and other miscellaneous mills.

Table 4.2. Cumulative job losses in Minnesota's forest products industry.

Year	Mill	Location	Type of closure	Jobs lost	Cumulative
2002	Sappi Fine Paper	Cloquet	Restructuring	200	200
2003	UPM-Blandin	Grand Rapids	Shutdown paper machines	300	500
2007	Weyerhaeuser	Deerwood	Permanent closure	158	658
2008	Ainsworth	Grand Rapids, Cook, Bemidji	Permanent closure	435	1,093
2011	Verso*	Sartell	Shutdown paper machines	175	1,268
2012	Georgia Pacific	Duluth	Permanent closure	141	1,409
2012	Verso*	Sartell	Permanent closure	260	1,669
2013	Boise Paper	International Falls	Shutdown paper machines	300	1,969
2013	Wausau Paper*	Brainerd	Permanent closure	134	2,103
2018	UPM-Blandin	Grand Rapids	Shutdown paper machines	150	2,253

Source: Minnesota Forest Industries.

*These mills likely procured a significant amount of their workforce and wood from the East Central Landscape.

E. Committee Findings on Overall Resources in the East Central Landscape

- **Complex Landscape.** This region is a highly complex landscape with an abundance of interconnected ecological, economic, and social resources and values.
- **Potential Ecosystem Stress.** Native plant communities are potentially stressed by altered natural disturbance regimes, invasive species, and climate change.
- **Land Ownership.** The East Central Landscape’s ecological, economic, and social resources are all influenced by patterns of land ownerships. The region has some areas of patchwork ownership but is predominantly privately owned. The large private forest resource base creates both opportunities and challenges.
- **Tribal Interests.** The majority of the region is covered by the 1837 Treaty.
- **Water Resources of National Significance.** This region encompasses water resources - including lakes, stream, and wetlands - that are nationally significant and provides drinking water for millions of people downstream. Landscape decisions will therefore have long-term significant impacts on water quality and availability on both a regional and national level.
- **Water Quality/Forest Connection.** Water quality is directly linked to healthy forests.
- **Recreation and Forest Products.** The local economy is diverse and includes the forest industry and outdoor recreation. Effective management of natural resources for multiple objectives is important to maintain and enhance the region’s economic and social well-being.
- **Forest Management Challenges.** Due to cost-limiting distance to markets, forest management through commercial harvesting is challenging in the East Central Landscape.
- **Forest Fragmentation.** A significant portion of the land base in the region is at risk to parcelization, fragmentation, and land use change. In particular, urban development is expanding outward from the metro region and intergenerational land transfers are contributing factors.
- **Habitat Change.** Forests and brushlands are aging and resulting in less early successional habitat.

F. Conclusion

Through the resource assessment process described in this section, the Committee has made a direct and intentional effort to give equal consideration to long-term ecological, economic and social needs and limits facing the forest resources in the East Central landscape. It has also added consideration to administrative, coordinative and financial aspects.

This work has helped to increase understandings and build a shared perspective on forest resource issues and challenges in the region for the Committee. It should be reviewed by users of the Plan to help them participate more effectively in the implementation of the Plan.

The findings provide a summary of the topics studied by the Committee in this planning process provide a substantial starting point or foundation for developing the policy framework in this Plan. This summary, along with the background studies and research, are intended to provide a logical and rational basis for the policy framework described in Sections 6-8.

Part 2. Strategic Policy Framework:

Where do we want to go?

Section 5

Working Principles and Definitions



A. Working Principles

These working principles summarize how the Committee views the context of the forests in the East Central Landscape over time and how they recommend interested stakeholders pursue sustainable forest management in the future:

Principle 1. Promote a Shared Understanding of the Forest Resources in the Region.

- Understanding the historical and current conditions of the forest resources in the East Central Landscape is important when making management decisions.
- Forest ecosystems and the climate are dynamic and it will not always be practical to restore historical conditions.
- Collective knowledge should be used deliberately to steer a stand/forest/landscape toward a future desirable and attainable condition.

Principle 2. Use Best Available Science, Traditional Knowledge, and Professional Judgment to Inform Decision Making.

- The Committee recognizes that forest ecosystems are complex and dynamic and that science is an ongoing endeavor.
- A wealth of data, models, and tools are available to help partners better understand forest ecosystems.
- Biodiversity and habitat considerations should help inform management decisions.
- We commit to using the best available science, traditional knowledge, and professional judgement to inform decisions.

Principle 3. Work Collaboratively to Sustainably Manage Forest Resources Across All Lands in the Landscape.

- The Committee recognizes that forest conditions, patterns of ownerships, and interests of land managers vary broadly across the region.
- The Committee recommends an ecologically based approach to land management and development in the region, such as the Ecological Classification System (ECS), as a means to plan and guide forest management activities.
- The Committee further recognizes the continuum of forestry practices and that forest management involves a number of conditions and approaches. There are different types of forests for different needs and landowner objectives.
- When possible, metrics following the SAM principle (Specific, Attainable, and Measurable) will be developed for goals and objectives to track accomplishments.
- By working collaboratively, the region's landowners and managers contribute to sustainably managed forest resources across the landscape.

Principle 4. Recognize the Challenges of Private Land and Population Growth.

- The Committee recognizes the challenges posed by the abundance of private land in the region, as well as an expanding population near the metro area.
- Goals, objectives, and strategies for enhancing private forest land management are priorities.
- Policy and management decisions should consider the impact of population growth and forest land parcelization.

Principle 5. The East Central Landscape Committee Recognizes Healthy Forest-based Industry is the Most Significant Tool for Sustainably Managing Forests.

- Sustainable forest management usually incurs costs, often large, and typically in the form of labor, equipment, and fuel.
- In addition to employment benefits, a healthy forest-based industry provides a market for forest products, which can offset the cost of forest management and provide incentives for landowners to retain forests and continue sustainable forest management practices.
- The East Central Landscape Committee recognizes that a healthy forest-based industry is the most significant tool for sustainably managing forests, and it is in the Committee's best interest to support efforts to retain existing markets, attract new markets, and promote new forest products.

B. Overview: Planning Terms

These are the terms used to organize the ideas and concepts used for the planning process:

Desired Future Condition. Desired Future Conditions (DFC) are broad overarching statements that 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. This plan used a one hundred (100) year horizon when describing the desired future conditions of forests.

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 ecological economic or social 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 Committee thought needed to be pursued over the next ten to twenty (10 – 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 more specific direction in implementing the goals. Often, objectives will include quantifiable targets as means to provide more specific and measurable parameters for monitoring progress. The initial direction and description of programs and projects are usually found in objective statements.

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Section 6

Desired Future Conditions, Goals, and Objectives



This section of the Plan further describes the vision for the future forest conditions across the East Central Landscape by providing the Desired Future Conditions and the approaches (Goals and Objectives) to promote the management of healthy forests in the region. The SFRA requires the MFRC and its regional committees give equal consideration to the long-term ecological, economical, and social needs and limits of the state's forest resources. The Committee addressed this legislative directive by organizing this section of the plan into ecological, economic, social, and coordination resource initiatives. The Committee recognized that there is significant overlap of topics between these resource initiatives (e.g., water quality is both an ecological and social issue) and cross-references are provided where appropriate.

Throughout this plan and in the development of the initiatives described below, it is a shared understanding that partners will implement the MFRC management guidelines when managing forest resources in the region. These measures are described in [Sustaining Minnesota's Forest Resources: Voluntary Site-Level Management Guidelines](#). It is also an understanding that the Committee will not be directly implementing all the goals and objectives in the Plan but encourages partner to adopt these directions and will promote and support efforts to carry them out.

During the planning process numerous action items and strategies were proposed to accompany the objectives in this section and provide more specific guidance. To keep the plan concise and readable these action items and strategies were moved to [Appendix D](#).



A. Ecological Resource Initiatives

From an ecological perspective, in 100 years the East Central Landscape Committee envisions a landscape with the following Desired Future Conditions (DFCs):

- **DFC 1: Healthy, Resilient, and Sustainable Forests.** Forests in the East Central Landscape are healthy and managed using science-based ecological principles. The East Central Landscape Committee envisions a forest that:
 - is resilient to threats such as climate change, invasive species, pests, and pathogens
 - has a variability of land cover types and age-classes that are consistent with the ecology of landscape, and
 - provides diverse habitats that maintain natural communities and viable populations of native plant and wildlife species in east central Minnesota.
- **DFC 2: Improved and Protected Water Resources.** Both landowners and local units of government recognize that healthy forests and wetlands managed at the watershed level are key to protecting water quality and quantity while maintaining the functionality of our hydrological systems and benefiting aquatic and riparian wildlife. Evaluation of forest and wetland cover is an integral component in the local land use planning process. Forest management is integrated into all water resource initiatives in the East Central Landscape to maintain quality water resources where they exist and restore or enhance impaired waters when necessary.

What is Forest Resilience?

Forest resilience is the capacity of a forest to withstand or recover from disturbance and stress. Characteristics of resilient forests include:

- Minimal forest stress
- High forest complexity (structure and species)
- Healthy soil conditions and protected water resources
- Threatened, endangered, and at-risk species are protected

The following ecological goals and objectives outline the steps the Committee believes are necessary to achieve the Desired Future Conditions (DFCs):

Goal 1: Protect, maintain, and increase ecologically sound and climate resilient forests in the East Central Landscape.

Objective 1: Evaluate Forest Resources. Identify, assess, and document all forest resources in the East Central Landscape. Include projections and impacts from climate change, along with suggested adaptation strategies.

Objective 2: Support Public Outreach. Distribute information and increase awareness on the importance of protecting forest resources, sustainable forest management, and existing forestry programs that can help landowners, land managers, government decision makers, and the general public to protect, enhance, and restore native forests in the East Central Landscape. *Also see [Economic Goal 1 Objective 7](#) (Inform and Support Landowners) and [Social Goal 1 Objective 1](#) (Implement Outreach).*

Objective 3: Support Conservation Programs and Projects. Develop, coordinate, and implement sustainable forest management programs and projects that foster native biodiversity by protecting, enhancing, and restoring forests and related wetland, brushland, and grassland ecosystems.

Objective 4: Monitor and Control Invasive Species, Pests, and Pathogens. Prevent and/or control the spread of non-native plants, animals, and pathogens. *Also see [Economic Goal 1 Objective 3](#) (Enhance Forest Health and Resilience).*

Objective 5: Restore Forests. Reforest historically forested lands with tree and shrub species appropriate to the native plant community, to the extent possible.

Objective 6: Promote Spatial Connectivity. Maximize forest connectivity and limit fragmentation to benefit native plant and wildlife species and increase landscape resiliency.

Objective 7: Enhance Forest Diversity. Increase native biological and ecological community composition, as well as species, age, and structural diversity of forests within and between stands to increase ecosystem resiliency. *Also see [Economic Goal 1 Objective 2](#) (Increase Cover Type and Age-Class Diversity).*

Objective 8: Conserve Rare Species. Consider and promote management objectives to fulfill the needs of endangered, threatened, and special concern plant and wildlife species in forest planning.

Objective 9: Increase Private Forest Management to protect forest cover, reforest historically forested lands, and improve forest health and resiliency on private lands. See [Appendix K](#) for a listing of private landowner assistance programs. *Also see [Social Goal 1 Objective 2](#) (Assist Landowners) and [Coordination Goal 3 Objective 1](#) (Enhance Technical Assistance).*

Objective 10: Implement Forest Carbon Projects. Increase the number and acres of forest carbon offset projects.

Goal 2: Improve water quality and storage capacity through forest management.

Objective 1: Integrate Forest/Watershed Management Planning. Integrate forest management into water resource management via watershed-based landscape stewardship plans and One Watershed, One Plan.

Objective 2: Evaluate Riparian Areas. Identify and prioritize riparian areas for protection or restoration.

Objective 3: Increase Forested Riparian Buffers along lakes and streams.

Objective 4: Support Site Level Guidelines. Support efforts by the MFRC site level program to implement the site-level guidelines/BMPs.

Objective 5. Protect Private Forest Lands. Use tax incentive programs (e.g., SFIA, 2C), easements, and public land acquisition as tools to increase protection of private forest lands in priority watersheds. Follow the guidance set forth in watershed-based landscape stewardship plans (e.g., Rum River LSP, Kettle River LSP) to target protection efforts.

Goal 3: Increase the knowledge and understanding among natural resource professionals and landowners about forest resources within the East Central Landscape to help coordinate management efforts and improve outcomes.

Objective 1: Prepare Forest Spatial Analyses Report. Develop a detailed assessment of past, existing, and projected future spatial and composition patterns of the major forested areas in the East Central Landscape.

Objective 2: Support Cooperative Forest Planning. Develop a cooperative forest planning program for local units of government, counties, tribes, and other local organizations in the region to develop forest management plans and priority conservation initiatives.

Objective 3: Monitor Forest Land Cover. Monitor the extent, composition, and age-classes of public and private forest land in the East Central Landscape.

Objective 4: Set Vegetation Targets. Develop vegetation restoration and age class targets in acres for the following scales: 1) the East Central Landscape, 2) the three major subsections (Mille Lacs, Anoka Sand Plains, and Big Woods) and 3) each of the nine counties.



B. Economic Resource Initiatives

From an economic perspective, in 100 years the East Central Landscape Committee envisions a landscape with the following Desired Future Conditions (DFCs):

- DFC 1: Sustainable Use of Forest Resources.** A wide range of forest products and services are sustainably produced which support local economies while maintaining biological and ecological integrity. The landscape has forests that appeal to the evolving values of residents, tourists, and outdoor enthusiasts. A broad range of opportunities in the forests are available to the public consistent with tribal interests, respect for private property rights, high quality of life enjoyed by residents, and protection of the natural resource base.
- DFC 2: Adaptive Forest Products Industry.** The forest supports both traditional forest industries as well as emerging opportunities, including ecosystem services, and ensures sustainable forest management.
- DFC 3: Informed Landscape Planning and Development Decisions.** Land use and development across the landscape are strategically planned using the best available data to minimize fragmentation and preserve contiguous blocks of healthy forests connected by green corridors. Forest, wildlife, and water resources are considered in land planning and management.



The following economic goals and objectives outline the steps the Committee believes are necessary to achieve the Desired Future Conditions (DFCs):

Goal 1: Promote sustainable timber production and expanded use of forest products harvested from the East Central Landscape.

Objective 1: Improve Forest Productivity. Work with landowners, foresters, loggers, agencies, and others in the forest products industry to improve forest productivity consistent with landowner objectives and consideration for the site's ecology.

Objective 2: Increase Cover Type and Age-Class Diversity. Manage for a mix of age classes and site appropriate cover types across ownerships to maintain or increase sustainable harvest levels and support forest based economies. *Also see [Ecological Goal 1 Objective 7 \(Enhance Forest Diversity\)](#).*

Objective 3: Enhance Forest Health and Resilience. Work with landowners to identify and mitigate threats to forest health and timber quality such as invasive species, pests, diseases, drought, wildfire, windthrow, etc. *Also see [Ecological Goal 1 Objective 4 \(Monitor and Control Invasive Species, Pests, and Pathogens\)](#).*

Objective 4: Advance Research and Development. Support research and development projects that promote sustainable forest management specific to the East Central Landscape.

Objective 5: Strengthen Markets and Utilization. Support existing industries and develop and/or expand wood product markets to improve utilization of forest resources, including brushland. Ensure that economic development efforts include the secondary forest products industry and niche markets.

Objective 6: Multiple Use Management. Look for opportunities to achieve multiple resource objectives while providing sufficient forest products to sustain current and future forest-based industries in the region.

Objective 7: Inform and Support Landowners. Provide opportunities to help landowners understand the connection between commercial forest management (including harvesting) and habitat health. Support additional outreach initiatives including tax incentive programs, sustainable harvest guidelines, and habitat best management practices. *Also see [Ecological Goal 1 Objective 2](#) (Support Public Outreach) and [Social Goal 1 Objective 1](#) (Implement Outreach).*

Objective 8: Collaborative Management and Education. Promote cooperative and collaborative education efforts that support economic benefits of forest management and effective water protection and other diverse benefits.

Objective 9: Monitor and Support Outreach About the Regional Forest Economy. Increase awareness of the breadth of the region’s forest products economy, which covers a large range of products and services that include – but is not limited to – traditional forest products, non-timber forest products, recreation, and ecosystem services (clean air, water, carbon sequestration, etc.).

For additional objectives about enhancing private forest management see [Ecological Goal 1 Objective 9](#) (Increase Private Forest Management), [Social Goal 1 Objective 2](#) (Assist Landowners), and [Coordination Goal 3 Objective 1](#) (Enhance Technical Assistance).

Goal 2: Integrate sustainable forest management into land use planning and decision-making processes.
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Objective 1: Support County and Community Planning. Support and advocate sustainable forest management concepts through local land use planning, plan implementation, and private land development.

Objective 2: Consider Other Plans. Consider and implement concepts from other forest resource plans.

Goal 3: Promote forestry-based recreation and tourism.

Objective 1: Increase Public Awareness. Increase accessibility of information about the benefits that forests provide to tourism and recreation, and the potential impacts from use.

Objective 2: Promote Recreation Planning. Plan for future recreation systems in the region. Encourage the integration of sustainable forest management practices in the local, county, regional, state, and federal planning and implementation programs.

C. Social Resource Initiatives

From a social perspective, in 100 years the East Central Landscape Committee envisions a landscape with the following Desired Future Conditions (DFCs):

- **DFC 1: Strong Cultural Connection to Forests.** People living, working, and recreating in the East Central Landscape are more closely connected to the forests and the landscape. They recognize the value of historical connections and the need for leaving the legacy of healthy forests for future generations. People have a greater awareness of the importance of forests from ecological, economic, social, and traditional perspectives.
- **DFC 2: Diverse Users.** People from diverse backgrounds are engaged in forest uses and advocacy.



The following social goals and objectives outline the steps the Committee believes are necessary to achieve the Desired Future Conditions (DFCs):

Goal 1: Increase the public awareness, including private landowners, about the importance of sustainable forest management.

Objective 1: Implement Outreach. Increase accessibility of information through resource professionals, events, and multiple media outlets about the Sustainable Forest Resources Act (SFRA), the Minnesota Forest Resources Council (MFRC), the landscape program, and other plans. *Also see [Ecological Goal 1 Objective 2](#) (Support Public Outreach) and [Economic Goal 1 Objective 7](#) (Inform and Support Landowners).*

Objective 2: Assist Landowners. Encourage and support landowner assistance in sustainable forest management and coordination and collaboration across property boundaries, from back yards to back forties. See [Appendix K](#) for a listing of private landowner assistance programs. *Also see [Ecological Goal 1 Objective 9](#) (Increase Private Forest Management) and [Coordination Goal 3 Objective 1](#) (Enhance Technical Assistance).*

Goal 2: Promote the wellbeing of the people living, working, and recreating in the region through sustainable forest management.

Objective 1: Foster Sense of Place. Support community efforts such as scenic roadway designations and other community design programs that encourage sustainable forest management.

Objective 2: Promote Community Forestry. Support and assist communities to develop and implement community forestry programs, such as School Forests.

Objective 3: Support Wild and Natural Areas. Connect local organizations and conservation organizations with state and federal agencies in managing and maintaining wild and natural areas.

Goal 3: Promote diverse forest uses.

Objective 1: Conduct Public Outreach. Increase awareness of opportunities on public land.

Objective 2: Conduct Private Outreach. Increase awareness of non-extractive forest uses to private landowners while respecting landowners' values.

Economic Goal 3 *(Promote forestry-based recreation and tourism) also supports the Social DFCs.*

D. Administration/Coordination/Financial Initiatives

From a coordination perspective, in 100 years the East Central Landscape Committee envisions a landscape with the following Desired Future Condition (DFC):

- **DFC 1: Shared Stewardship Management Approach.** Landscape planning is universally practiced and part of standard operating procedures to enhance management across multiple ownerships. Coordinated and collaborative management of East Central Landscape's forest resources is a thoroughly established practice. Landowners, local officials, local nonprofits and agency staff work collaboratively on both the planning and management of forest resources to achieve the goals set forth in this plan.

The following coordination goals and objectives outline the steps the Committee believes are necessary to achieve the Desired Future Condition (DFC):

Goal 1: Increase coordination of sustainable forest management in the East Central Landscape.
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Objective 1: Establish Landscape Committee. Form an East Central Landscape Committee to oversee the overall coordination and implementation of this Plan.

Objective 2: Promote Shared Stewardship. Facilitate communication and establish working relationships between the East Central Landscape Committee, land managers, and other key stakeholders.

Objective 3: Improve Private Landowner Cooperation. Develop cooperative land management approach across ownerships (peer to peer networking). Capitalize on MFA, MNWWN, and Master Woodland Owner Program.

Goal 2: Promote public involvement in sustainable forest management throughout the East Central Landscape and build leadership capacity to maintain sustainable forest management.

Objective 1: Implement Public Outreach. Increase awareness and appreciation among the public, local officials, and natural resource professionals about efforts being undertaken by the East Central Landscape Committee to promote sustainable forest management and communicate ways they can get involved.

Objective 2: Support Volunteerism. Establish approaches for recruiting and organizing volunteers to help implement specific forest stewardship projects and activities as outlined in this plan and as developed by the Landscape Committee and its subcommittees.

Objective 3: Develop Local Leadership. Work with foundations and organizations to support the development of a natural resource leadership training program for the East Central Landscape that focuses on sustainable forest management.

Objective 4. Survey Public Attitudes. Periodically gather public opinion regarding the work being completed by the East Central Landscape Committee, the MFRC, resource agencies, and organizations managing forests in the region.

Goal 3: Expand and improve assistance to stakeholders regarding sustainable forest management.

Objective 1: Enhance Technical Assistance. Enhance the coordination and delivery of technical assistance to private landowners, tribal agencies, loggers, forest industries, and local land use officials. See [Appendix K](#) for a listing of private landowner assistance programs. [Ecological Goal 1 Objective 9](#) (*Increase Private Forest Management*) and [Social Goal 1 Objective 2](#) (*Assist Landowners*).

Objective 2: Promote Use of Research. Ensure natural resource professionals, loggers, and other forest operators are working with the most recent research and recommendations.

Goal 4: Expand the financial resources available to support the implementation of this Plan and to enhance the quality of technical assistance provided to landowners in the region on sustainable forest management.

Objective 1: Advocate for Funding. Develop and pursue outside funding sources (in addition to the MFRC budget) and leverage collaborative assistance to identify and finance priority stewardship projects.

Objective 2: Support Budget Development. Encourage adequate budgets to implement the actions outlined in this Plan and those developed by the East Central Landscape Committee.

[Ecological Goal 3](#) (*Increase the knowledge and understanding among natural resource professionals and landowners about forest resources within the East Central Landscape to help coordinate management efforts and improve outcomes*) also supports the *Coordination DFC*.

Section 7

Vegetation Management Framework



This section of the Plan further provides land managers with more specific guidance for achieving the Plan’s broader ecological goals and moving the landscape towards the Desired Future Conditions described in Section 6. It accomplishes this by providing guidance regarding A) Native Plant Community Management and B) Open Landscape Habitat Management. Together, these directions assist in managing forest land while considering the existing and potential future environmental conditions of each site.

A. Native Plant Community Management

The 2005 East Central Landscape Plan laid out several broad ecological goals but did not provide specific goals for the various plant communities that are found in the region. For this 2nd generation plan the East Central Landscape Planning Committee developed goals, strategies, and potential projects specific to the forested native plant community (NPC) systems. The Landscape Committee used several sources of information including, but not limited to: NPC descriptions and disturbance regime history, climate change projections, Public Land Survey interpretations, Forest Inventory and Analysis data, and MN DNR Tree Suitability Tables, in addition to social and economic considerations to determine the 100-year goals and strategies.

This part of the Plan provides landowners and managers an assessment of the native plant communities in the East Central Landscape along with a more detailed goals and strategies. These goals and strategies are based on the MN DNR’s NPC Classification Framework at the ecological system level. For more information on NPCs and NPC Classification Systems see the Field Guide to Native Plant Communities of Minnesota, visit MN DNR’s Ecological Classification System (ECS) website (<https://www.dnr.state.mn.us/ecs/index.html>), or see [Appendix E](#).

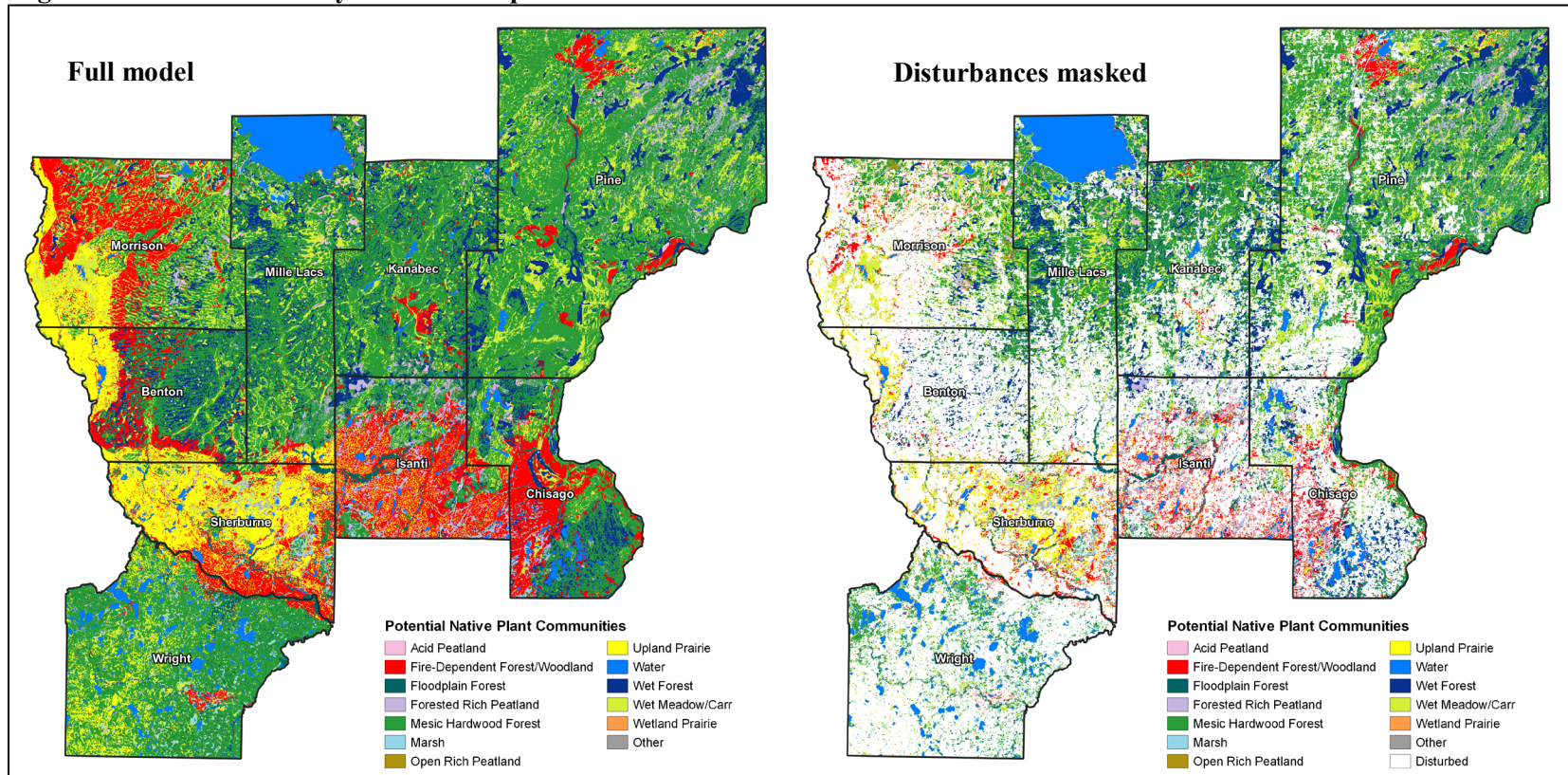
Land managers and owners are encouraged to adopt and implement these goals and strategies as well as support the recommended collaborative projects. Users seeking further guidance on forest stand management and prescription writing may also consult MN DNR’s NPC Silviculture Strategies for Forest Stand Prescriptions website (https://www.dnr.state.mn.us/forestry/ecs_silv/npc/index.html). Partners are encouraged to view ECS and NPC as tools to provide relevant information to their decision making processes. These concepts are not an end or a goal in and of themselves. The Landscape Committee further encourages landowners to use these concepts as ways to mimic natural systems and habitats to promote sustainable management of forests across the East Central Landscape.

Native Plant Community Assessment

Potential Native Plant Communities

As of writing this plan, the best available estimate of the extent and distribution of native plant communities (NPC) across all ownerships in the East Central Landscape comes from the potential NPC geospatial data developed by researchers at the Natural Resources Research Institute. Figure 7.1 shows the full map of the potential NPC systems in the landscape – which is an estimate of the NPC systems if no land use conversion/disturbance had occurred – as well as a map showing the potential NPC systems with the disturbances masked. Estimates of NPC area as shown later in this section is derived from the potential NPC data with disturbances masked.

Figure 7.1. Potential NPC system level map without and with masked disturbed areas*.



Source: Natural Resources Research Institute and MN Geospatial Commons.

*Disturbed areas included the following 2012 NLCD classes: cultivated crops, pasture/hay, and developed (open, low, medium, and high intensity).

Native Plant Community Values

Prior to developing NPC-based goals and strategies, the East Central Landscape developed a value ranking for each forested NPC system regarding its forest productivity, recreation opportunities, and ecological vulnerability (Table 7.). Table 7. also indicates the climate vulnerability of each NPC system as determined by a panel of experts and reported in the 2014 Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis report.

Table 7.1. Forest management values – High (H), Medium (M), or Low (L).

Code	NPC System	Description	Forest Productivity	Recreation Opportunities	Ecological Vulnerability	Climate Ch. Vulnerability*
FD	Fire Dependent	Strongly influenced by wildfires, coarse or gravelly soils or thin soils over bedrock.	H/M	H	H/M	M
MH	Mesic Hardwood	Upland sites with moist soils, usually protected from fire.	H	H	M/L	M
AP	Acid Peatlands	Conifer, low shrub peat communities, acidic soils, extremely low nutrients, hydrology precipitation based.	L	L	M	H
FP	Forest Rich Peatlands	Conifer tall shrub wetlands on deep actively forming peat, poorly drained level basins.	L	L	M	H
FF	Floodplain Forest	Occasionally or annually flooded sites on terraces and floodplains of streams and rivers.	M	M	H/M	M/L
WF	Wet Forest	Located in narrow zones along lakes, rivers and peatlands. Also occurs in shallow depressions or other settings where groundwater is near the surface.	M	M	H	H

Source: MFRC East Central Landscape Committee and *Forest Ecosystem Vulnerability Assessment and Synthesis (Handler et al. 2014).

Fire-Dependent NPC System Goals and Strategies

Description:

As the name implies, Fire-Dependent Forest (FD) communities are strongly influenced by wildfires. Fires are the major source of species mortality and exert strong influence on patterns of plant reproduction by exposing mineral soil seedbeds, triggering dispersal of propagules, and increasing the amount of light reaching the ground or understory. Fires periodically remove much of the litter, duff, and other organic material from the community and can have a significant effect on nutrient cycling and nutrient availability. In the Laurentian Mixed Forest Province FD communities are characterized by prevalence of evergreen species, most visibly pines and other conifers, while in the Eastern Broadleaf Forest Province the dominant trees of FD communities are oaks and aspen.



Within the East Central Landscape FD communities:

- Cover 4% of the region.
- Face management challenges such as:
 - Potential reduction in habitat quality/plant diversity due to development, change in land use, and fire suppression.
 - Difficult to implement controlled burns because of:
 - Fragmented ownership – who pays for fire insurance and equipment?
 - Lack of understanding by the public and landowners in the southern part of the landscape about the importance of controlled burns.
 - Private property safety/liability of controlled burns.
 - Cost-effectiveness of refugia provisions when conducting prescribed burns.
 - Small lots and agriculture.
 - Oak wilt.
 - Deer herbivory.

NPC Goals and Strategies:

Goal 1: No net loss of fire-dependent forests.

- Replant or use natural regeneration prescriptions of pine where appropriate.
- Increase management in high production areas.
- Activity manage fire dependent communities to favor fire dependent species.
- Emulate natural disturbances with prescribed fire and silvicultural practices.
- Reduce encroaching mesic species (red maple, basswood, aspen etc.).

Goal 2: Maintain and increase the presence of conifers in the NPC classes to which they are suited – principally the FDn and FDc classes.

- Reserve canopy conifer species where appropriate.
- Plant and manage conifers in locations where ecologically appropriate.
- Release and/or retain areas of white pine regeneration.

Goal 3: Maintain or restore fire where possible.

- Focus efforts on private and state lands, where more fire-dependent acres occur.
- Promote prescribed burns as an essential component to fire-dependent habitats.
- Allow fires to burn out where appropriate and allow a longer burn window before putting out fires.
- Work with blocks of landowners to coordinate prescribed burns.
- Incorporate neighboring private lands in a public burns co-op.
- Increase cost-share for prescription burns on private lands.
- Encourage the legislature to increase money for insurance and equipment to manage burns.
- Follow the Crex Meadows and Northwest Sands model for prescribed burns.
- Conduct outreach and increase transparency prior to conducting burns.
- Support efforts of the MN Prescribed Fire Council.

Goal 4: Emulate natural disturbances across various land ownerships to promote fire-dependent species.

- Design and implement silvicultural prescriptions to emulate natural disturbances.
- In addition to emulating natural disturbances at the site scale with silvicultural practices (see previous bullet), plan management activities to reproduce patterns of natural disturbances at the neighborhood and landscape scale.

Goal 5: Provide public outreach and education on the importance of disturbance in fire-dependent ecological communities.

- Promote responsible prescribed fire on private lands across ownership boundaries.
- Promote the MN DNR Firewise program (<https://www.dnr.state.mn.us/firewise/index.html>).

Goal 6: Contain oak wilt.

- Provide public education and outreach about oak wilt and its prevention (i.e., don't move firewood).
- Provide cost share to manage oak wilt.
- Empower local government units with information on preventing oak wilt during development.

Potential Collaboration Projects:

Outreach & Education Projects

- Workshops at Sherburne NWR and Camp Ripley on managing fire-dependent communities.
- O & E on oak wilt and bur oak blight.

Research and Development Projects

- Oak wilt surveys and treatments.
- Treatment and prevention of Heterobasidion Root Disease (HRD).
- Effects of prescribed fire in different seasons.
- Effects of prescribed burns compared to emulating natural disturbances through silviculture.
- Potential for assisted migration involving oaks and other fire-dependent species.

Opportunity Area Projects – Pilots or Demonstration Projects

- Pilot project for managing fire-dependent NPC systems - potentially located in Isanti and Chisago counties where there seems to be the most concentrated area for fire-dependent NPC systems

Mesic Hardwood NPC System Goals and Strategies

Description:

Mesic Hardwood Forest (MH) communities are present on upland sites with moist soils, usually in settings protected from fire. They are characterized by continuous, often dense, canopies of deciduous trees, including sugar maple, basswood, paper birch, and northern red oak, and understories with shade-adapted shrubs and herbs.

Within the East Central Landscape MH communities:

- Cover 22% of the region.
- Face management challenges such as:
 - Oak wilt.
 - Deer herbivory.
 - Exotic earthworms.
 - Invasive plant species – garlic mustard, European buckthorn.



NPC Goals and Strategies:

Goal 1: Maintain and enhance species and age class diversity at multiple scales (landscape to site-level).

- Underplant to diversify hardwoods and strategically incorporate climate change winners into the planting mixes.
- Protect rare species such as butternut and hickory.
- Plant mesic-adapted conifers in MHn sites which lack natural regeneration follow logging activities.
- Manage for brushland and openland habitat where appropriate.
- Reserve patches of white pine and red pine legacy trees.
- Promote management for high-quality early successional forest habitats.

Goal 2: Maintain healthy aspen forests across the landscape.

- Favor clumping residuals or legacy patches over single-tree retention.
- Diversify stands by retaining priority non-aspen species and planting conifers in recently harvested areas that lack natural regeneration.
- Promote salvage management of degraded or damaged stands.
- Prioritize harvest of older aspen stands before stand degradation occurs.
- Encourage conversion of degraded aspen stands to other forest types.

Goal 3: Maintain oak as a component.

- Prioritize retention of oak patches and larger trees (>15" DBH) during harvest.
- Apply intermediate treatments to encourage future oak.
- Implement crop tree release where needed.

- Provide public education and outreach about oak wilt and its prevention (i.e., don't move firewood).
- Provide cost share to manage oak wilt.
- Empower local government units with information on preventing oak wilt during development.
- Control deer damage to seedlings with bud capping, fencing, etc. and by introducing forestry concerns during deer planning initiatives.

Potential Collaboration Projects:

Outreach & Education Projects

- O & E on EAB, oak wilt, and bur oak blight.

Research and Development Projects

- Oak wilt surveys and treatments.
- Long-term silvicultural trials to improve quality in northern hardwood and mixed oak stands.
- Comparison of increased deer hunting pressure vs deer exclosures to promote oak regeneration.

Acid and Forested Rich Peatland NPC System Goals and Strategies

Note to reader: due to similarities in forest composition and management challenges, guidance regarding the management of acid peatland and forested rich peatland NPC systems were grouped together.

Description:

Acid Peatland (AP) and Forested Rich Peatland (FRP) are characterized by conifer or shrub dominated wetlands on deep peat (>15 in). AP communities develop in association with peat-forming *Sphagnum*, are acidic (pH < 5.5), extremely low in nutrients, and have hydrological inputs dominated by precipitation rather than groundwater. FRP communities are characterized by mossy ground layers, often with abundant shrubs and forbs. Both communities support forests of black spruce and tamarack, but FRP communities may additionally have white cedar, balsam fir, and paper birch.



Within the East Central Landscape AP and FRP communities:

- Cover 4% of the region.
- Face management challenges such as:
 - Eastern larch beetle.
 - Lack of frozen ground.
 - Changes in hydrology and health due to disease and stress from climate change.
 - Lack of market for tamarack.
 - Acid peatlands in this landscape are refuge communities from long-past climate and vegetation changes, they may be relics.

NPC Goals and Strategies:

Goal 1: Protect and support critical forest habitats and peatland ecosystems.

- Follow MFRC site-level guidelines for harvest on wetlands and frozen soils.
- Manage for multiple age classes.
- Develop markets that allow for management, including non-timber markets (e.g., carbon markets).
- Work with local government units and private landowners to help identify and raise awareness of their NPC classes.
- Work with county zoning department and/or local government units administering the Wetland Conservation Action to ensure protection.
- Educate private landowners on maintenance of forested rich peatland through private forest management professionals and organizations (DNR Forest Stewardship Program, Soil and Water Conservation Districts, Natural Resource Conservation Service, consulting foresters, etc.)
- Promote management of this cover type through Minnesota Forestry Association and Minnesota Women's Woodland Network.
- Follow BMPs to promote wildlife species which are partially or wholly dependent on peatlands (e.g. Connecticut Warbler).
- Restore degraded wetlands in priority areas.

Goal 2: Build resiliency to eastern larch beetle and climate change.

- Support research that is comparing silviculture and diversification strategies.
- Identify alternative species to tamarack
- Identify areas to implement pilot project that serves as demonstration areas to private landowner.

Goal 3: Encourage the use of silvicultural systems to address forest health issues.

- Use even aged management of black spruce and tamarack for timber production, forest health, and wildlife, including harvest designs, to address eastern larch beetle and mistletoe management.

Goal 4: Maintain or restore hydrology.

- Manage peatlands using a systems approach by protecting peatland associated species and linkages within the ecosystem.
- Plan new logging or forest management roads and recreational trails to not adversely affect hydrology.
- Identify hydrological flow across landscape.
- Work with counties and MNDOT to replace old culverts and bridges to increase hydrologic connectivity.
- Support proposals that would accomplish enhanced habitat and maintenance of hydrology for public and private lands.
- Restore decommissioned right of ways.

Potential Collaboration Projects:Outreach & Education Projects

- Field tours – partner with MFA woodland chapters, hunting groups (MNDH, PF, etc.).
- Promote awareness of these unique NPCs through landscape stewardship and forest planning efforts.
- O & E on eastern larch beetle.
- O & E on benefits of forested wetlands.
- County education – highway department, planning re: culverts, roads, hydrology.

Research and Development Projects

- Eastern larch beetle surveys and treatments.
- Use of fire to promote spruce regeneration.
- Long-term sustainability of spruce tip collection – ecological and economic factors.
- Carbon quantification.
- Test some of the experimental trials or initial findings from the [SPRUCE experiment](#) in northern MN.
- Tamarack influences on hydrology and how to maintain if tamarack disappears.

Opportunity Area Projects – Pilots or Demonstration Projects

- Potential project with public agencies and private landowners that promotes awareness and benefits of acid and forested rich peatlands.
- Bundling wetland sales on private lands.
- Bundling for forest carbon projects on multiple small peatlands.

Floodplain Forest and Wet Forest NPC System Goals and Strategies

Note to reader: due to similarities in forest composition and management challenges, guidance regarding the management of floodplain forest and wet forest NPC systems were grouped together.

Description:

Floodplain Forest (FF) and Wet Forest (WF) communities are dominated by trees tolerant of saturated soils. FF communities are present on occasionally or annually flooded sites on terraces and floodplains of streams and rivers, whereas WF communities occur in settings where the groundwater table is almost always within reach of plant roots but does not remain above the mineral soil surface for long periods (e.g., margins of lakes, rivers, peatlands, as well as in shallow depressions). FF communities are characterized by a canopy of deciduous species such as silver maple, American elm, black ash, green ash, basswood, and cottonwood. WF communities are dominated most often by black ash or white cedar.



Within the East Central Landscape FF and WF communities:

- Cover 8% of the region.
- Face management challenges such as:
 - Limited advance regeneration of co-occurring tree species in black ash wetlands.
 - Insects – emerald ash borer, eastern larch beetle, larch casebearer.
 - Difficult access due to climate change, fewer cold winters, and fluctuating water tables.
 - Increasing flooding events.
 - Invasive plant species – reed canary grass, European buckthorn.
 - Beavers and beaver dams.
 - Floodplain development and infringement from grading and filling activities.
 - Lack of markets for many species such as ash.

NPC Goals and Strategies:

Goal 1: Maintain forest land cover to buffer against water level fluctuations.

- Maintain or increase forest cover in threatened areas (i.e., flood susceptible hydrology).
- Promote forest buffers for sediment control, water quality, and wildlife habitat.
- Utilize MFRC site-level guidelines for riparian management zones and non-open water wetlands (e.g., vernal pools).
- Update culverts and bridges to increase hydrologic connectivity.
- Discourage tiling outlets for drainage, promote water retention on landscape.
- Integrate watershed and forest resource planning.

- Manage and control beaver populations in key forest habitat areas.
- Implement strategies under Goal 3 to help protect forest cover from EAB.

Goal 2: Protect these NPCs from land use conversion for wildlife habitat and water quality benefits.

- Minimize fragmentation and creation of new roads to protect hydrology.
- Educate county planning/zoning on importance of maintaining hydrologic connections and the impacts of new roads.
- Work with local units of government, state, and private landowners to enhance protection of these NPCs.
- Encourage private landowners to get Woodland Stewardship Plans and promote land protection options – conservation easements, SFIA, 2C, etc.

Goal 3: Prevent and/or slow the spread of emerald ash borer.

- Collect tree seed to preserve the genetic diversity of ash populations and help identify potentially EAB resistant individuals.
- Facilitate species transitions where EAB infestations are likely, especially to climate adapted species.
- Increase the presence of non-ash species using the best available science and research.
- Monitor the spread of EAB and proactively manage threatened stands through selective harvesting, especially group-selection approaches..
- Use uneven aged silvicultural systems to promote mixed species forest.
- Increase early detection efforts and beetle suppression through outbreak mitigation strategies (biocontrols, targeted harvesting, etc.).
- Pursue funding to implement adaptive management strategies to mitigate EAB outbreak.
- Increase EAB outreach and education efforts and encourage private landowners to take action to mitigate the effects of EAB.
- Improve enforcement of EAB regulations.

Goal 4: Increase management of wet forest and floodplain forest native plant communities.

- Support legislation that provides funding for research and project implementation, such as DNR cost share to private landowners.
- Improve ash sales with bundling and 5 year permits on public lands.
- Encourage private landowners to cooperate and bundle their ash sales.
- Support development of new markets for underutilized species.
- Maintain ash sales and supply to encourage new markets.

Potential Collaboration Projects:

Outreach & Education Projects

- O & E on:
 - EAB.
 - Benefits of forested wetlands.
 - Planting and stand diversification using co-occurring tree species.
- County education – highway department, planning re: culverts, roads, hydrology.
- Work with local units of government on awareness and hydro benefits of these NPCs relating to shoreland/floodplain development and land use ordinances.

Research and Development Projects

- EAB surveys and treatments.
- Alternative harvesting systems or equipment to decrease dependence on frozen ground conditions for management activities.
- Effects of wood chip movement.
- Biocontrol of EAB.
- EAB mitigation strategies.
- Ash replacement strategies and approaches.
- Monitor and evaluate winter severity effects on EAB.
- Promote existing research and monitoring programs for ongoing ash management.

Opportunity Area Projects – Pilots or Demonstration Projects

- Potential project with public agencies and private landowners that promotes awareness and benefits of floodplain forests and wet forests.
- Pilot project to track changes in water quality and quantify from a post-EAB wet forest system and its downstream impacts on fisheries, drinking water, etc.
- Bundling wetland sales on private lands.

B. Open Landscape Habitat Management

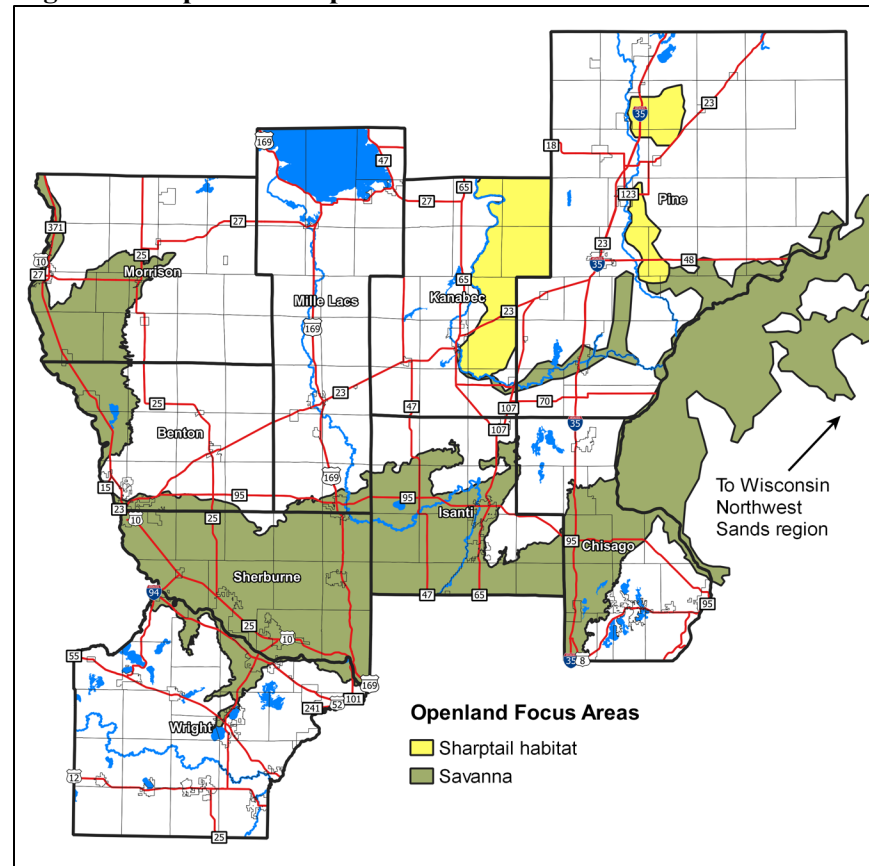
Expansive open landscape habitats were once a conspicuous feature of Minnesota. These habitats include a breadth of native plant communities in early successional stages, dynamically created and maintained by natural disturbances. Open landscape habitats (or “open habitats”) are defined as land supporting an open to semi-open complex of vegetation consisting of < 2/3 total cover by trees (MN DNR 2002). The two habitats within open landscape are defined as “openland” ($\leq 1/3$ total cover by shrubs and/or trees) and “brushland” ($> 1/3$ total cover by shrubs and/or 1/3-2/3 total cover by trees). Based on Marschner’s pre-settlement vegetation map, 11.3 million acres or over 1/3 of the state’s northern and central forest and transition region was vegetated with brushy prairie, oak openings and barrens, jack pine barrens and openings, conifer bogs and swamps, and open muskeg (MN DNR 2002). During settlement, small scale farming and logging created additional open habitats, as well as large wildfires like the Hinckley Fire of 1894 and Cloquet Fire of 1918. These habitat areas are directly connected to similar habitat types in the bordering lands of Northwestern and West-Central Wisconsin.

Based on 1990’s land use and cover information, only 1.3 million acres (4%) of state’s northern and central forest and transition region remained in brushland. These habitats are now primarily limited to the northwest and east-central portions of the state. Natural succession to forest from lack of disturbance and tree planting, habitat fragmentation and conversion, and development are key factors. Pastures, hay lands and small grain fields have been lost as fewer people farm and remaining farms become larger with row crops. A patchwork of land ownerships and administrations with varying goals and policies affect open landscape habitat management options.

Conservation of open landscape habitats is critical to sustaining biodiversity and certain wildlife populations including game species, providing outdoor recreation specific to open landscapes such as game hunting, maintaining beneficial groundwater filtration characteristics of sandy-soil uplands and lowlands, overall clean air and water, and potential biomass products. These open habitats are used by up to 301 terrestrial wildlife species (MN DNR 2002).

The overall goal of the following goals and strategies is **to increase the amount and quality of open landscape habitats on public and private lands within identified core habitat areas in the East Central Landscape.** (Figure 7.2)

Figure 7.2. Open landscape focus areas.



Sharptail Habitat Goal and Strategies

Sharp-tailed grouse, a native bird and species in greatest conservation need in [Minnesota's Wildlife Action Plan](#), serves as an umbrella and flagship species for other wildlife requiring similar habitat. Sustainable populations require a heterogeneity of open landscape habitat components within a radius of two to three miles, including a lek site, nesting cover, brood-rearing habitat, winter cover, and food sources in complexes of 10,000 acres or more. Habitat management for them actively promotes abundant populations of other wildlife. Open habitats are urgently needed. A recent study of North American bird populations from 1970 – 2017 indicated a net loss of 2.9 billion birds, or 29% of abundance, with the grassland biome breeding bird group having the largest change at -53% (Rosenberg et. al. 2019). In east-central Minnesota, the need to reverse the significant sharp-tailed grouse population decline is urgent. Active leks (spring dancing grounds) dropped from 67 in 2004 to 30 in 2019 - a 55% decline (Roy 2019).



Goals and Strategies:

Goal 1: Maximize the amount and quality of open landscape habitats and corridors on public lands within core habitat areas through increased, more diverse, and improved habitat management. Creation and enhancement of upland habitats are a focus.

- Implement open landscape habitat projects in the DNR Aitkin, Cloquet, and Cambridge Wildlife Areas.
- Coordinate with partners such as PF and MSGS to secure and utilize OHF and CPL grants for habitat management.
- Increase the diversity of management techniques beyond the norm to reduce density of woody vegetation and increase open, early successional habitat and native plant diversity, especially on uplands. Using the best science and management practices, support options such as prescribed burning during summer and fall, conservation haying and grazing, seeding to increase native plant diversity, and selective herbicide treatments to control invasive plants and woody vegetation.
- Increase the amount of habitat treated with prescribed burning by conducting more burns in summer and fall, utilizing the DNR NE Roving Habitat Crew, Division of Forestry staff and TNC staff, securing burn contractors, and maximizing size of burn units.
- Creatively address forest management policy and timber harvest requirements that influence effective and efficient open landscape habitat management on public lands. For example, explore and implement methods to address School Trust Fund requirements and allow conversion of forest patches to open habitat on those lands.
- Utilize other landscape planning efforts, such as DNR SFRMP, to identify and clearly and consistently communicate core open habitat areas and management practices. For example, clearcutting of forest patches with few or no reserves left and conversion of upland forest patches to open habitat.
- Support state land administrators, counties, USFWS and tribal nations in managing for expansive open habitat on their lands, using the best science and management practices, and collaborating on projects across ownerships boundaries.

Goal 2: Support partners in protecting, restoring and enhancing open landscape habitats on private lands and tribal lands within core habitat areas, within potential “stepping stones” between them, and to the Northwest Sands of Wisconsin. Upland habitats are a focus.

- Support the Farm Bill Assistance Partnership which funds PF Farm Bill Biologists in east-central Minnesota, including Pine County, to assist private landowners. Support addition of similar biologists to Kanabec and other counties. The federal and state conservation programs they implement, such as the Environmental Quality Incentive Program, Conservation Stewardship Program, Conservation Reserve Program, and Reinvest in Minnesota, are critical.
- Share this plan, the science, and best management practices with partners and Farm Bill Biologists, such as through train the trainer workshops and at NRCS local work group meetings, to address local resource concerns and target resources to core areas.
- Support increasing the amount of private land habitat treated with prescribed burning by making training, equipment, contractors, funding, and other resources available to landowners.
- Support protecting working open habitats, such as pastures and hay lands, through set-aside programs (e.g., Conservation Reserve Program) and easements (e.g., Board of Water and Soil Resources Reinvest in Minnesota).
- Support enhancing agricultural lands with best management practices such as cover crops, rotational grazing, and delayed haying until after the prime nesting season (August 1).
- Utilize existing teams in east-central Minnesota to implement this plan across land ownerships, such as the Minnesota Forest Habitat Collaborative.
- Facilitate a discussion among partners about additional methods to increase and improve open habitats, especially in core areas.

Oak Savanna Goals and Strategies

One particular type of open landscape habitat type that is unique to the East Central Landscape is oak savanna. According to the Sherburne National Wildlife Refuge Comprehensive Conservation Plan “Oak savanna is characterized by 10-85 percent canopy closure, 5-35 percent relative cover of shrubs, and at least 25 percent relative cover of diverse native grasses and 25 percent relative cover of diverse native forbs”. The following goals, strategies, and potential collaboration projects are intended to restore, enhance, and protect oak savanna ecosystems in the savanna focus areas identified on Figure 7.2.

Goals and Strategies:

Goal 1: Restore oak savanna ecosystems on degraded sites where oak savanna was formerly present or where oak savanna foundation characteristics are present (sandy soils, good drainage, mixed oak and pine).

- Identify potentially restorable sites - the presence of sand and open-grown oaks is a good indicator.
- Identify potential corridor areas – sites that may be narrow or irregularly distributed but could provide “stepping stones” for species movement.
- Remove weedy trees and shrub species not typically found in oak savannas.
- Utilize appropriate vegetation control methods to reduce non-desirable understory vegetation. This may include:
 - Prescribed burning over 1/3 site every 3-5 years.
 - Chemical spot treatment of woody vegetation.
 - Mechanical maintenance through scarification, hand-cutting, or mowing.
 - Grazing methods to mimic natural disturbance by megaherbivores and reduce woody vegetation and grasses. Can be used to enhance alternative vegetation control methods, and reduce the use of potentially detrimental or time consuming mechanical, fire, and chemical treatments. Rotation and frequency of use requires adjustment depending on the species being used:
 - Cows – commonly available grazers, eat mostly grasses and forbs, heavy grazers.
 - Goats – widely known to eat everything if given enough time, also focus on sweet-tasting invasives such as buckthorn.
 - Bison – not commonly available, but historically maintained oak savannas across the Midwest. Eat mostly graminoids. Rub and horn on woody vegetation.
- Seed treated areas with desirable herbaceous species to restore an understory typical of oak savannas. This may include:
 - An assortment of native, local eco-type drought-resistant flowering forbs such as asters, goldenrod, daisy fleabane, wild blue lupine, milkweed, sunflowers and New Jersey tea.
 - Native dry-soil sedges and grasses.



Goal 2: Protect remaining oak savanna remnants.

- Protect oak savanna on private land with conservation easements, public land acquisition, or landowner oak savanna management and maintenance education.
- Ensure that management plans of properties which contain oak savanna include recommendations for maintaining this rare and unique ecosystem.

Goal 3: Manage sites to maintain the composition and structural characteristics of intact, functioning oak savannas.

- Conduct frequent, low-intensity prescribed burns (3-5 years) or infrequent high-intensity burns (10+ years) to perpetuate fire-dependent species, reduce undesirable vegetation, control insects and diseases, cycle nutrients, increase mineral soil exposure, and reduce fuel loads.
- Monitor and control undesirable brush, trees, and weeds as needed.
- Follow best management practices to prevent the spread of oak wilt during all management activities.

Potential Collaboration Projects:Outreach & Education Projects

- Annual brush removal public-participation events on public lands.
- Annual oak savanna public education open events held on public lands.
- Online or public-arena access to materials providing background on oak savanna biological communities and recommendations for landowner “backyard” work.
- Regular publication of educational materials and articles in local or statewide newsletters, magazines, or journals.

Research and Development Projects

- Develop ongoing volunteer data-collection efforts to track progress of habitat management and restoration on private and public lands. Make data and results accessible to volunteers online (suggest Better Impacts online software).
- Organize existing datasets and identify potential ways to compare data between sites, evaluate habitat quality, and assess the effectiveness of management techniques.
- Collaborate with Federal agencies, Tribal representatives, UM or other academic institutions to identify potential projects for studying the oak savanna biological community specific to Minnesota.
- Conduct surveys of property managers and landowners across the geographic area to evaluate habitat expanse, habitat quality, and management methods.
- Collaborate with School Trust Lands to conduct before and after habitat assessments on harvested sites.

Opportunity Area Projects – Pilots or Demonstration Projects

- School Trust Lands that are scheduled to be harvested in the next 5 years.
- Public lands that are part of an oak savanna long-term management plan, such as St. Croix State Park.
- Camp Ripley oak savanna restoration.

Section 8

Climate Adaptation Framework



Climate change is impacting Minnesota's forests and will continue to have widespread effects in the future. Many of the important factors that influence forest composition and distribution are changing, including seasonal temperatures, the timing and type of precipitation, soil moisture patterns, the severity and frequency of natural disturbances, and the abundance of pests and diseases. Management decisions need to consider climate change to ensure the long-term health of forest ecosystems throughout the East Central Landscape. This section of the East Central Landscape Plan provides guidance to decision makers regarding climate change and actions to mitigate its impact. It is structured in four subsections:

- A. **General Forest Adaptation Strategies** includes a 'menu' of many adaptation strategies and approaches for forest ecosystems developed by the USDA Forest Service, Northern Institute of Applied Climate Science (NIACS). This subsection also highlights priority adaptation strategies and approaches for the East Central Landscape.
- B. **Cover Type Adaptation Strategies** reviews the resilience of five important Minnesota forest cover types and assess how they might be managed to increase climate adaptability.
- C. **Carbon Mitigation** provides strategies and approaches to maintain or enhance forest carbon stocks, as well as directions for using forests and trees to reduce carbon emissions.
- D. **Available Resources** lists and provides links to resources to assist natural resource professionals and landowners with climate-related management decisions.



Summary of Minnesota's Climate Changes

- Most of Minnesota's observed warming has been when its coolest. Since 1970, winter has warmed 13 times faster than summer, and nights have warmed 55% faster than days.
- Minnesota has warmed by 2.9F between 1895 and 2017, while getting an average of 3.4 inches wetter.
- Heavy rains are now more common in Minnesota and more intense than at any time on record.



A large part of this section focuses on adaptation strategies, which generally fall into three categories:

1. **Resistance** focuses on maintaining a relatively unchanged ecosystem.

These strategies require enhancing forest defenses against potential disturbances or anticipated changes, often through thinning. This approach will likely become more costly as future climate change effects intensify and may be best utilized as either a short-term option or to specifically maintain highly-valued economic, ecological, or cultural forest resources.

For example, the maintenance of black spruce peatlands, which are highly ecologically valuable due to their carbon-holding capacity, is one example where a resistance approach to management may be implemented. While maintaining these ecosystems is important, the costs of regenerating sites and avoiding loss due to pests or pathogens will likely increase over time.

2. **Resilience** allows for some change to current conditions with the ultimate goal of increasing the ability of the ecosystem to adapt to the effects of climate change while maintaining its essential functions.

These strategies focus on how best to manage an ecosystem in order to maximize its ability to cope with and rebound from possible future disturbance events, while understanding the variability of climate at local and regional scales and the diversity of landforms and soil properties. Resilience strategies can often include harvesting sites or practicing prescribed burns to emulate a natural disturbance at a particular site. It can also include thinning of stands to remove fire ladders and increase the ability of forestlands to recover from natural disturbances. Resilience practices can help to increase the resilience of systems by creating a patchwork of age classes and by facilitating the growth of biodiverse native communities, especially by focusing on site-based resilience.

For example, dependably cool and moist sites (e.g., north-facing slopes and low-laying areas) may provide resilient sanctuaries for boreal species as the climate warms, allowing the maintenance of these species on the landscape.

3. **Transition** involves making intentional, directed changes to an ecosystem's native plant community to guide it toward a desired, but different, future-oriented state.

These strategies aim to enable ecosystems to better respond to changing conditions while also preserving essential ecosystem functions and meeting management objectives by introducing species adapted to a landscape's predicted future resource conditions.

An example of a transition strategy is the proactive planting of tree species that are better adapted to a warmer future climate than existing species. This may be most effective in regions where the at-risk native species provide essential ecosystem services that can be preserved should an appropriate replacement species be identified. For example, black ash is threatened by emerald ash borer (EAB) and plays a crucial role in moderating water levels and providing nutrients in northern Minnesota wetlands. Replacing black ash with a single or multiple replacement tree species that can fulfill these services – prior to the loss of ash from EAB – may be essential to maintaining the hydrological function of those wetland ecosystems.

A. General Forest Adaptation Strategies

The following is a list of climate change adaptation strategies and approaches developed by the USDA Forest Service, Northern Institute of Applied Climate Science (NIACS) and published in the USDA general technical report [Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers](#) (Swanston et al. 2016). Technical advisers to the East Central Landscape Committee identified priority adaptation strategies and approaches for the East Central Landscape.

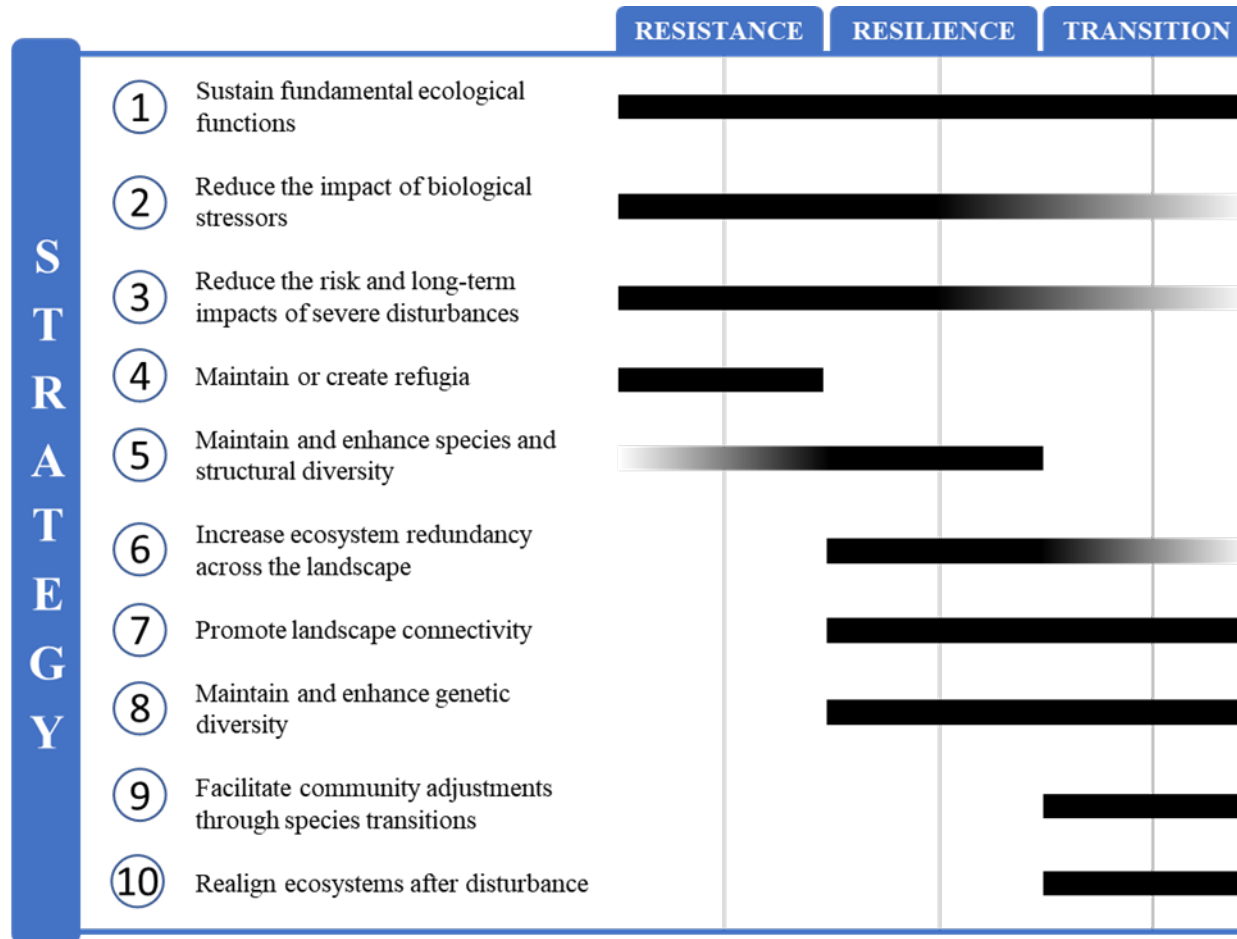


Figure 8.1. These strategies may be used under one or more options. A solid line indicates a strong relationship between an option and a strategy, whereas fading indicates that the strategy relates to that option under some circumstances. Although a strategy may work under multiple options, the implementation is likely to be achieved through very different approaches and tactics.

Strategy 1: Sustain fundamental ecological functions.

- Reduce impacts to soils and nutrient cycling.
- Maintain or restore hydrology.
- Maintain or restore riparian areas.
- Reduce competition for moisture, nutrients, and light. **(Priority Approach—see Figure 8.2)**
- Restore or maintain fire in fire-adapted ecosystems.

Strategy 2: Reduce the impact of biological stressors.

- Maintain or improve the ability of forests to resist pests and pathogens.
- Prevent the introduction and establishment of invasive plant species and remove existing invasive species.
- Manage herbivory to promote regeneration of desired species.

Strategy 3: Reduce the risk and long-term impacts of severe disturbances.

- Alter forest structure or composition to reduce risk or severity of wildfire.
- Establish fuelbreaks to slow the spread of catastrophic fire.
- Alter forest structure to reduce severity or extent of wind and ice damage.
- Promptly revegetate sites after disturbance.

Strategy 4: Maintain or create refugia.

- Prioritize and maintain unique sites.
- Prioritize and maintain sensitive or at-risk species or communities.
- Establish artificial reserves for at-risk and displaced species.

Strategy 5: Maintain and enhance species and structural diversity. (Priority Strategy)

- Promote diverse age classes.
- Maintain and restore diversity of native species.
- Retain biological legacies.
- Establish reserves to maintain ecosystem diversity.

Strategy 6: Increase ecosystem redundancy across the landscape.

- Manage habitats over a range of sites and conditions.

Figure 8.2. Thinning. Reducing tree densities through silvicultural thinning – such as in the red pine plantation below – can enhance climatic resistance and resilience, in addition to increasing growth of remaining trees.

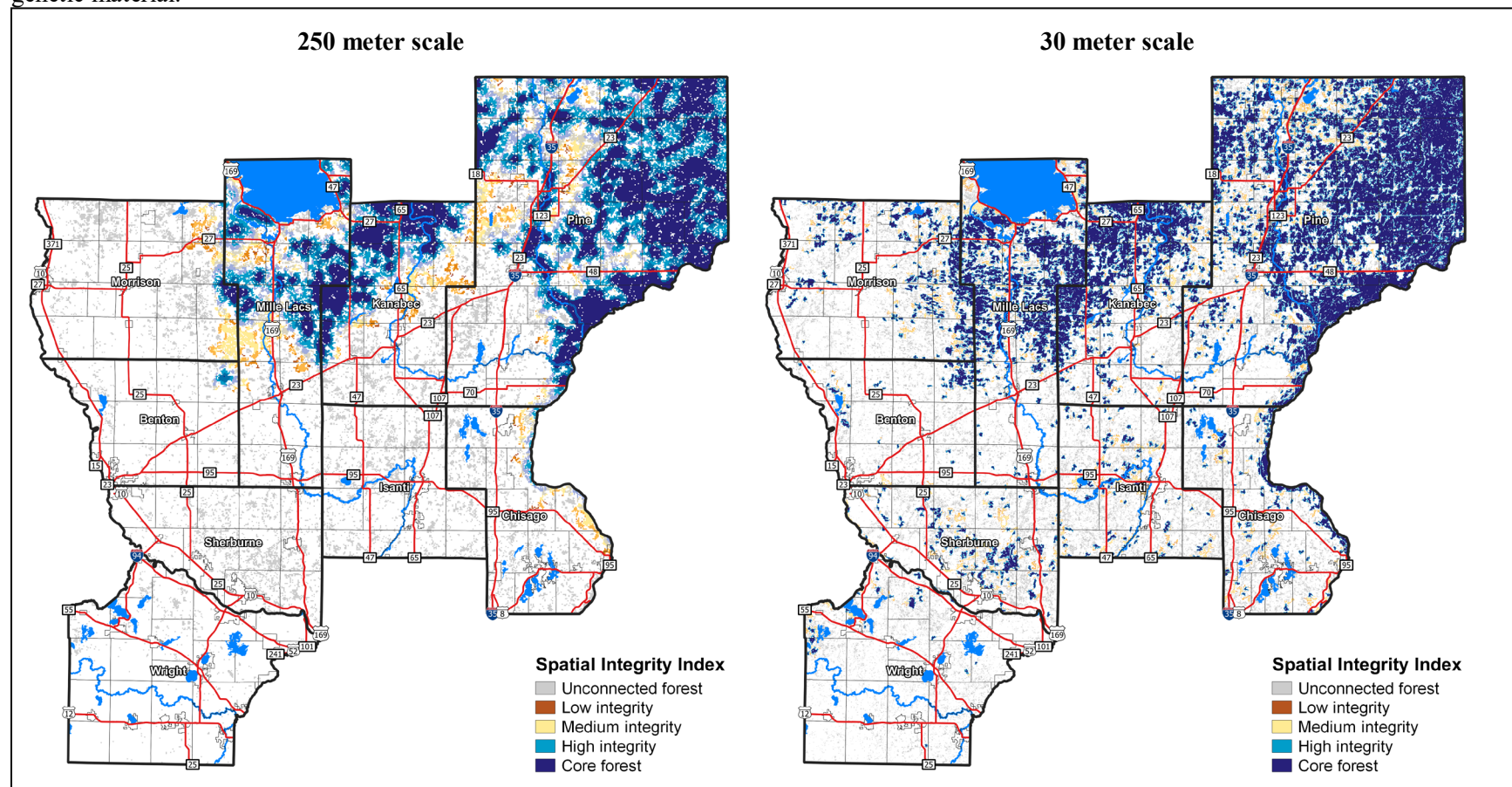


- Expand the boundaries of reserves to increase diversity.

Strategy 7: Promote landscape connectivity. (Priority Strategy – see Figure 8.3)

- Reduce landscape fragmentation.
- Maintain and create habitat corridors through reforestation or restoration.

Figure 8.3. Spatial Integrity Index (SII). SII is a metric for the impact of fragmentation on forest ecosystem functioning. Maintaining forest cover and connecting core and high integrity areas will allow for easier species movement, reduce lags in migration, and enhance the flow of genetic material.



Note: SII was calculated at both large (250 m) and small (30 m) scales. The 250 m scale is better for considering the impact of forest fragmentation on highly mobile species with large home ranges, while the 30 m scale is better suited to visualizing the impact on less mobile species with smaller home ranges.

Source: Rachel Riemann, USDA Northern Research Station.

Strategy 8: Maintain and enhance genetic diversity.

- Use seeds, germplasm, and other genetic material from across a greater geographic range.
- Favor existing genotypes that are better adapted to future conditions.

Strategy 9: Facilitate community adjustments through species transitions. (Priority Strategy – see textbox to right)

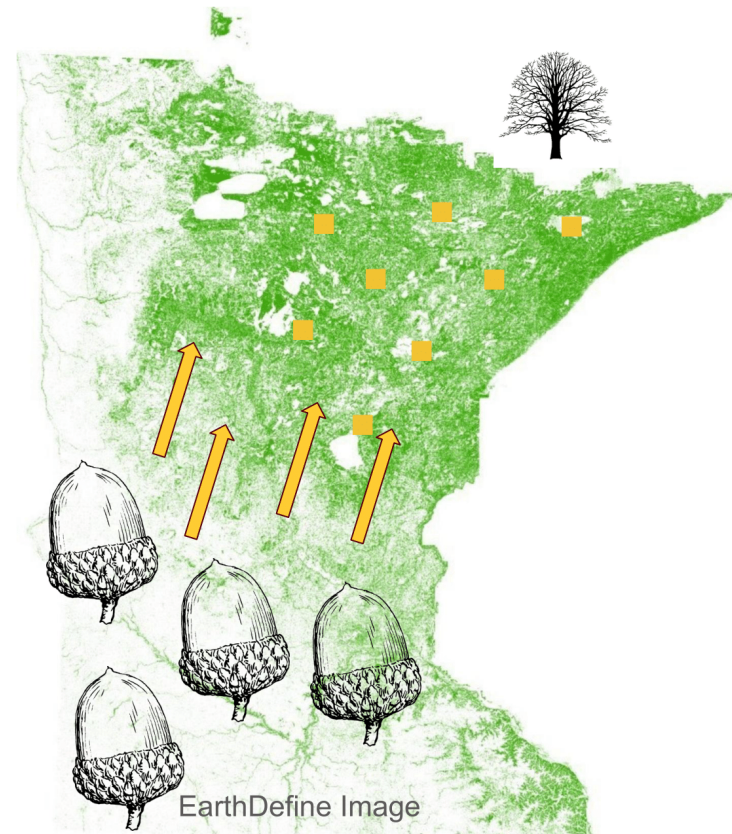
- Favor or restore native species that are expected to be adapted to future conditions.
- Establish or encourage new mixes of native species.
- Guide changes in species composition at early stages of stand development.
- Protect future-adapted seedlings and saplings.
- Disfavor species that are distinctly maladapted.
- Manage for species and genotypes with wide moisture and temperature tolerances.
- Introduce species that are expected to be adapted to future conditions.
- Move at-risk species to locations that are expected to provide habitat.

Strategy 10: Realign ecosystems after disturbance.

- Promptly revegetate sites after disturbance.
- Allow for areas of natural regeneration to test for future-adapted species.
- Realign significantly disrupted ecosystems to meet expected future conditions.

Take the Guesswork Out of Assisted Migration!

Deliberately altering the forest with species and genotypes from outside the region should be guided by the best available data to be successful. Two tools which can help land managers are [Tree Atlas Grid Summaries](#) and the [Seedlot Selection Tool](#). Together these resources provide information about how climate change will impact the forest in an area of interest, and which seedlots will be best adapted to a given planting site.



B. Cover Type Adaptation Strategies

This subsection has been adapted from the 2020 MFRC report [Climate Change and Minnesota's Forests](#).

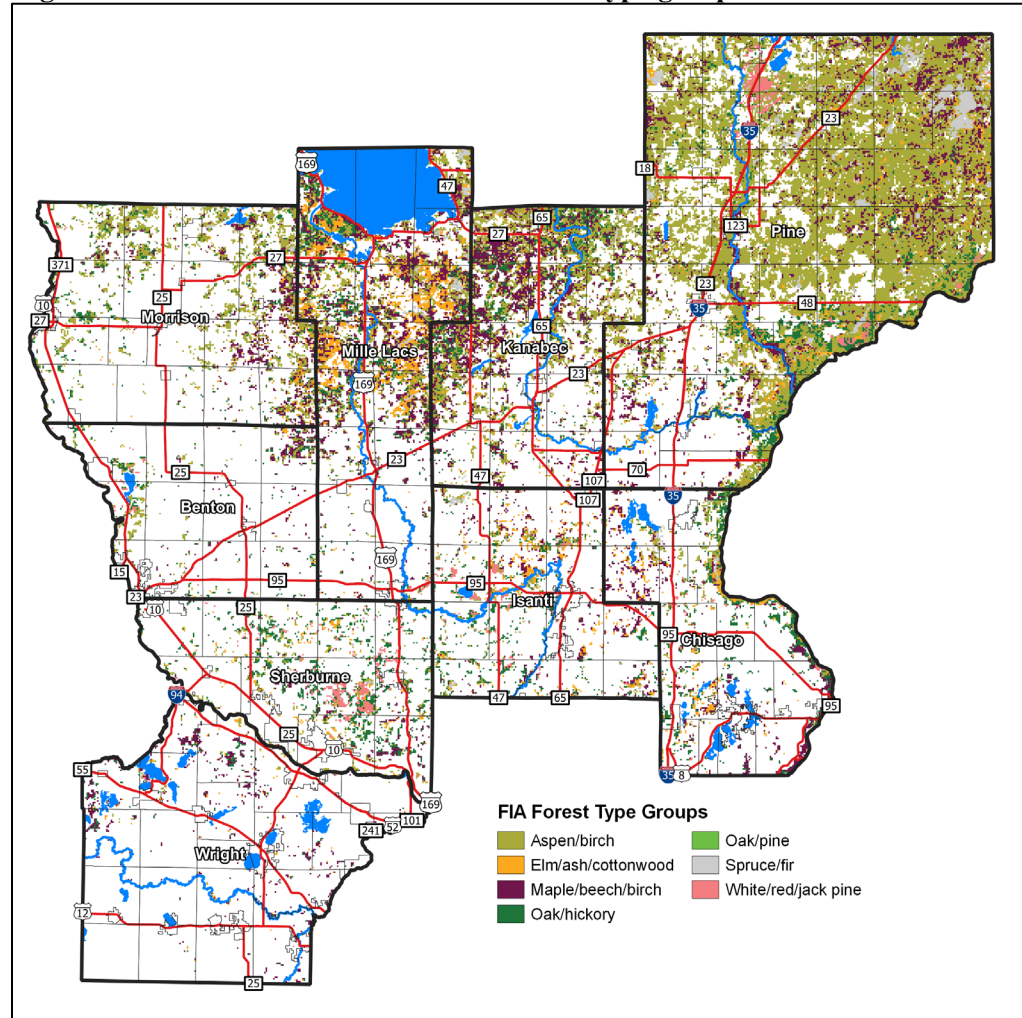
Here, we review several important and iconic Minnesota forest cover types and assess whether a resistance, resilience or transition adaptive silvicultural strategy may be most effective in managing these forest types under a changing climate. These cover types were selected based on their relative abundance, importance to the forest products industry, and cultural or recreational significance. The cover types selected include aspen, pine (including red, white, and jack pine), oak, northern hardwoods (e.g., maple, basswood), and lowland conifers (including black spruce, tamarack and northern white cedar).

In order to give readers a sense of where in the East Central Landscape these cover types occur, Figure 8.4 displays the modeled distribution of forest type groups from FIA plot data. Forest type groups and the cover types listed in this section are different forest cover classification systems, and so a crosswalk is provided in Table 8.2 below.

Table 8.2. Forest type group to cover type crosswalk.

Forest Type Group	Minnesota Cover Type
Aspen/birch	Aspen
Elm/ash/cottonwood	Lowland hardwoods
Maple/beech/birch	Northern hardwoods
Oak/hickory	Oak
Oak/pine	Pine
Spruce/fir	Lowland conifers
White/red/jack pine	Pine

Figure 8.4. Modeled distribution of FIA forest type groups.



Source: USDA Forest Service Forest Geospatial Technology and Applications Center.

Table 8.3. Summary rating of climate adaptability and proposed adaptation strategy types by cover type.

Cover Type	Likely Climate Adaptability	Recommended Adaptation Strategy Types
Aspen	Low	Resistance, resilience, or transition
Pine	Medium	Resistance, resilience, or transition
Oak	High	Resilience
Northern hardwoods	High	Resistance or resilience
Lowland Conifers	Low	Resistance or resilience

Aspen

- Aspen stands may also be susceptible to gypsy moth infestations and other native and invasive pests and pathogens because of their low diversity of tree species.
- Aspen are near the southern end of their native range in Minnesota. This may make them particularly susceptible to the effects of climate change, especially the warmer temperatures that are expected throughout the region and the possible increase in drought conditions.
- Manage through resistance, resilience or transition strategies:
 - Resistance – these strategies are best for maintaining aspen in regions which could be considered climate refuges (e.g., north-facing slopes).
 - Resilience – includes strategies such as prescribed burning and retention of non-aspen tree diversity during harvest or short-rotation harvest.
 - Transition – strategies that encourage the growth of other climate change adapted, commercially viable species in place of or in tandem with aspen could be considered, particularly along the southern-most portions of the aspen range in Minnesota and in areas where aspen is less likely to be competitive in the future.

Pine

- Both planted and natural pine forests are at risk due to pests and diseases such as jack pine budworm and bark beetles. Regeneration of pine forests, particularly white pine, is hampered by herbivory from white-tailed deer, often requiring large investments in anti-herbivory measures.
- Manage through resistance, resilience, or transition strategies:
 - Resistance – strategies that focus on maintaining the growth of pine forests in regions with dry, sandy soils may also be appropriate, as other species may be less likely to grow in these areas.
 - Resilience – strategies such as thinning may increase adaptive capacity by limiting risk of drought-induced stress, dieback, and mortality, and if used to increase structural diversity, may further enhance resilience of pine forests.
 - Transition – strategies that focus on the growth of more southern-adapted species, such as white pine, over less climate-hardy species such as jack pine, may be appropriate and will maintain economic timber value on the landscape.

Oak

- Oak forests are threatened by gypsy moth infestations and oak wilt. Additionally, oak regeneration is generally poor in areas where invasive woody shrubs (e.g., buckthorn) have become established.
- Oak forests may exhibit a high adaptive capacity to the effects of climate change in Minnesota. Bur oaks, which are both drought and fire-tolerant, may be one of the most climate-hardy tree species in the state. White oak and northern pin oak will likely experience increased growth in Minnesota under a warming climate.
- Manage through resilience strategies which encourage the maintenance of oak on the landscape but allow for some disturbance. These strategies allow for prescribed burning, thinning, and other management of oak forests to encourage their adaptive capacity by reducing competition.

Northern Hardwoods

- Because northern hardwood forests have been historically underutilized, there may be an abundance of low-quality, overmature stands. Gypsy moth may threaten this forest type and further constrain its usability due to transport quarantines.
- Northern hardwood forests are likely to exhibit fairly high adaptive capacity due to their diversity in species composition and are likely to expand their range as temperatures warm.
- Manage through resistance or resilience strategies:
 - Resistance – strategies that maintain growth and encourage the ability of northern hardwoods to migrate into desired regions may be appropriate. These strategies may involve intensive tending of regenerating forests to control quality and composition, as well as controlling herbivory and the spread of pests, such as gypsy moth and Asian longhorn beetle. Management to increase diversity may be warranted on second-growth northern hardwood stands that have developed relatively low species diversity.
 - Resilience – strategies which allow for disturbance but ultimately result in the regrowth of this forest type may also be appropriate given the likelihood that this forest can adapt and regenerate following harvest or other disturbance.

Lowland Conifers

- Black spruce and tamarack in Minnesota are currently found near the southern edge of their suitable range, and a warming climate is likely to result in habitat changes that expose these species to greater stress and the potential for regeneration failure following death or disturbance. Tamarack is also under threat from a prolonged outbreak of the native pest, eastern larch beetle.
- Many lowland conifer forests have low adaptive capacity and are particularly vulnerable to climatic changes like alterations in the precipitation regime.
- Manage through resistance or resilience strategies:
 - Resistance – maintaining hydrologic integrity is critically important to increasing the resilience of these systems. This includes limiting and removing ditches, maintaining culvert systems, addressing invasive species outbreaks such as spruce budworm, and developing other strategies for keeping and enhancing hydrologic connectivity.
 - Resilience – strategies that focus on increasing diversity in sites that are capable of supporting more than one species may also be effective for these forests. Artificially introducing species could increase resilience in forest stands.

C. Carbon Mitigation

In addition to managing the forest to be more adapted to a changing climate, forest management may also mitigate climate change by enhancing carbon storage and sequestration. Furthermore, forests and trees within communities can directly reduce carbon emissions by reducing energy demands, with the added benefit of promoting human health. Implementing the strategies below can help to directly impact the carbon cycle in a way that will reduce negative impacts from climate change.

Forest Carbon Management

The following has been adapted from [NIACS Forest Carbon Menu of Adaptation and Mitigation Strategies and Approaches](#).

Strategy 1: Maintain or increase extent of forest ecosystems.

- Avoid forest conversion to non-forest land uses.
- Reforest lands that have been deforested or degraded and afforest suitable lands.
- Increase the extent of forest cover within urban and suburban areas.
- Increase or implement agroforestry practices which result in a net increase in carbon storage in open lands.

Strategy 2: Sustain fundamental ecological functions.

- Reduce impacts to soils and nutrient cycling.
- Maintain or restore hydrology.
- Prevent the introduction and establishment of invasive plant species and remove existing invasives.
- Maintain or improve the ability of forests to resist pests and pathogens.
- Reduce competition for moisture, nutrients, and light.

Strategy 3: Reduce carbon losses from natural disturbance, including wildfire.

- Restore or maintain fire in fire-adapted ecosystems.
- Establish natural or artificial fuelbreaks to slow the spread of catastrophic fire.
- Alter forest structure or composition to reduce the risk, severity, or extent of wildfire.
- Reduce the risk of tree mortality from biological or climatic stressors in fire-prone systems.
- Alter forest structure to reduce the risk, severity, or extent of wind and ice damage.



Strategy 4: Enhance forest recovery following disturbance.

- Promptly revegetate sites after disturbance.
- Restore disturbed sites with a diversity of species that are adapted to future conditions.
- Protect future-adapted seedlings and saplings.
- Guide species composition at early stages of stand development to meet expected future conditions.

Strategy 5: Prioritize management of locations that provide high carbon value across the landscape.

- Prioritize low vulnerability sites for maintaining or enhancing carbon stocks.
- Establish reserves on sites with high carbon density.

Strategy 6: Maintain or enhance existing carbon stocks while retaining forest character.

- Increase structural complexity through retention of biological legacies in living and dead wood.
- Increase stocking on well-stocked or understocked forest lands.
- Increase harvest frequency or intensity due to greater risk of tree mortality.
- Disfavor species that are distinctly maladapted.
- Manage for existing species and genotypes with wide moisture and temperature tolerances.
- Promote species and structural diversity to enhance carbon capture and storage efficiency.
- Use seeds, germplasm, and other genetic material from across a greater geographic range.

Strategy 7: Enhance or maintain sequestration capacity through significant forest alterations.

- Favor existing species or genotypes that are better adapted to future conditions.
- Alter forest composition or structure to maximize carbon stocks.
- Promote species with enhanced carbon density in woody biomass.
- Introduce species or genotypes that are expected to be adapted to future conditions.

Urban and Community Forests

The following has been adapted from [NIACS Climate Adaptation Actions for Urban Forests and Human Health](#)

Strategy 1: Activate social systems for equitable climate adaptation, urban forest, and human health outcomes.

- Address socio-ecological systems in early, comprehensive response.
- Integrate urban forestry in climate planning and policy.
- Address climate and health challenges of disadvantaged communities and vulnerable populations.

Strategy 2: Reduce the impact of human health threats and stressors using urban trees and forests.

- Reduce extreme temperatures and heat exposure.
- Improve urban air quality conditions.
- Anticipate and reduce human health impacts of hazardous weather and disturbance events.

Strategy 3: Maintain or increase extent of urban forests and vegetative cover.

- Minimize forest loss and degradation.
- Maintain existing trees through proper care and maintenance.
- Restore and increase tree, forest, and vegetative cover.
- Sustain locations that provide high value across the landscape.

Strategy 4: Sustain or restore fundamental ecological functions of urban ecosystems.

- Maintain or restore soils and nutrient cycling in urban areas.
- Maintain or restore hydrologic processes in urban forests.
- Restore or maintain fire in fire-adapted ecosystems.

URBAN FOREST BENEFITS FOR CLIMATE, CARBON, AND HUMAN HEALTH

Healthy forests support healthy communities. Urban trees and forests are more than just scenery. These are some of the benefits that urban ecosystems provide:



Human Health

- Improved air quality and reduced pollutants.
- Lowered temperatures and reduced heat – related illness and mortality.
- Greater opportunities for physical activity.
- Improved mental health, happiness, and wellbeing.
- Reduced mental fatigue and enhanced cognitive function.
- Relief from mental illness
- Stress reduction/recovery.
- Improved social health, cohesion, and resilience.
- Improved social equity from access to nature.
- Reduced crime and safer communities.
- Improved drinking water quality.



Climate Adaptation

- Reduced air temperatures from increase tree canopy cover.
- Interception and absorption of stormwater, reduced flooding.
- Reduced erosion and stable slopes from improved plant cover, which maintain water quality.
- Enhanced flood resilience relative to “gray” infrastructure.
- Increased biodiversity.
- Reduced wildfire risk.



Carbon Mitigation

- Reduced energy use from tree shading and urban forest cooling.
- Enhanced carbon storage in trees and ecosystems.
- Increase sustainable production through urban wood utilization.
- Reduced transportation emissions to create green and walkable communities.

Strategy 5: Reduce the impact of physical and biological stressors on urban forests.

- Reduce impacts from extreme rainfall and enhance water infiltration and storage.
- Reduce risk of damage from extreme storms and wind.
- Reduce risk of damage from wildfire.
- Maintain or improve the ability of forests to resist pests and pathogens.
- Prevent invasive plant establishment and remove existing invasive species.
- Manage herbivory to promote regeneration, growth, and form of desired species.

Strategy 6: Enhance taxonomic, functional, and structural diversity.

- Enhance age class and structural diversity in forests.
- Maintain or enhance diversity of native species.
- Optimize and diversify tree species selection for multiple long-term benefits.
- Maintain or enhance genetic diversity.

Strategy 7. Alter urban ecosystems toward new and expected conditions.

- Favor or restore non-invasive species that are expected to be adapted to future conditions.
- Establish or encourage new species mixes.
- Introduce species, genotypes, and cultivars that are expected to be adapted to future conditions.
- Disfavor species that are distinctly maladapted.
- Move at-risk species to more suitable locations.
- Promptly revegetate and remediate sites after disturbance.
- Realign severely altered systems toward future conditions.

Strategy 8: Promote mental and social health in the face of climate change.

- Provide nature experiences to ease stress and support mental function.
- Encourage community and social cohesion for climate response.

Strategy 9: Promote human health co-benefits in nature-based climate adaptation activities.

- Co-design large scale green infrastructure and systems to promote health.
- Provide micro-scale experiences for health promotion and healing.

D. Available Resources

Below is a list of available resources to assist natural resource professionals and landowners with climate-related management decisions.

- **Climate and Health Action Guide** (<https://www.vibrantcitieslab.com/guides/climate-health-action-guide/>): This action guide is designed to help you promote human health and climate benefits of urban forests in your community while minimizing risks from climate change. It outlines a process for you to create an urban forestry project to optimize for climate and health outcomes.
- **Climate Change and Minnesota's Forests** (https://mn.gov/frc/docs/Climate_Change_and_Minnesota's_Forests_2020.pdf): Report summarizing the impact of climate change on Minnesota's forests and the path forward for landowners, managers, tribes, industries, and researchers. This report was developed and written in coordination with the Research Advisory Committee of the MFRC.
- **Increasing Forest Resiliency for an Uncertain Future** (<https://masswoods.org/sites/masswoods.net/files/Forest-Resiliency.pdf>): Publication with the goal of helping forest decision makers in New England find actions to reduce forest vulnerability and increase resilience. Although designed for New England decision makers, the principles are also applicable to Minnesota.
- **LANDIS-II Landscape Change Model** (<https://sites.google.com/site/landismodel/home>): Forest landscape model which simulates future forests (both trees and shrubs) at decadal to multi-century time scales and spatial scales spanning hundreds to millions of hectares. The links site includes several tools for interacting with the model and viewing outputs.
- **NIACS Adaptation Strategies & Approaches** (<https://forestadaptation.org/adapt/adaptation-strategies>): Collection of adaptation strategies and approaches for a variety of natural resource topics, including but not limited to forests, urban forests, forested watersheds, forest carbon management, recreation, and tribal perspectives.
- **NIACS Climate Change Field Guide for Northern Minnesota Forests** (https://forestadaptation.org/learn/resource-finder/MN_field_guide): Field guide designed to be a quick reference on climate change for northern Minnesota forests. The intent is to highlight key information that can be used during field visits or forest planning. This guide will help foresters consider climate change risks together with local site characteristics and design adaptation actions that help meet management goals.
- **NIACS Minnesota Private Landowner Climate Scorecard** (<https://forestadaptation.org/learn/resource-finder/minnesota-private-landowner-climate-scorecard-actions>): Booklet designed to help private landowners in Minnesota think about climate change in their own properties. Use the "Scorecards" to identify high-risk factors in your woods and use the "Actions" pages to get ideas on how to cope with change. This booklet can also help landowners start conversations with consulting foresters or other natural resource professionals.
- **Resilient Land Mapping Tool** (<http://maps.tnc.org/resilientland/>): Online GIS mapping tool which identifies climate resilient areas capable of sustaining biodiversity and ecological functions into the future under a changing climate.
- **Seedlot Selection Tool** (<https://seedlotselectiontool.org/sst/>): Online GIS mapping program designed to help forest managers match seedlots with planting sites based on climatic information. The climates of the planting sites can be chosen to represent current climates, or future climates based on selected climate change scenarios.
- **Tree Atlas Grid Summaries** (<https://www.fs.fed.us/nrs/atlas/combined/resources/summaries/grid/>): Summary of the current and potential future habitat, capability, and migration of individual tree species in any 1 x 1° lat/long grid within the eastern United States.

Part 3. Operationalizing the Plan:

How will we get there?

Section 9

Coordination and Implementation Framework



A critical component of any planning document is the section that describes how the “vision” will be implemented. Successful implementation of a regional plan that affects dozens of agencies and organizations and thousands of private interests requires clear and meaningful development. The purpose of this section is to outline the organizational structures and coordination strategies that the East Central Committee believes are necessary to support the successful implementation of this Plan.

A. How will this Plan Get Implemented?

How will the ideas suggested in the Strategic Policy section of this plan (Part 2) get done? Who will do the work? How much will it cost? How long will it take? As with past successes in forest management, progress is achieved through intentional **cooperation, coordination, and collaboration**. This plan proposes to significantly increase and enhance the ways that interested persons and stakeholder groups can work together to implement sustainable forest management across the East Central Landscape.

It is important to remember the regional context of this document and its primary role is to support and coordinate sustainable forest management by interested stakeholders. The primary work across the millions of acres in the East Central Landscape will continue to be done on the ground by foresters and loggers, contractors, land managers, resource agency staff, forest products industry, individual forest landowners, and local officials, among many others.



While the **planning horizon** for MFRC Landscape Plans typically span 100 years or longer, the **implementation horizon** for this Plan is ten to twenty years. After five to ten years, parts of the Plan will need to be reconsidered as changes merit. The MFRC and the Coordination Committee should collectively determine the point at which this Plan needs to be either amended or updated as time moves forward.

B. Coordination Strategies

By participating in the coordination and implementation of landscape plans, partners in the MFRC regions experience significantly increased benefits through the collaborative management of the forest resources they are responsible for. Over the past fifteen or so years, the MFRC regional landscape committees have developed a series of coordination strategies that have evolved to enhance the successful implementation of the landscape plans.

Implementation of Landscape Plans

Regional committees meet on a regular basis to coordinate land management activities and support the development and implementation of collaborative projects. In general terms, the MFRC landscape plans are implemented through four basic approaches including:

- **Encourage consideration of the landscape-level context** by all agencies, organizations, industry, and private landowners when developing their resource management plans and implementation projects.
- **Coordinate and support projects by partnering organizations** that promote sustainable forest management practices in the landscape region.
- **Develop and implement committee projects** that proactively address the goals and strategies outlined in the regional forest resource plans. Regional committees have been catalyst for securing of funds for Committee and partner project development and implementation.
- **Monitor activities and outcomes** of projects implemented by the committees, as well as those by partnering organizations and landowners across the landscape region.

Recommended Coordination Strategies

By working through a series of coordinated strategies with stakeholders in the region, each partnering entity that participates in the coordination and implementation of this Plan will more likely experience significantly increased benefits from forest resources over time. The following is a list of coordination strategies that have been developed by the Committee to enhance the implementation of this Plan:

1. Information Sharing and Networking
2. Landscape Plan Outreach
3. Promote Integration of the Landscape Plan into Partners' Plans
4. Actively Support the Forest Policy and Research Development Processes
5. Develop Regional Priorities to Guide Investment in the Region
6. Promote Cross Boundary Demonstration Projects
7. Support Monitoring Efforts

Strategy #1: Information Sharing and Networking

Regional committees meet on a quarterly basis to provide an open public forum for diverse interests to cooperatively promote forest sustainability. By bringing together representative interests from landscape regions, the committees serve as springboards for effective forest management activities that address specific needs and challenges in each region. One of the core functions that the regional landscape committees have done since the approval of their first-generation plans has been to support the sharing of information. They have done this through presentations by topical experts, exchanging reports and studies, and providing updates on work that members are doing. The Committee will continue to support this information sharing function at their future coordination meetings.

Strategy #2: Landscape Plan Outreach

One of the key steps in encouraging the more robust use and application of this Plan is to increase awareness of the Plan by landowners and managers beyond the Committee members. Immediately after the approval of this Plan by the Council, the Committee will develop and implement an outreach strategy that increases awareness of the directions set forth in this Plan and stakeholders throughout the region can support the implementation of this Plan. The outreach strategy will include workshops, presentations to local boards, direct mailings, and maintaining a robust and useful MFRC website.

Strategy #3: Promote Integration of the Landscape Plan into Partners' Plans

One of the primary ways that MFRC landscape plans are implemented is through the integration of goals and strategies from the landscape plans into the forest and related natural resource management plans developed by partners in the region. The Committee will actively encourage all agencies, organizations, industry, and private landowners to integrate the goals from this Plan into their resource management plans and implementation projects. The Committee plans to:

1. Review existing and proposed forest and related resource management plans to see how they fit with the goals and strategies in this Plan. Documents reviewed include National Forest Plans, DNR Section Forest Resource Management Plans, tribal resource plans, county plans, private forest stewardship plans, fish and wildlife management plans, local water management plans, and local land use plans.
2. Determine how much each landowner can voluntarily contribute toward the landscape goals.
3. Look for ways to cooperate and coordinate on-the-ground management activities to achieve landscape goals.
4. Analyze the cumulative effects of current and planned activities across the region.
5. Assist MFRC staff in collecting necessary monitoring information as described in the “Monitoring Framework” of this Plan and periodically report accomplishments to the Council.

As a part of the development of this Plan, the Committee developed a series of technical support reports and research studies. These documents provide a wealth of knowledge on a broad range of relevant forest resource topics. By using these landscape level documents, partnering groups in the region can save time and money in their planning and land management efforts while at the same time increase implementation of this Plan.

Strategy #4: Actively Support Forest Policy and Research Development Processes

As established in the SFRA, the landscape committees are to provide regional perspectives to the Council on broad range of sustainable forestry matters. With this statutory responsibility, regional committees play a critical role in shaping forest policy in Minnesota. The Committee will continue to support this by providing recommendations to the MFRC in the future as a part of their strategic forest policy development program and on relevant forest policy matters.

As a part of the development of this Plan, the Committee developed a series of recommendations in Section 11 to assist leadership in the forestry community to more quickly understand actions they can take to address a range of forest policy issues. These recommendations, if addressed by the partnering groups, will increase the ability of the Committee to more effectively facilitate and coordinate the implementation of this Plan.

Strategy #5: Develop Regional Priorities to Guide Investment in the Region

Over the past ten years, the Committee provided input to various agencies and organizations responsible for making major funding decisions. Input has been gathered at the Committee meetings through a series of Committee discussions and worksheets. The Committee will help set priorities that promote the implementation of the Plan and support increased coordination amongst partners in the region.

Strategy #6: Promote Cross Boundary Demonstration Projects

Since 2005, the Committee has supported numerous sustainable forest resource projects including the Four Corners Pilot Forestry Project and Kettle River Landscape Stewardship Plan. The Committee will continue to support the coordination and implementation of these projects. The Committee will also seek out new Landscape Stewardship projects within the region that promote collaborative or cross-boundary efforts, both local and multi-state, that support the implementation of this Plan, the state's Forest Action Plan, the 25-Year Lessard-Sams Outdoor Heritage Council Habitat Vision, and other relevant policy documents.

Strategy #7: Support Monitoring Efforts

Monitoring and evaluating the implementation of this Plan is critical towards enhancing coordination between partners. The Committee will work with research organizations and existing monitoring efforts to identify potential monitoring metrics and compile datasets for monitoring trends and setting goals. See Section 10 of the Plan for an outline of the Committee's proposed monitoring and evaluation program.

Additional details about these coordination strategies may be found in the Committee Operations Guide – see [Appendix G](#).

Section 10

Monitoring and Evaluation Framework



This section serves as an outline for monitoring and evaluating the implementation of this Plan over the next decade. The East Central Landscape Committee will be responsible for coordinating landscape level monitoring efforts. The Committee will periodically review progress made towards the implementation of this Plan, both short and long term, based on information provided by partners in the region and report their findings to the Minnesota Forest Resources Council. These efforts should then become part of a larger state-wide monitoring effort developed by the DNR and supported by the other MFRC regional landscape committees in cooperation with partnering natural resources agencies.

A. Background

Monitoring and evaluation are fundamental components of landscape-level management and are identified in Minnesota Statute 89A.07 of the Sustainable Forest Resources Act as:

“The DNR Commissioner shall maintain a program for monitoring broad trends and conditions in the state's forest resources at statewide, landscape, and site levels. To the extent possible, the information generated under the monitoring program must be reported in formats consistent with the landscape regions used to accomplish the planning and coordination activities specified in section 89A.06.”

The SFRA further states, *“To the extent possible, the program must incorporate data generated by existing resource monitoring programs.”* The SFRA also calls for compliance and effectiveness evaluation of forest management activities.

The Committee based this next generation monitoring and evaluation program on this legislative direction.

B. Monitoring Results from the First Generation East Central Landscape Plan

The 2005 East Central Landscape Plan included a brief outline for monitoring activities across the region. The Committee agreed that a high quality monitoring system was needed to measure actions and outcomes.

Unfortunately there was failure to develop a monitoring program for landscape-level management for several budgetary, logistical, and operational reasons, including: 1) much of the data needed to support such a monitoring effort is often not collected and organized at a landscape level, 2) data collection systems change in scope making use of the data not feasible, 3) managing agencies have not been required to report data on a landscape basis, and 4) a clear, coordinated approach to monitoring has not yet been envisioned nor funded. This plan revision process provided the Committee with an opportunity to develop an outline to guide the creation of a practical and meaningful monitoring and evaluation process.

With a modest investment of state General Funds into the MFRC and its Landscape Program over the next ten years, at minimum restoring previous allocation levels from the state legislature, the Committee strongly believes that significantly more progress can be made toward implementation of this Plan. Assuming a modest budgetary increase and the creation of a coordinated monitoring program with the DNR – including monitoring efforts at the MFRC landscape level – the Committee decided to develop a monitoring and evaluation program to support this second generation Plan. The following narrative is intended to help initiate the development of a more robust, collaborative, and meaningful monitoring and evaluation program.

C. Outline for the Second Generation East Central Landscape Plan Monitoring & Evaluation Program

The Committee recommends that the following two basic questions be addressed to evaluate the implementation and effectiveness of this Plan:

1. Resource Trend Monitoring (long term): Are management efforts moving the East Central Landscape towards the forest resource management goals outlined in the Plan and fulfilling the requirement of the SFRA?
2. Implementation Monitoring (short term): Are management actions being carried out in a manner that is consistent with the Plan goals and strategies?

It is important to emphasize that implementation of this and all MFRC landscape plans is voluntary and that the proposed monitoring program should be viewed as a means to improve and enhance coordination in the management of forest resources on landscape to sub-landscape levels. This process is not intended to subject partners to any type of enforcement or regulatory action. Another important consideration in monitoring forest resources is that longer timeframes are required to be able to document change. Users of this Plan are encouraged to take these factors into consideration.

Monitoring Indicators

To objectively monitor and evaluate progress towards plan implementation, metrics or monitoring indicators must first be identified and agreed upon by the Committee. A table of potential monitoring indicators and data sources is provided in [Appendix J](#). This table is only a starting point and should be refined as needed.

Resource Trend Monitoring: Are management actions moving the East Central Landscape towards the goals outlined in the Plan?

Forest Land Cover

One of the primary policy directives in the Sustainable Forest Resources Act (SFRA) is to “foster no net loss of forest land”. The National Land Cover Database (NLCD) administered by the Multi-Resolution Land Characteristics (MRLC) Consortium, a group of federal agencies that create and distribute United States land cover data for public use, provides forest land cover in relatively consistent formats and at regular intervals of time (five year intervals, e.g., 2006, 2011, 2016) across the state. It is anticipated that the federal government will continue to support this data collection. Datasets such as the NLCD are fundamental to making useful forest land cover comparisons over time to help evaluate the state’s policy of no net loss of forest land. Using this dataset the Committee will report results to the MFRC, DNR, and partners in the region every five years (e.g., 2021, 2026, 2031) as NLCD data as well as other satellite image-based datasets becomes available.

Forest Composition and Age Class

As the second generation efforts of coordination and implementation of this Plan matures over the next five to ten years and beyond, the Committee should further explore in conjunction with the DNR, the use of the U.S. Forest Service’s Forest Inventory and Analysis (FIA) data and other relevant sources to help establish long term trends of forest composition and age class of forest lands in each ECS subsection.

Additional research and reporting work on forest land cover, net volume, net growth, removals, mortality, and other relevant information from FIA should be gathered and evaluated on regular time intervals. The Committee should review this data on five-year intervals at a minimum. This effort should be developed after there is a review of available data sets, the preparation of a clear scope of work and assigning of workloads, and the allocation of funding adequate to support the work.

Implementation Monitoring: Are management actions being carried out in a manner that is consistent with the Plan?

After Plan approval by the MFRC, the Committee will need to prioritize the Plan’s goals and objectives to help identify which are the most important areas to focus efforts on. To support this priority setting process, the Committee should consider applying the “SAM” principle to select the goals and objectives to gather information on. When setting priorities, the Committee should consider the following questions for each objective to be monitored:

1. Is it: (S) significant?
2. Is it: (A) attainable?
3. Is it: (M) measurable?

Private Forest Management Monitoring

Given the importance of private land ownership in the East Central Landscape, tracking accomplishments of activities relating to private forest land management is essential to monitoring progress made on implementing this Plan. Given the budget restrictions of the Private Forest Management program, members of the Committee will take steps to assist DNR staff in developing and organizing this information into the Private Forest Management Module (PFMM) where possible.

Partners working on landscape stewardship projects should support the collection of data regarding services provided to landowners such as forest stewardship plan writing and outreach activities and share that information with DNR Forestry staff. Data to complete the following table should be developed by DNR Forestry through its PFMM and provided to the Committee on an annual basis.

The table below illustrates a proto-type format for annual reports for private forest management activities in the East Central Landscape.

	2021	2022	2023	2024	2025	Total EC Landscape
Total Area in EC Landscape (acres)						
Private Land (acres)						
Important Forest Res. Areas (acres)						
Technical Assistance						
Site visits						
Forest stewardship plans (number)						
Forest stewardship plans (acres)						
Incentive Programs						
Cost share assistance						
SFIA						
2c						
Conservation Land Protection						
Conservation easements acquired						
Public land acquisitions						

Technical Support Documents

As noted in Section 1, the MFRC recommended that the regional committees follow a general planning process in developing landscape plans. One of the important steps is to assess and document resources in the region. The MFRC has prepared several technical support documents for both the first and second generation plans. These documents not only helped to inform the planning process but also support the overall monitoring effort. These documents support the observation and documenting of numerous major trends relevant to sustainable forestry including:

- Amount of forest land, timberland, and other land uses.
- Ownership of forest land.
- Composition of forest lands and age class structures.
- Timber volume and quality.

The following reports should be maintained and updated every ten years to support landscape planning efforts in the region:

- Resource Atlas.
- Demographic Data Report.
- Conditions & Trends Report.
- Timberland Mortality Report.
- Forest Policy Inventory.

Cooperation and Funding

Obtaining relevant data from partners that is both useful and scalable at landscape to sub-landscape levels is essential to the effective monitoring of this Plan. Land managers and resource agency staff in the region need to share data and information regarding their activities in ways that can be used to evaluate progress towards the Plan's goals and objectives for this landscape-level monitoring program to be successful.

Furthermore, there needs to be adequate budgets and staff resources available to the DNR and MFRC to prepare the monitoring and evaluation documentation. The Committee notes that inadequate resources and commitments for the first generation monitoring program resulted in fewer opportunities to more fully fund and evaluate the implementation of the first generation Plan.

While the Committee recognizes public resources for monitoring are limited, it recommends that the MFRC work closely with the MN DNR and other partners in the region to inform the legislature that adequate funding resources are needed to support the development and maintenance of a meaningful monitoring system.

In conclusion, it is essential that partners and the public be aware that the landscape management process, including monitoring and evaluation, is voluntary, and that the primary purpose of landscape-level monitoring is to support and enhance sustainable forest resource management in the region.

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Section 11

Priority Recommendations to Agencies and Organizations



The purpose of this section is to summarize priority recommendations from the Committee to agencies, organizations, and private landowners working in the region on sustainable forest management. These recommendations do not include goals or priorities from elsewhere in this plan or the MFRC 2020 Strategic Plan. The intent is to assist people from these entities in finding specific strategies that apply to their organizations or personnel interests. One overarching recommendation from the Committee was to encourage all organizations, agencies, landowners, and citizens, to use this Plan and the corresponding maps and data in as many ways as possible. As a regional level plan, it is intended to provide a broad context on how forest resources can be managed sustainably through collaboration. The following represents an initial list of recommendations:

Priority Recommendations	MN Forest Resources Council – Governor and Legislature	Federal and State Agencies	Tribal Agencies	Local Units of Government	Conservation and Non- Governmental Organizations	Forest Products Industry	Education and Research Groups	Private Landowners and Citizens
Forest Conservation Vision Update. Update 25 Year Forest Vision report to the Lessard-Sams Outdoor Heritage Council in conjunction with the Minnesota Forest Resources Partnership and the regional committees. Develop a parallel and concurrent vision for Clean Water Legacy funds.	X							
Develop Monitoring Program. As per the monitoring statute of the Sustainable Forest Resources Act (M.S. 89A.07), expand DNR reporting to include MFRC landscape regions. Correspondingly increase MFRC capacity to provide oversight and program direction.	X							
Increase Funding for the Council and its Programs. There needs to be adequate funding to ensure that coordination and collaboration can really happen.	X							

Priority Recommendations	MN Forest Resources Council – Governor and Legislature	Federal and State Agencies	Tribal Agencies	Local Units of Government	Conservation and Non- Governmental Organizations	Forest Products Industry	Education and Research Groups	Private Landowners and Citizens
Reference This Landscape Plan. Use this Plan as a reference document when developing plans, strategies, and project proposals.		X	X	X	X			
Support Forest Industry Development. Find ways to more effectively support and foster economic development opportunities for the primary and secondary forest products industries in the region. Invest in innovative diversification to increase wood utilization and timber harvest to achieve forest management goals. Work with partners to ensure a sustainable and predictable supply of timber to the regional mills.	X	X		X		X	X	
Forest Resources Data. Support the collection, organization, and evaluation of forest resources related data and encourage the coordination and sharing of data with other resource agencies and local officials.		X						
Improve Private Landowner Assistance. Continue to improve the awareness and delivery of technical, educational, and financial assistance on forest management to private landowners. Find ways to increase funding for the private forest management program.		X		X				
Consider Climate Change. Consider available and emerging information on climate change risks and opportunities for forests, and use this information to adapt and prepare for a range of future conditions. Communicate these decisions to stakeholders and partners.	X	X	X	X	X	X	X	X
Landscape-Level Participation. Participate and contribute to landscape planning and coordination processes supported by the MFRC and the regional committees.		X	X	X	X	X	X	X
Consider Natural Resource Benefits. Incorporate a more comprehensive consideration of natural resources into land use planning processes while also considering the values and benefits that forests can bring to communities.				X				

Priority Recommendations	MN Forest Resources Council – Governor and Legislature	Federal and State Agencies	Tribal Agencies	Local Units of Government	Conservation and Non- Governmental Organizations	Forest Products Industry	Education and Research Groups	Private Landowners and Citizens
Partnerships. Partner with land management entities to support sound planning, management, and education efforts which address major ecological, economic, and social resource management issues in the region.			X	X	X	X	X	
Seek Technical Assistance to help plan and manage family forest lands. Landowners are encouraged to commit to having a stewardship plan prepared every 10 years and to implement at least one part of the plan.								X