



Sustainable Forestry

A Management Guide for Private Forest Landowners

Fifth Edition, 2024

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Silviculture is the art and science of tending a forest. And it truly is, an 'art' and a 'science.' Check out this section to learn more about the knowledge and techniques applied to keeping forests diverse and healthy.



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Certification and Guidelines

The words "certification" and "guidelines" sound ominous. They are not! Certification gives testimony that wood products from Minnesota's forests are being produced in a manner that is economically, socially, and ecologically sustainable. Minnesota's Voluntary Forest Management Guidelines incorporate 'best management practices' and are respected among forest management organizations throughout the nation.



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Private Forest Management

YOU – the private woodlands owner – are the focus and reason for this landowner guide. Collectively you own nearly one half of the forested land in the state of Minnesota. The decisions you make as well as the commitment you have to your woodlands are invaluable to wildlife, wood products, tourism, and recreation. In this section you will find information about 'planning' for your land: its present condition and its future.



How to Learn More

Throughout this document you will see QR codes that link to the Minnesota SFI Implementation Committee website. These QR codes are intended to help you, the landowner, find more information about a topic.

To use a QR code, open the camera app on your smartphone and hover it over the code on the page. A prompt will appear with a link. Click on the link and you will be directed to the **Management Guide for Private Forest Landowners** webpage.

Once there you will find additional information for the sections on Forest Management & Silviculture Systems, Certification & Guidelines, and Private Forest Management within the Guide. Alternatively, you can manually type **mnsfi.org/landowner-manual** into your internet browser to find the additional resources available to you.

Front cover photo by Richard Hamilton Smith



Minnesota Sustainable Forestry Implementation Committee

(denotes those assisting with Landowner Manual editing and rewrite. **donation of paper)*

American Bird Conservancy
Beltrami County
Carlton County
The Conservation Fund
Crow Wing County
Koochiching County
Louisiana Pacific
Molpus Woodlands Group
Minnesota Department of Natural Resources
Minnesota Forestry Association
*Minnesota Forest Industries
Minnesota Logger Education Program

Minnesota Forest Resources Council
Minnesota Forest Resources Partnership
*Packaging Corp. of America
PotlatchDeltic
Project Learning Tree
**Sappi
Society of American Foresters – Minnesota Chapter
St. Louis County
*University of Minnesota
*UPM Blandin
West Fraser



Dear Forest Landowner,

Sustainable Forestry – A Management Guide for Private Forest Landowners has been published by the Minnesota Sustainable Forestry Initiative (SFI) Implementation Committee (SIC) to help you, as a private owner of Minnesota's forested land, manage your woodlands to meet your personal goals. We hope it will also teach you more about tending your forest, managing wildlife habitats, protecting rare species and ecosystems, and maintaining forest health.

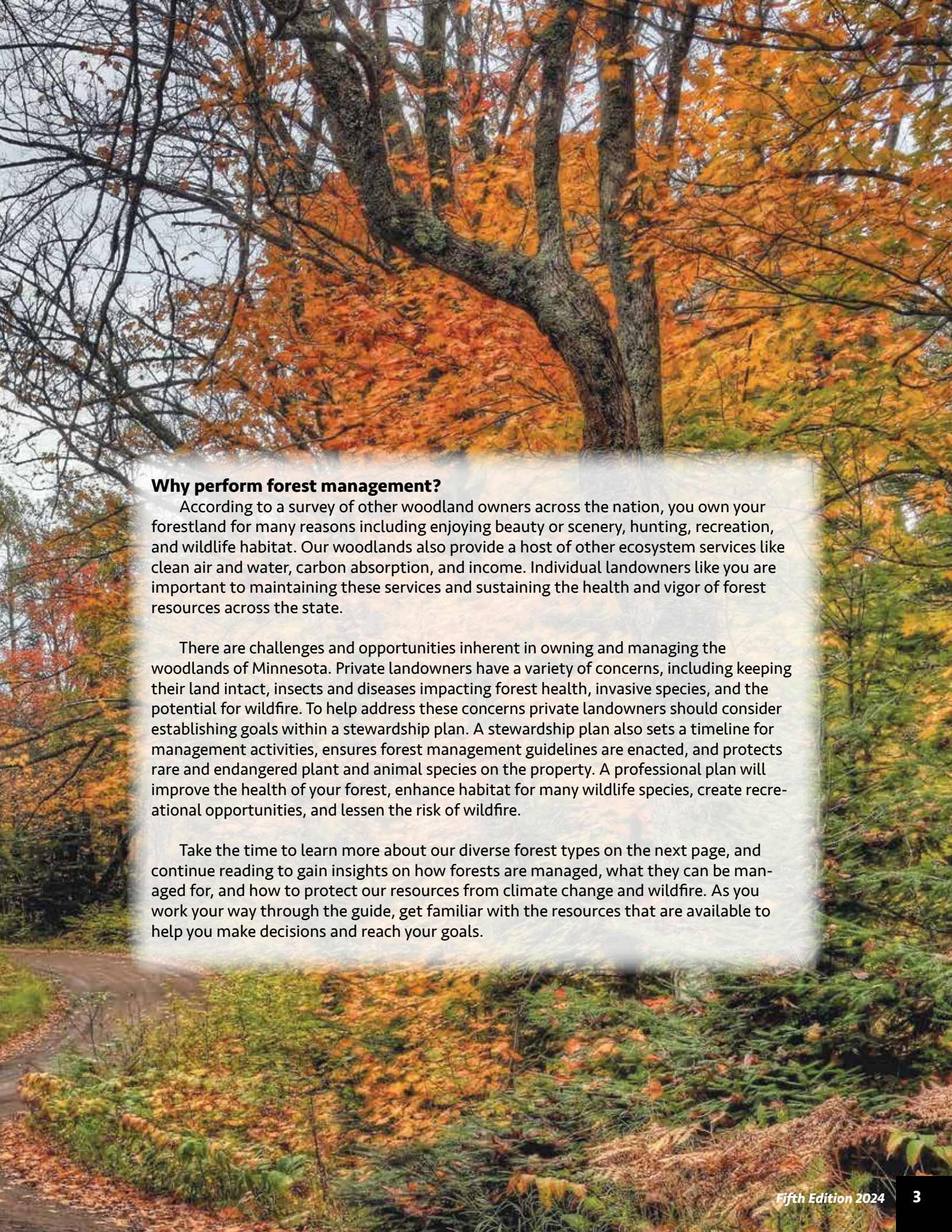
As one of over 200,000 family forest landowners in Minnesota, you play a significant role in the management of nearly 40% of the state's forested land. These forests provide Minnesotans with a myriad of benefits, such as clean water and air, recreation opportunities, and diverse forest products which provide support for rural communities. Everyone who lives, works, or plays in our forested land shares the responsibility to maintain the health and vigor of our forests.

The Minnesota SIC administers the Sustainable Forestry Initiative across the state, overseeing the application of a set of standards that ensure that the wood for forest products comes from sustainable sources and the forests are managed for continued growth while protecting wildlife, soils, rare plants, and water quality. Sustainable forest management is a hallmark of good stewardship in our forests.

Forestry professionals are eager to help you achieve your goals and sustainably manage the forest for future generations. Although you may not think of loggers or foresters as 'tools' to help you meet your forest land objectives, they are just that! A forester can assist you in creating a professional forest stewardship plan, and a logging professional can help you implement that plan.

Take some time to review this guide. It will provide you with information on forest management methods, knowledge you need to plan and execute a timber sale, and the forest management guidelines that help protect soil and water quality, cultural sites, and aesthetics. Most importantly, our hope is that this guide helps to ensure your forestland management activities are rewarding experiences.

Enjoy your woods!



Why perform forest management?

According to a survey of other woodland owners across the nation, you own your forestland for many reasons including enjoying beauty or scenery, hunting, recreation, and wildlife habitat. Our woodlands also provide a host of other ecosystem services like clean air and water, carbon absorption, and income. Individual landowners like you are important to maintaining these services and sustaining the health and vigor of forest resources across the state.

There are challenges and opportunities inherent in owning and managing the woodlands of Minnesota. Private landowners have a variety of concerns, including keeping their land intact, insects and diseases impacting forest health, invasive species, and the potential for wildfire. To help address these concerns private landowners should consider establishing goals within a stewardship plan. A stewardship plan also sets a timeline for management activities, ensures forest management guidelines are enacted, and protects rare and endangered plant and animal species on the property. A professional plan will improve the health of your forest, enhance habitat for many wildlife species, create recreational opportunities, and lessen the risk of wildfire.

Take the time to learn more about our diverse forest types on the next page, and continue reading to gain insights on how forests are managed, what they can be managed for, and how to protect our resources from climate change and wildfire. As you work your way through the guide, get familiar with the resources that are available to help you make decisions and reach your goals.

Minnesota's Diverse Forests

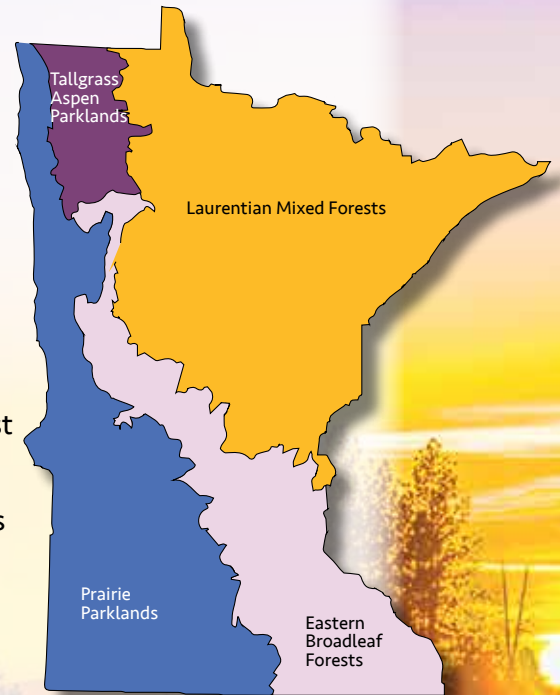
Minnesota boasts the unique distinction of being at the crossroads of four ecological provinces. These provinces describe the major land types across the country ranging from open prairies to dense mountainous forests.

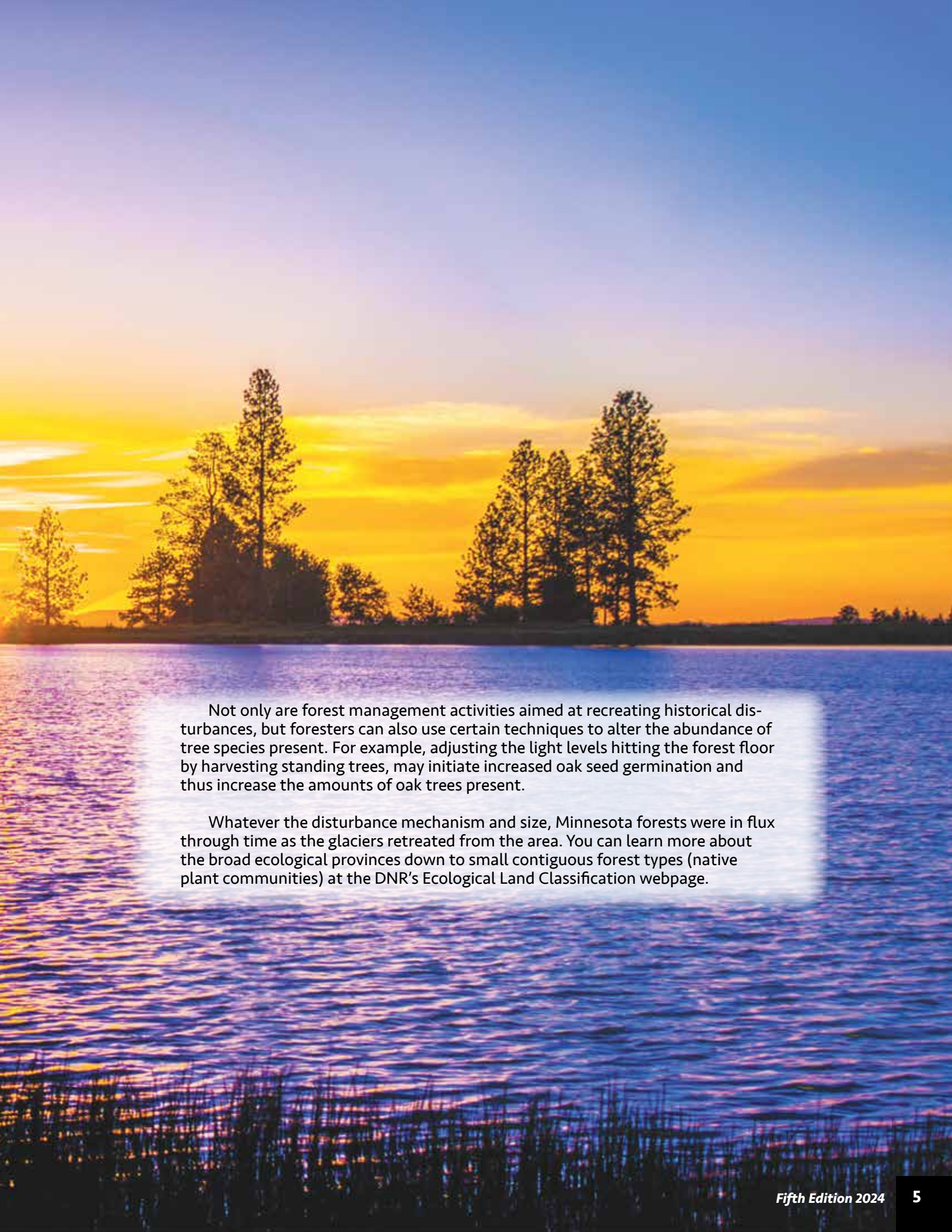
In northeast Minnesota, the Laurentian Mixed Forests dominate the landscape punctuated by conifer forests, mixed hardwood/ conifer forests, and conifer bogs.

Bisecting Minnesota from northwest to southeast is the Eastern Broadleaf Forest which represent the transition from humid forests of the northeast to the semi-arid prairies to the southwest. These forests exhibit more signs of woodlands than forests with glacial features and climatic variables dominating species ranges in this province.

The Tallgrass Aspen Parklands and the Prairie Parkland provinces are characterized by dry and cold conditions that are typically out of range for some tree species. This dry landscape is prone to fire and some fire-dependent woodland communities are found here. As the name suggests, aspen is the typical tree species present and historically experienced frequent disturbances stunting tree growth.

Forest management occurs in each wooded province within the state. Foresters use silvicultural techniques to mimic the natural disturbances that would typically impact each forest. For instance, single trees or small groups of trees would topple in windstorms which can be simulated with equipment harvesting small patches and thinning across a forest. Some disturbances would be catastrophic for a forest, leaving no standing trees such as a large windstorm or severe fire. Today, that would result in an even-aged silviculture system such as a shelterwood, leaving just a few trees to create seed in the new forest.





Not only are forest management activities aimed at recreating historical disturbances, but foresters can also use certain techniques to alter the abundance of tree species present. For example, adjusting the light levels hitting the forest floor by harvesting standing trees, may initiate increased oak seed germination and thus increase the amounts of oak trees present.

Whatever the disturbance mechanism and size, Minnesota forests were in flux through time as the glaciers retreated from the area. You can learn more about the broad ecological provinces down to small contiguous forest types (native plant communities) at the DNR's Ecological Land Classification webpage.

Indigenous History

Minnesota Indian Tribes

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innesota is home to seven Anishinaabe (Chippewa, Ojibwe) reservations and four Dakota (Sioux) communities. These are federally 'recognized' Indian Tribes.

"Recognition" is a legal term meaning that the United States recognizes a government-to-government relationship with the tribe and that a tribe exists politically in a domestic dependent nation status. These tribes operate under their own governmental systems.

SFI-Certified Organizations respect the rights of Indigenous Peoples and believe our shared quality of life improves when forests are sustainably managed for current and future generations. Indigenous communities began certifying their forestlands to the SFI Standards in 2010. Today, 39 Indigenous groups across Canada and the U.S. work on over 10 million acres of land certified to SFI Standards. In Minnesota, as well as throughout the country, there is increasing commitment to, and interest in, incorporating Indigenous knowledge into the policies and practices of Minnesotans working with forestry and wildlife.

Minnesota's seven Anishinaabe and four Dakota communities include:

Fond Du Lac Band of Lake Superior Chippewa

The Fond du Lac Band of Lake Superior Chippewa Reservation lies in northeastern Minnesota adjacent to the city of Cloquet. It is located approximately 20 miles west of Duluth. The Fond du Lac Reservation, was established by the LaPointe Treaty of 1854.

Gichi-Onigaming/Grand Portage Band of Lake Superior Chippewa

The Grand Portage Reservation is located in Cook County in the extreme northeast corner of Minnesota, approximately 150 miles from Duluth. It is bordered on the north by Canada, on the south and east by Lake Superior and on the west by Grand Portage State Forest. The reservation extends about 18 miles along the lakeshore and from nine miles to a quarter mile inland.

Leech Lake Band Of Ojibwe

The Leech Lake Reservation is located in the forests of north-central Minnesota. It contains 864,158 acres, including parts of Beltrami, Cass, Hubbard, and Itasca counties.

Boise Forte Band of Chippewa

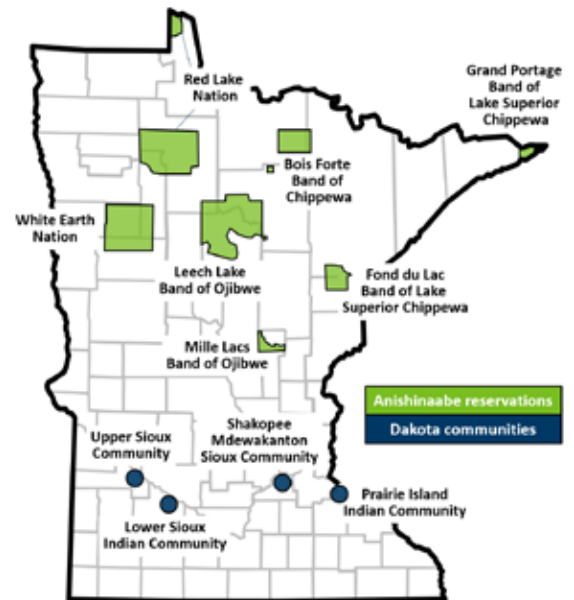
Boise Forte Band of Chippewa is located in north-central Minnesota. Their landbase is the Boise Forte Reservation which is comprised of three sections: Nett Lake, area 162.872 square miles, Deer Creek, 35.109 square miles, and Lake Vermillion, 1.623 square miles.

Lower Sioux Indian Community

The Lower Sioux Indian Community is located on the south side of the Minnesota River at the site of the U.S. Indian Agency and the Bishop Whipple Mission, a part of the original reservation established in the 1851 Treaty. Approximately 145 families live on 1,743 acres of tribal land.

Upper Sioux Community

The Upper Sioux Community is located in Yellow Medicine County. In 1938, 746 acres of original Dakota lands in Minnesota were returned to its people, and the Upper Sioux Indian Community came into existence. The Upper Sioux Community has been able to re-acquire and obtain an additional 1,579 acres of Dakota ancestral lands, giving a total land base of 2,325 acres.





Mille Lacs Band of Ojibwe Reservation

In the Treaty of 1855, the United States government set aside 61,000 acres of land south and west of Mille Lacs Lake, which became the Mille Lacs Band of Ojibwe.

Prairie Island Indian Community

Prairie Island Indian Community is located in southeastern Minnesota, north of Red Wing. It is a Mdewakanton Sioux Indian reservation in Goodhue County, located along the Mississippi River. Most of the reservation now lies within the city of Red Wing.

Red Lake Band of Chippewa Indians

The Red Lake Indian Reservation covers 1,260.3 square miles in parts of nine counties in northwestern Minnesota. It is made up of numerous holdings but the largest section is an area around Red Lake, the largest lake in the state. This section lies primarily in the counties of Beltrami and Clearwater.

Shakopee Mdewakanton Sioux (Dakota) Community (SMSC)

The Shakopee-Mdewakanton Reservation is located entirely within the city limits of Prior Lake, in Scott County. As of 2020, the SMSC reservation and off-reservation trust land totaled 7.99 square miles, all of which is located within or near the original 250-acre reservation established for the tribe in the 1880s. Tribal lands are located in the communities of Prior Lake and Shakopee.

White Earth Nation

The White Earth Nation is located in the northwestern Minnesota counties of Mahnomen, Becker, and Clearwater. The reservation originally covered 1,300 square miles. Much of the community's land was improperly sold or seized by outside interests. In the latter half of the 20th century, the federal government arranged for the transfer of state and county land to the reservation in compensation for other property that had been lost. The White Earth Nation holds the 160,000-acre White Earth State Forest.



Section 1:



Forest Management & Silviculture Systems

Silviculture is the art and science of tending a forest. It is based on the understanding of natural processes, such as disturbance, succession, competition, hydrology, tree biology, soils and climate change.

Forest Rotation is the time required to grow a timber crop to economic or natural maturity. Silvicultural treatments that occur during the rotation will affect yield, rate of growth and quality of timber. A silvicultural treatment, using the partial cutting of trees during the stand's development, is generally referred to as **thinning**. At the end of the rotation, trees are harvested and the forest is regenerated. Whatever regeneration method is used, the final harvest, at the end of rotation, should produce a new, young, healthy forest.

Forest Thinning

Individual trees or groups of mature, unhealthy or other selected trees are harvested periodically. Most of the trees are left to regenerate the stand naturally. Before any harvesting is done, an inventory of the forest is completed. The inventory identifies the tree species, the different sizes of trees, the quality and health of the trees and the availability of habitat in the forest.

Based on this information, a tree marking prescription is written and all trees to be cut are marked. Crop trees are usually marked with something (e.g., paint) that identifies them. Crop trees are the trees you want to grow for their future commercial value, for their value to wildlife or as sources of seed for regenerating desired tree species. Every eight to 15 years, the stand is thinned to give crop trees room to grow, and some unhealthy and mature crop trees are harvested. Care is taken during the thinning and harvesting operations to avoid damaging the site and the crop trees. Damage

to young and old trees can lower the future health and value of the tree.

Road access and a good network of skid trails are important. Good access will improve the efficiency of each thinning and also minimize damage to crop trees.

This system maintains a diverse, all-aged forest with a wide range of species of different sizes and ages. These natural-looking forests provide continuous supplies of wood, fuelwood and other forest products, as well as habitat for wildlife and attractive areas for recreation.

Uneven-aged Management

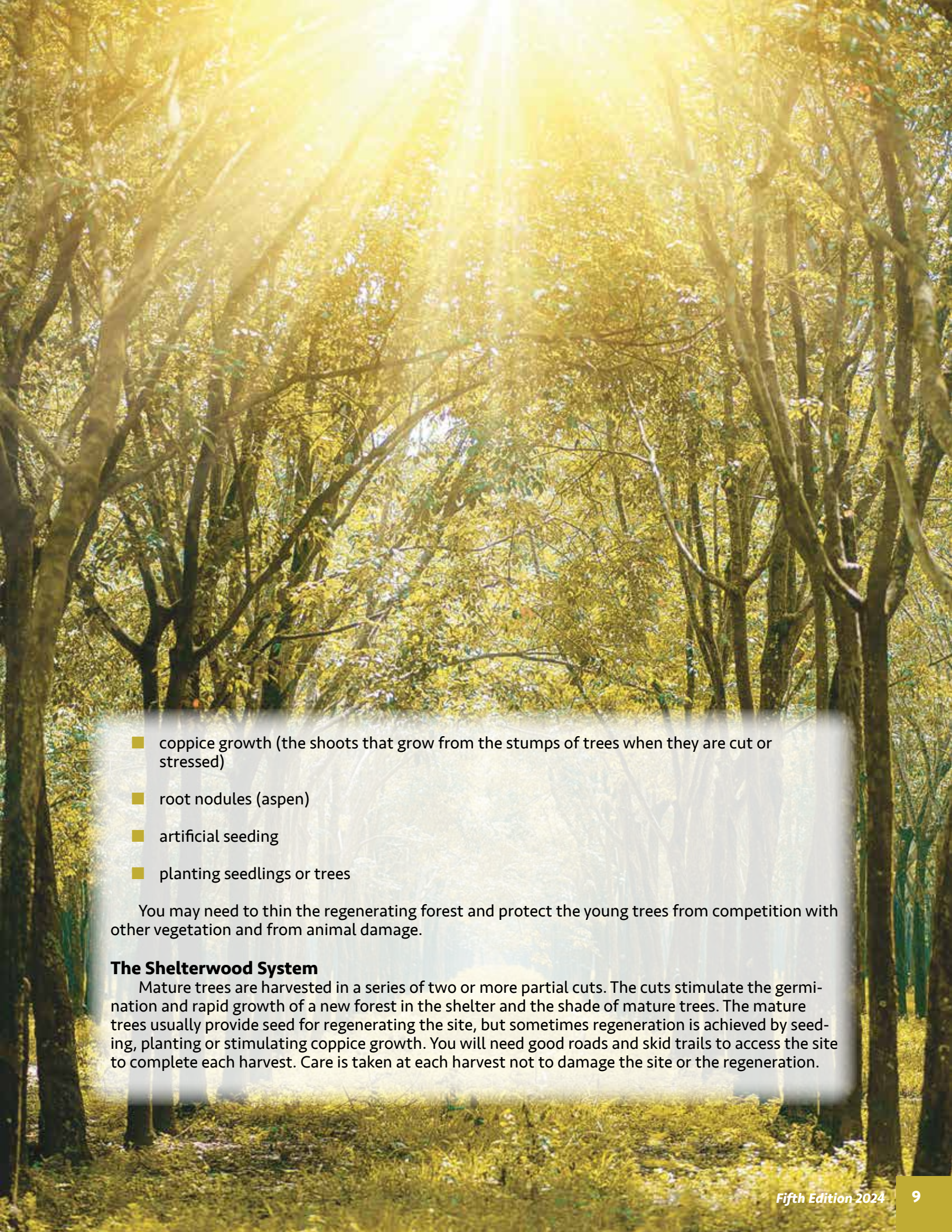
This system promotes uneven-aged stands with clumps of even-aged trees well distributed throughout the cutting unit. These even-aged groups are large enough to accommodate some shade-intolerant species in addition to more shade-tolerant species. Small gaps or openings are created on short intervals to develop into a mosaic of at least three or more age classes throughout the stand.

Even-aged Management

All the trees are harvested in one cutting operation. Clearcutting produces an even-aged forest with trees that are about the same age. Although maple and other shade-tolerant species can become established in clearcut areas, clearcutting strongly favors the growth of shade-intolerant species, like jack pine, oak, aspen, and paper birch. These species, which need full sunlight, grow fast and quickly dominate clearcut areas.

The clearcut area can be regenerated by:

- windborne seeds from nearby areas
- seeds from trees left on the site, singly, in strips or in groups

- 
- coppice growth (the shoots that grow from the stumps of trees when they are cut or stressed)
 - root nodules (aspen)
 - artificial seeding
 - planting seedlings or trees

You may need to thin the regenerating forest and protect the young trees from competition with other vegetation and from animal damage.

The Shelterwood System

Mature trees are harvested in a series of two or more partial cuts. The cuts stimulate the germination and rapid growth of a new forest in the shelter and the shade of mature trees. The mature trees usually provide seed for regenerating the site, but sometimes regeneration is achieved by seeding, planting or stimulating coppice growth. You will need good roads and skid trails to access the site to complete each harvest. Care is taken at each harvest not to damage the site or the regeneration.

Forest Management Practices for Wildlife

Wildlife Management

Wildlife management is the art of manipulating different factors to affect a change in wildlife populations. That is a fancy way of saying that you, as a woodland owner, can change and enhance elements of your forested land that will likely cause some type of change in the wildlife who live on, or visit that land.

Forest wildlife management involves managing forest vegetation to provide for the needs of wildlife. Typically that means harvesting the right amount of trees in the right place at the right time.

Wildlife biodiversity is directly tied to forest diversity. Having a wide variety of forest types and ages provides habitat for a wide variety of animals. But one must also consider scale. We cannot provide everything on each patch of earth. Landscape diversity ensures that all the pieces of the puzzle are there, but that one area may have more diversity, or less, than another. So an individual forest stand may not have a lot of diversity, but zooming out to the 40,000 foot level there is an enormous amount of diversity in Minnesota's forests.

The carrying capacity of an area is the number of individuals of a given species that the area can support and sustain over time. Population growth is often suppressed by a limiting factor, something that is lacking in availability like food, water, nest sites, etc. Disease and predation are not limiting factors. When the availability of a limiting factor is increased the population increases to a new carrying capacity.

Wildlife habitat provides animals with water, food, cover, and space. These limiting factors can determine animal diversity and abundance.

Water – Drinking water is rarely a limiting factor for wildlife in Minnesota. While a water spot can attract animals, creating one will not increase animal populations.

Food – Wildlife food is rarely limiting year-round but can be seasonally rare. For example, grouse and deer have a lot of food options during the growing season. However, in winter, they specialize in what is available. Deer browse on shrubs, white cedar and other woody material, whereas grouse feed on the flower buds of mature male aspen, birch, or hazel brush. More summer food will not lead to more wildlife, but providing natural foods in winter could, like shearing brush near deeryards or retaining some birch and aspen in reserve clumps or riparian zones



during harvest. Providing for the seasonal dietary needs of wildlife can help them survive winter and emerge in better breeding condition

Cover – Good wildlife habitat provides animals with escape cover and thermal cover.

- Escape cover allows animals protection from predators. This can be in the form of brush piles, dense young forests, marshes, burrows, etc.
- Thermal cover protects animals from excessive heat or cold (usually the latter in Minnesota). Many animals seek dense stands of conifers that limit radiant heat loss, break the wind and reduce snow depths. Others use dens, brush piles, hollow trees, etc.

Space – Animals need a certain amount of space to meet all of their annual needs and reduce competition for resources. For example, you wouldn't expect a moose to live in a 20-acre woodlot, but it would be plenty for a pine squirrel. Bluebirds use about 5 acres of open grasslands while American kestrels need about 100 acres. If you have a 50-acre field, you might expect to have 10 pairs of bluebirds but should not expect to support a pair of kestrels. Two components of space are home range and territory.

- Home range is the area regularly traveled by an animal as it meets its annual needs. Typically, large animals have larger home ranges than small ones and predators have larger ranges than herbivores. Home ranges can become smaller if an animal meets all of its annual needs in a smaller area.



Home range size can be seasonal – larger in breeding season, smaller in winter. They can also be seasonally disjointed, as when a deer goes miles away to a deeryard for the winter.

- Territory is an area actively defended from other animals. Usually, the animal is defending a finite limiting resource. When territories are full, excess animals must move on or take lesser territories – meaning they may not survive or may not reproduce. Providing more of the limiting resource can reduce territory sizes and allow for higher local populations and more reproduction.

Social systems can determine local animal densities. For example, solitary grouse can live in close proximity to other grouse so long as their needs are being met. Deer live in matriarchal family groups and need bigger areas to meet the needs of the group. Wolf packs often defend large areas from other packs.

Local wildlife populations increase through increased reproduction, reduced mortality, or immigration from other areas. You can increase a local population by taking steps to:

- Increase the number of breeding animals. For example, manipulate the deer sex ratio through selective harvesting, or increase grouse numbers by providing more breeding territories.
- Increase adult survival so adults have time to reproduce. Bald eagles take five years to get their white head and tail and become breeders.
- Increase the survival of young by optimizing brood-rearing habitat.
- Increase immigration by creating optimal habitat to entice animals from neighboring areas.

Local wildlife populations decrease through mortality and emigration. The young of many species disperse to new home ranges when they reach sexual maturity. This is nature's way of reducing inbreeding, but it usually balances itself. Mortality increases in certain seasons, like winter, migration time, breeding season and hunting season. In many

cases, mortality is sex specific. Male mammals die more often than females due to the rigors of defending breeding sites, displaying for females or fighting among themselves. Female birds die during incubation and brood rearing. Mortality is also age-specific, with young and old more frequently succumbing to predators, disease or weather. There are many causes of mortality in wild animals:

- Predation is the chief cause of mortality among animals. You can reduce predation by providing adequate escape cover.
- Human harvest can be considered predation. In some cases, harvest is offset by increases in the survivors' fecundity. In other situations, limiting harvest may increase populations.
- Disease and parasites often are not a serious concern unless the population is stressed due to overcrowding. Artificially holding populations above their natural carrying capacity through supplemental feeding can lead to severe disease problems.
- Accidents are a minor source of mortality but can be locally significant. For example, when a road is built between a turtle pond and a nesting area, deer cross highways at a particular spot, or when power lines, windmills, or radio towers go up in important bird flyways.
- Bad weather rarely kills significant numbers of animals but can be important at key times of the year. Harsh winters are tough on many animals, but when provided with adequate food and cover most animals can cope. Extended cold, wet springs are tough on most birds but there is little you can do about it.



Want more of these animals? Perform these practices:

Deer

- Clearcuts, seed tree cuts, and shelterwood cuts will provide abundant deer food as well as thick escape cover to get away from predators.
- Timber thinnings will allow more sunlight to reach the forest floor, increasing plant and shrub food for deer.
- Timber stand improvement in oak systems releases crop trees and can lead to higher acorn production for deer, bear, turkey, squirrels, etc.
- Planting 3- to 5-acre mixed conifer patches adds diversity and creates thermal cover where deer can better survive harsh winters.
- Wildlife openings on old log landings can be fawning areas and important early spring feeding areas.

Ruffed Grouse

- Clearcutting small blocks of aspen creates ideal grouse cover. Leaving small balsam fir diversifies the future stand with additional thermal cover.
- Hazel and dogwood shrubs and birch provide important food resources.
- Leave sufficient down logs after harvest to serve as drumming logs.

Wild Turkeys

- Clearcuts, seed tree cuts, and shelterwood cuts create temporary brood-rearing cover and nesting cover.
- Older open-grown trees provide roosting cover.
- Well managed hardwood stands generate a diverse mix of seeds and nuts for foraging turkeys.
- In heavily forested zones wildlife openings are critically important brood-rearing areas, especially when seeded with a variety of plants.

Black Bears

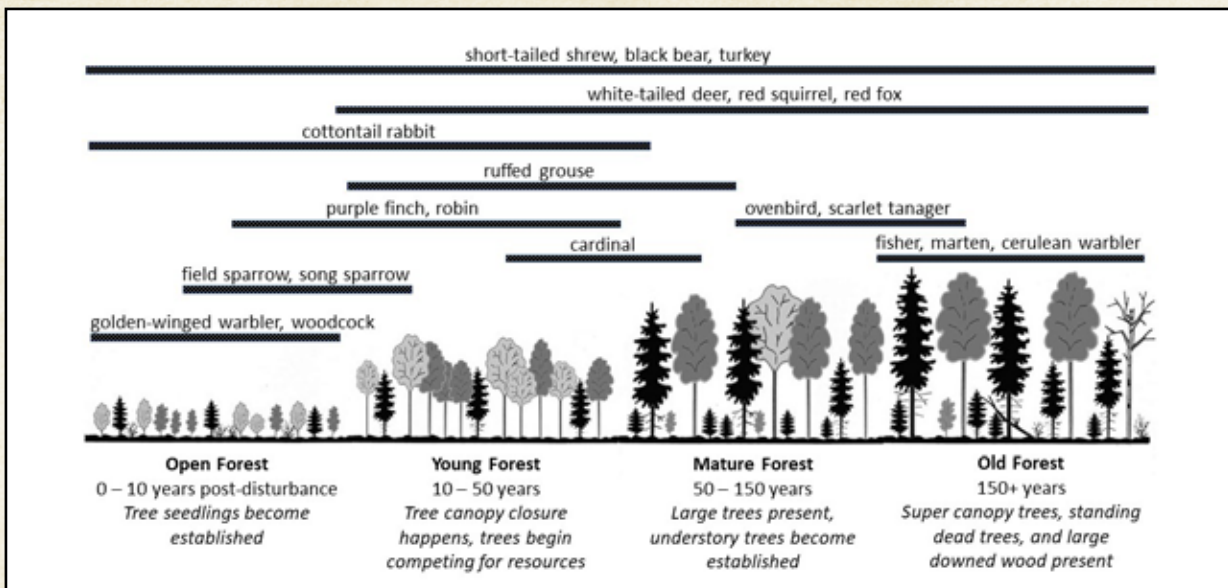
- Bears will inhabit and use all of Minnesota's forest types at certain times of the year.
- Wildlife openings and old fields offer early green forage as bears emerge from dens.
- Regenerating clearcuts offer new shoots, catkins and soft mast.
- Lowlands and jack pine clearings offer blueberries and cover.
- Mature hardwoods offer hard mast while transition areas offer both hard and soft mast.

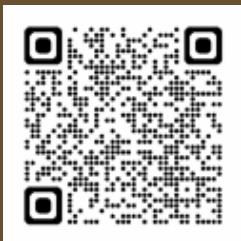
Songbirds

- Songbirds occupy such a wide array of niches that you can increase bird diversity by providing a diversity of forest ages, types, and stand sizes.
- Clearcuts, seed tree cuts, and shelterwood cuts favor early successional songbirds like golden-winged warblers, chestnut-sided warblers, mourning warblers, etc.
- Selection cuts create smaller canopy gaps and benefit hooded warblers, flycatchers, and many forest interior species post-fledging.
- Thinning older stands maintains canopy cover and forest continuity for mature forest interior species.

Forest Bats

- Snag trees and older loose-barked trees can provide maternal roosts for forest bats.
- Clearcuts and selection cuts create openings that attract insects, thus providing feeding areas for bats.
- Timber thinnings and forest roads provide open flyways for bats.





Section 2:



The Endangered, Threatened & Special Concern Species of Minnesota's Forests

Minnesota's private forest landowners are stewards not only of the trees growing in their woodlands, but also of the other plants and animals that live there. To be a good land steward, it's important to be aware of how forest management affects those species and imperiled, critically imperiled, threatened, or endangered ecological communities. State threatened and endangered species are listed by the Minnesota Department of Natural Resources, and federal ones are listed by the U.S. Fish and Wildlife Service. NatureServe, a non-governmental organization, designates species or plant communities as critically imperiled (G1) or imperiled (G2). This section is designed to increase your awareness of these rare species and communities in Minnesota.

Definitions

- The term "endangered species", as defined by the Endangered Species Act of 1973, means any species which is in danger of extinction throughout all or a significant portion of its range.
- The term "threatened species", as defined by the Endangered Species Act of 1973, means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- The term "species of special concern", as defined by Minnesota's Endangered Species Statute, applies to species that are not endangered or threatened, but are extremely uncommon in Minnesota, or have unique or highly specific habitat requirements and deserve careful monitoring of its status. Species on the periphery of their range that are not listed as threatened or endangered but now have increasing or protected, stable populations. Species of special concern are not protected by Minnesota's Endangered Species Statute or associated Rules.
- The global rank (G-rank) of a species or plant community is a measure of its rarity and imperilment across its entire range. G1 = Critically imperiled - very few remaining acres or very vulnerable to elimination throughout its range. G2 = Imperiled - few remaining acres or very vulnerable to elimination throughout its range. State ranks (S-ranks) are similar to global ranks but are based on the extent and condition of the species or community in Minnesota.



Minnesota's forests are home to several species that are designated as endangered, threatened, or species of special concern. Following are 15 examples of these vulnerable species.



Northern Long-eared Bat (*Myotis septentrionalis*)

Federal: Endangered

The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7" but a wingspan of 9 to 10". Their fur color can be medium to dark brown on the back and tawny to pale brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*. Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They spend spring, summer, and fall in forests, where they raise their young. All forest management should consider impacts to this species. Northern long-eared bat populations have been decimated by white-nose syndrome, an invasive exotic fungus that kills them during hibernation. While forest habitat is not lacking for them, and active management helps create foraging habitat, landowners are urged to protect and buffer known maternal roost trees during timber harvesting operations.

Bald Eagle (*Haliaeetus leucocephalus*)

Federal: Protected under Bald & Golden Eagle Protection Act

Minnesota: Special Concern

The bald eagle inhabits forests near lakes and rivers where large trees are available for nesting. They focus their activities in habitats where there is open water. In the winter, this might be an area below a dam. Carrion, the decaying flesh of dead animals, is an important food source during this time.

Bald eagles tend to nest in large white pine, red pine, aspen, or cottonwood trees near lakes and rivers. Their nests are large - six to eight feet across. Eagles lay their eggs in March and most young leave the nest areas by August. The nesting season (January-August) is considered one of the more sensitive times of the year for this species. Management of forests near an active eagle nest should be discussed with a professional forester or wildlife biologist.

Canada Lynx (*Lynx canadensis*)

Federal: Threatened

Lynx are sometimes confused with bobcats. They are about the same size as a bobcat, but have brown fur with white undersides, long ear tufts, and a pronounced goatee under their chin. The tip of its tail is completely surrounded in black. Like a rabbit, the lynx's hind legs appear longer than its front legs.

Lynx tend to favor the young forest habitats that are preferred by their primary prey, the snowshoe hare. In fact, its populations are known to fluctuate closely with hare abundance. In addition to hares, lynx eat rodents, grouse, and other birds. Our knowledge and understanding of this cat is increasing as research is conducted in Minnesota. Forest management activities that create habitat for snowshoe hare help support lynx populations. Minnesota is the far southern portion of lynx range, so their numbers have always been relatively low.

Gray "Timber" Wolf (*Canis lupus*)

Federal: Endangered

Perhaps no other animal species represents the north-woods in legend and folklore more than the gray wolf. Wolf packs cover large territories of land - from 50 to 120 square miles. Usually the pack, which generally consists of five to eight individuals, restricts its travels and hunting to within a specific territory which the pack defends from other predators. Wolves use a wide variety of habitats for hunting and raising their young. In Minnesota, they are particularly dependent on white-tailed deer (which is 80 percent of their winter diet) and beaver.

Young forests provide high quality deer habitat and thus, quality habitat for the wolf. The wolf population in Minnesota has exceeded the Endangered Species Act recovery goal since 1980, but repeated lawsuits keep it federally listed.

Blanding's Turtle (*Emydoidea blandingii*)

.....
Minnesota: Threatened

The Blanding's turtle has a very obvious domed upper shell and a bright yellow neck, throat, and chin. The upper shell appears bluish-black, with numerous spots and bars of yellow. This turtle lives in complexes of wetlands that contain diverse vegetation patches. It nests in open, sandy upland areas within one mile of wetlands. In the summer, the Blanding's turtle seeks open, shallow wetlands or slow moving waters with mud bottoms and abundant aquatic vegetation.

It nests in late May-June, with hatching occurring in September, and overwinters in the muddy bottoms of marshes and ponds. Since Blanding's turtles walk between wetlands and nesting areas, they are very vulnerable to being run over by cars. Road development in key habitats is a management concern.

Timber Rattlesnake (*Crotalus horridus*)

.....
Minnesota: Threatened

This long snake, three to four' in length, is very distinctive with its barred body pattern and a large tan rattle. Although the background color of its body varies from yellow to brown, its tail is always solid black. The timber rattlesnake is found in the bluff and hill country of southeastern Minnesota. Its ideal habitat includes forested bluffs, south-facing rock outcrops, and bluff prairies, particularly in the Mississippi River Valley. In the summer, it will be found in forests, prairies, and agricultural lands; it overwinters in communal dens, often in crevices or fissures in limestone bluffs and outcrops. Do not interfere with the timber rattlesnake when and if you encounter one! In the winter, take care not to disturb areas around known den sites.

Wood Turtle (*Glyptemys insculpta*)

.....
Minnesota: Threatened

Wood turtles are found in 15 of Minnesota's eastern counties. The wood turtle is mostly aquatic. It prefers small to medium-sized, fast-moving streams with adjacent forests. Wood turtles will occupy adjacent alder thickets, and forest and grassland habitat for basking and foraging. Sandy, sparsely vegetated areas that are not prone to flooding and have ample exposure to direct sunlight provide important nesting sites. They nest on sandy bars, cutbanks, or sand/gravel mining areas. During the summer, this species will forage on land. Wooded floodplains and uplands adjacent to wood turtle streams supply a variety of foods, including berries, succulent leaves, mushrooms, insects, and earthworms. Wood turtles overwinter in water beneath the ice in bank undercuts and near log jams. They are very long-lived, maturing between the ages of 14 and 18 years. Maintenance of small clearings and young forests adjacent to wooded streams, particularly near sandy streambanks with exposed soils, will provide basking and feeding habitat near nesting and hibernation sites.

Ram's Head Orchid (*Cypripedium arietinum* R. Br.)

.....
Minnesota: Threatened

This legendary orchid has always been considered rare in Minnesota. The reasons for its rarity are not entirely known. However, it has suffered a general decline largely because of habitat loss due to changes in land use. Many remaining populations face a critical threat from people who illegally dig up these plants, even in state parks and state scientific and natural areas. This type of poaching is especially tragic because the plants do not survive transplantation from the wild. This beautiful, rare plant is found in diverse coniferous forest habitats including bogs or lowland forests (dominated by northern white cedar, tamarack, balsam fir, dry pine forests) and upland mixed deciduous forests. The ram's head orchid prefers shady, lowland sites.



Braun's Holly Fern (*Polystichum braunii* subsp. *purshii*)

.....
Minnesota: Threatened

This rare fern was first found in 1966 during a geological survey of Cook County and has since been discovered in adjacent Lake County. This is a large fern, up to a 3' tall, and similar in size to the lady fern with which it commonly grows. In Minnesota, Braun's holly fern typically occurs along moist, often rocky draws and ephemeral rocky streams in rich hardwood forests dominated by sugar maple and yellow birch. This fern is affected by activities and conditions that dry the soil and increase light levels.

Grape Ferns and Moonworts (*Botrychium* Sp.)

.....
Minnesota: Endangered. Threatened. Special Concern.

There are several species of plants that are under the genus of *Botrychium*. They are small, rare, and easily overlooked. There are over 50 species worldwide; 30 are in North America and 12 in northeastern Minnesota. The rattlesnake fern is the most common in this state, with other species ranging from rare to extremely rare.

Glade Mallow (*Napaea dioica* L.)

.....
Minnesota: Threatened

Glade mallow is a large, robust plant, often standing six feet tall with several flowering stems. Flowers are white. Although recent surveys have located additional sites in the southeastern part of the state, this species is still considered rare because its geographic range in Minnesota is very limited, and most of its habitat has been altered by agricultural activity. Although a number of important sites occur in state parks or on state forestland, most plants occur on private land.

Dwarf Trout Lily (*Erythronium propullans*)

.....
Federal: Endangered
Minnesota: Endangered

Dwarf trout lily is one of only two or possibly three plant species found only in Minnesota, and is the state's only federally endangered plant. It occurs only in the southeastern counties, typically on north-facing slopes of maple-basswood forests and floodplains of the Zumbro, Straight, Little Cannon, and Cannon rivers in Rice, Goodhue, and Steele counties. The plants usually occupy the lower part of the slope but may extend nearly to the top of the slope or descend into the level floodplain. This is a deeply shaded habitat in the summer, but the dwarf trout lily completes its life cycle in early spring before the trees leaf out. Habitat loss is largely the result of incompatible recreation uses and housing development. Loss of the elm canopy in floodplain habitat, earthworm infestations, over browsing by deer, and proliferation of invasive species such as European buckthorn, reed canary grass, and garlic mustard threaten the species even at protected sites. Soils at the sites where dwarf trout lilies grow are generally quite erodible, and caution should be used in mechanical removal of non-native species to assure that seedbeds are not created for other invasive species.

Golden Seal (*Hydrastis canadensis* L.)

.....
Minnesota: Endangered

Golden-seal has always been rare in Minnesota, in part because southeastern Minnesota is at the northwestern periphery of its North American range. It has become even more rare in recent times, however, not only in Minnesota, but across its entire range because of intensive and unsustainable harvest by commercial root diggers. It is often associated with a rich woodland ground cover of wild ginger, hepatica and blue cohosh. Populations range from just a few scattered individuals to more than 100 at each site. Golden seal appears to be intolerant of grazing or disturbances that open the forest canopy.

Eastern Hemlock (*Tsuga canadensis*)

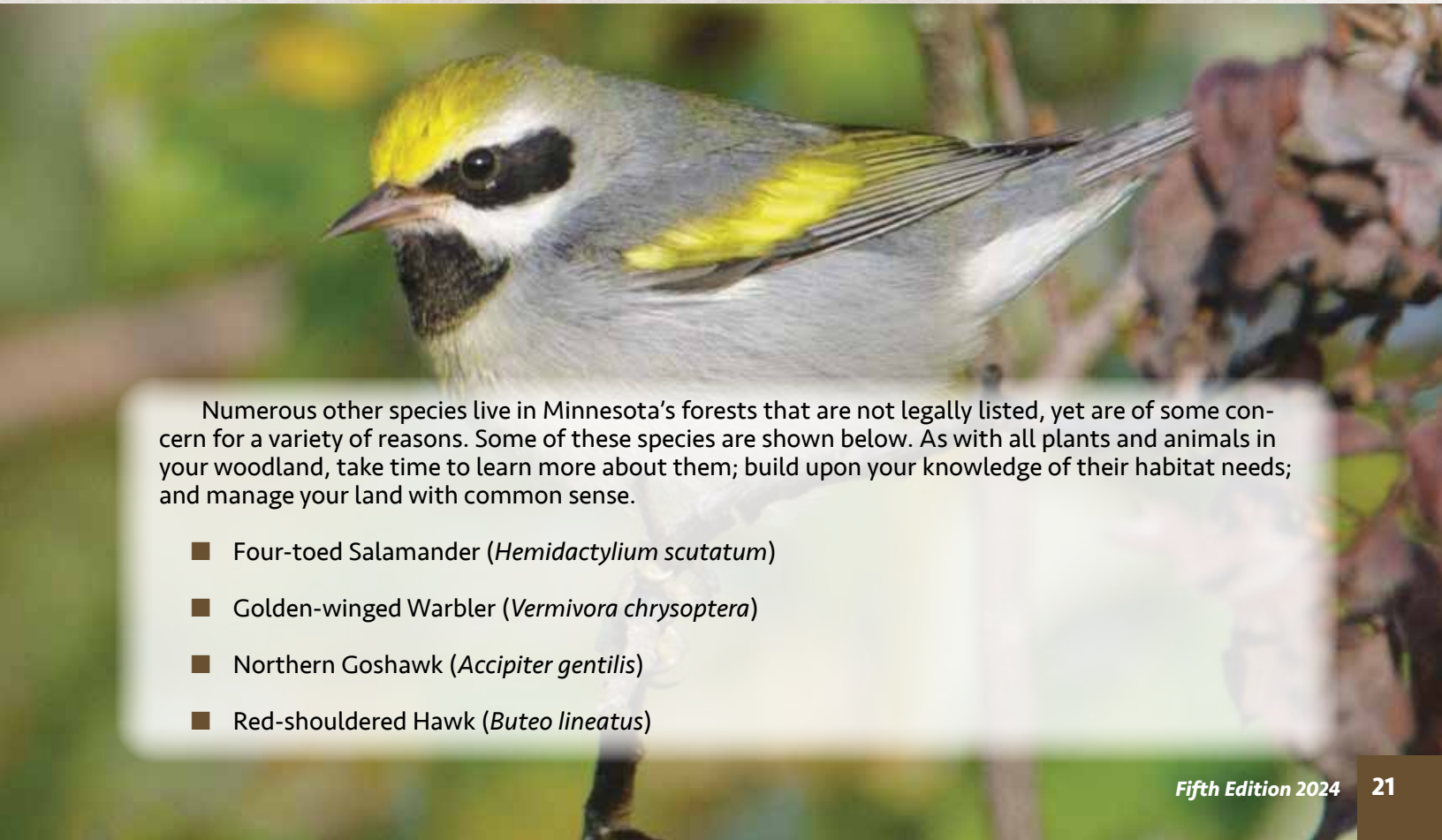
.....
Minnesota: Endangered

Eastern hemlock is one of Minnesota's rarest and most imperiled trees. It has always been rare in Minnesota, which represents the northwestern edge of its range. Currently there are 10 known stands with a total of perhaps 50 mature trees occurring in Carlton, Aitkin and St. Louis counties.

Butternut (*Juglans cinerea*)

.....
Minnesota: Endangered

Butternut was a fairly common tree in southern Minnesota until recently. The main issue facing its conservation is not loss of habitat, but the spread of the lethal fungal disease known as butternut canker. There is no known treatment or control for butternut canker, and few if any trees are immune. This tragic situation has progressed to the point where nearly all butternut trees in Minnesota are now dead or dying.



Numerous other species live in Minnesota's forests that are not legally listed, yet are of some concern for a variety of reasons. Some of these species are shown below. As with all plants and animals in your woodland, take time to learn more about them; build upon your knowledge of their habitat needs; and manage your land with common sense.

- Four-toed Salamander (*Hemidactylium scutatum*)
- Golden-winged Warbler (*Vermivora chrysoptera*)
- Northern Goshawk (*Accipiter gentilis*)
- Red-shouldered Hawk (*Buteo lineatus*)

Forests Of Exceptional Conservation Value

Forests of Exceptional Conservation Value (FECV) include areas with critically imperiled and imperiled species and communities. Most of the forests we manage include places with unique environmental, cultural, historical or recreational value. We manage these areas to protect their unique qualities. Protecting forests of exceptional conservation value is part of implementing the Sustainable Forestry Initiative® standard. All forests contain environmental and social values, such as wildlife habitat, watershed protection or archaeological sites. FECV are forests with values that are considered to be of outstanding significance or critical importance.

Lake States Regional Assessment for Forests of Exceptional Conservation Value

In accordance with the requirements of the 2022 SFI Fiber Sourcing Standard, the SFI Implementation Committees of Minnesota, Michigan, and Wisconsin worked cooperatively on an assessment of FECVs. Lists of Globally Critically Imperiled (G1) and Imperiled (G2) species and ecosystems were acquired from NatureServe for each state. Trained biologists and foresters reviewed each entry and evaluated the potential for forestry activities to impact the FECV positively and/or negatively in their respective states. Information gained during this process is being used to educate landowners, forest managers, and loggers about the importance of FECVs and mitigation techniques to ensure continued presence on the landscape. The assessment found the following two FECV communities in Minnesota:

- **Jack Pine / Prairie Forbs Barrens**

Jack Pine / Prairie Forbs Barrens ecosystems are found on the prairie/forest border in the US and Canada. The sandy soils are acidic, droughty, and infertile. The open vegetation was historically influenced by fires. The vegetation is dominated by grasses and forbs with a sparse tree layer. The dominant tree is jack pine (*Pinus banksiana*), with varying amounts of northern pin oak (*Quercus ellipsoidalis*), red pine (*Pinus resinosa*), and aspen (*Populus spp.*).

Fire is the most important natural disturbance in this community, keeping the tree canopy very open. In the absence of fire, oak became more abundant, and then the canopy closes and more shade-tolerant species invade. Logging can be used to open up the overstory before the reintroduction of fire as a management strategy.

- **Northern White Cedar - Yellow Birch Forest**

Northern White Cedar - Yellow Birch Forest ecosystems are found on well-drained to somewhat poorly drained upland soils across the Lake States. The canopy of this upland community is dominated by white cedar (*Thuja occidentalis*) and a variety of hardwoods, most typically yellow birch (*Betula alleghaniensis*), paper birch (*Betula papyrifera*), and quaking aspen (*Populus tremuloides*), but occasionally red maple (*Acer rubrum*) and sugar maple (*Acer saccharum*). Associated conifers include balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), and (rarely) eastern hemlock (*Tsuga canadensis*).

Forest managers should be aware of the community and avoid logging practices that could significantly alter the composition of these forests. Both white cedar and yellow birch are difficult to regenerate, especially where white-tailed deer numbers are high.





Section 3:



Forest Invaders

Forest pests are any organism that can harm trees, forests, or the environment. What is considered a pest can range from an animal to a plant or as small as a microbe. By detecting and reducing the spread of these pests, forest landowners can protect the natural environment in the future. The following pests are emerging threats to our forests in Minnesota.



Emerald Ash Borer

This exotic insect is native to Asia and is currently killing ash trees (*Fraxinus spp.*) in the Great Lakes region at an alarming rate. Since its initial discovery in 2002 in Michigan, the emerald ash borer (EAB) has killed millions of ash trees across the eastern United States and Canada. It was found in Minnesota in 2009 and poses a great risk to all species of the state's ash trees. Where it presently occurs in other states, it has been found in nurseries, community shade trees, and rural forests.

Government-imposed quarantines and restrictions on the movement and transportation of firewood are two methods being used to slow the spread of the borer.

The EAB belongs to a group of insects known as metallic woodboring beetles (*Buprestidae*). The adults are small, iridescent green beetles that live outside of trees during the summer months. The larvae are grub or worm-like and live underneath the bark of ash trees. Trees are killed by the tunneling of the larvae under the tree's bark. The tree host suffers extensive damage to its vascular system, depriving its crown of water and nutrients.

How do we stop it? This is a slow-moving insect, except when it gets help from us. The insect's natural dispersal rate is just one-half to two miles annually; however, its transmission has accelerated due to the inadvertent transport of emerald ash borer larvae in infested materials by people. Don't import materials to Minnesota that could harbor EAB such as ash firewood. Minnesota has one of the highest volumes of ash on forestland in the U.S. with an estimated 867 million forestland ash trees, and ash was a prominent component of our urban forests as well.

Spongy (Gypsy) Moth

Spongy moth, (*Lymantria dispar*), is one of the most damaging invasive forest defoliators in the U.S. It was introduced in 1869 in Massachusetts and ever since then the population has been slowly moving westward. Currently spongy moths are established in northeastern Minnesota extending south through central Wisconsin. These areas are considered generally infested. The Minnesota Department of Agriculture has been actively surveying and slowing the advancing population front by eradicating small, isolated populations in advance of the main population front for over four decades.

Spongy moth caterpillars are the only damaging life stage and can feed on over 300 species of trees and woody plants, with aspen and oak being on their most preferred list. The caterpillars have five pair of blue dots and six pair of rusty red dots. They are present in early-midsummer and can completely defoliate an entire tree. Repeated defoliation can stress trees leaving them vulnerable to other insects and diseases, which may result in tree death. Widespread defoliation can change the mix of tree species and affect wildlife dependent on that habitat.

The spongy moth on its own has limited ability to spread, however they spread easily by hitchhiking, laying tan colored egg masses on firewood, logs, vehicles, campers, and any outdoor household items. Each egg mass can contain over 1,000 viable caterpillars. Pest quarantines are in place to minimize this artificial spread from areas infested with spongy moth. General awareness of the pest and areas of establishment will greatly reduce the spread of this insect to new areas. Managing forests for stand diversity is the best means of limiting defoliation once established. Encourage a mix of tree species, forest types, ages and sizes. If you find a suspect spongy moth caterpillar or egg mass, report it to the Minnesota Department of Agriculture or a local state forestry office.

Asian Longhorned Beetle

The Asian longhorned beetle (ALB), *Anoplophora glabripennis*, is native to China and Korea. It was first found in the U.S. in New York (1996) and then Chicago (1998), likely transported in wood shipping crates. It has not yet been found in Minnesota.

The adults are large, glossy and black, with irregular white spots on their wing covers, 3/4 to 1-1/4 inch long. Their long, curved antennae are striped white and black. The ALB prefers maple trees. Other known hosts include horse chestnut, elms, willows, poplars, and birches. Adults chew holes through tree bark to lay eggs. Initial attacks are usually high in branches in the upper crown. Succeeding generations infest lower branches on the same tree.

Early detection is critical. Key signs for ALB are: Presence of adults, oval to round pits chewed in the bark of live trees, round 3/8" diameter holes made by emerging adults on trunks and branches, and coarse sawdust around the base and in branch unions of heavily infested trees.

Sirex Wood Wasp

The sirex wood wasp's native range is Europe, Asia, and northern Africa. It has invaded New Zealand, Australia, South Africa, and South America. It was detected in North America in 2006 and has been found in nine northeastern U.S. states and two Canadian provinces. It was found in solid wood packing materials.

Sirex wood wasps look a lot like native wood wasps. Females are metallic blue-black in color with orange legs. Males are similar to females, but the middle portion of the abdomen is orange, and the hind legs are black. The wasps feed primarily on pines, including Jack, eastern white, red, Scots, and Austrian pines. It also infrequently attacks spruce, larch, and fir. It prefers stressed trees, but can kill apparently healthy trees.

Females lay eggs in the outer sapwood and, in a combination with a mucous and symbiotic fungus, kill the tree to make it suitable for the larvae. Injury results from larval feeding and the toxic mucus and fungus injected into the tree when eggs are laid. Infestations have been documented causing up to 80% tree mortality. If you have dead or dying pine trees exhibiting this damage, contact the Minnesota Department of Agriculture or a local state forestry office.

Invasive Terrestrial Plants

Invasive plants can be detrimental to the ecosystems in forests, prairies, and wetlands by outcompeting native vegetation and altering natural functioning. If these invasive species are left unchecked, it may reduce your ability to manage the forested condition into the future. Some invasive species may also diminish the recreation and wildlife value of your land by forming dense thickets or providing less forage. Learn more about terrestrial invasive species by using the QR code.

Buckthorn

There are two species of invasive buckthorn: Common buckthorn (*Rhamnus cathartica*) was first brought to Minnesota from Europe in the mid-1800s as a very popular hedging material. It escaped cultivation and has become widely established as a dominant forest understory tree or shrub. Glossy buckthorn (*Frangula alnus*) and its cultivars, also from Europe aggressively invades wetlands including acidic bogs, fens and sedge meadows. Both species are regulated as Restricted Noxious Weeds in Minnesota.

Common buckthorn is an understory shrub or small tree up to 25' high with a spreading loosely branched crown, often with multiple stems at the base. Leaves are egg-shaped, dark, glossy, and finely toothed. Glossy buckthorn is similar, but typically growing only up to 18' with oval-shaped, dark glossy leaves with smooth edges.

Plants that are two" in diameter or larger, are best controlled by cutting the stem at the soil surface and then covering with a tin can or black plastic to prevent resprouting. Or you can treat the stump immediately after cutting (within 2 hours) with a herbicide containing triclopyr or glyphosate to prevent resprouting.

Round Leaf Bittersweet

Round leaf bittersweet is native to eastern Asia and was introduced to North America in the late 1800s as an ornamental. Most known infestations are in the Stillwater, Red Wing, and Winona areas. It is a prohibited noxious weed on the eradicate list.

Round leaf bittersweet is an aggressive perennial vine that can grow up to 70 ft in length, girdling and smothering trees and shrubs. It produces male and female plants and is most recognizable by the female-produced fruit capsules that develop late in the summer (green) and ripen in the fall (yellow). Ripened fruits consist of yellow outer capsules that split into three parts exposing the red berry center. Berries are produced in clusters in the leaf axils along stems. Once this plant becomes established, it can be severely detrimental to healthy forest systems if left unmanaged. Be careful not to confuse round leaf bittersweet with our native American bittersweet species. American bittersweet looks similar but is distinguished by orange flower capsules with red fruits that cluster in the terminal regions of stems.

How do we stop it? Because this species is most recognizable in the fall, survey forest lands during this period and map locations if found. If you have located round leaf bittersweet, report it to Arrest the Pest (Arrest.The.Pest@state.mn.us, 888-545-6684). Control vines with foliar, cut-vine, and basal bark treatments as appropriate.

Garlic Mustard

This European exotic occurs across 27 midwestern and northeastern states and in Canada. It is regulated as a Restricted Noxious Weed in Minnesota.

This is a biennial plant with weak single stems 12 - 36" high. It is the only plant of this height blooming white in wooded environments in May. It prefers moist, shaded deciduous forests and floodplains. Its leaves are round, scallop-edged, dark green; first year it has rosettes of 3 or 4 leaves; second year the plants have alternate stem leaves. The leaves and stems smell like onion or garlic when crushed. Flowers are white, small and numerous, with four separate petals.

There are both mechanical and chemical means to control garlic mustard. In areas of light infestations you can just pull the plant up and dispose of it on site. Flowering stems can be cut at ground level. If there are larger patches, prescribed burning and herbicide treatments are options. Wash your boots, gear, and mechanical equipment after working in a garlic mustard infestation since seeds are easily spread and can remain viable for several years.

Wild Parsnip

This native of Europe and Asia is grown as a root vegetable. It escaped cultivation to invade grasslands. It is abundant in southeastern Minnesota. It is a prohibited noxious weed on the control list.

This perennial may spend one or more years in a rosette stage, bloom under favorable conditions, and then die. Leaves are alternate and made up of 5-15 egg-shaped leaflets along both sides of a common stalk. Flat-topped broad flower clusters bloom yellow from June to late summer. It invades slowly into disturbed habitats and along edges but once the population builds, it spreads rapidly and can severely modify open dry, moist, and wet-moist habitats. The toxic sap of the plant tissue can cause a rash, blistering, and skin discoloration on people.

Do nothing in healthy prairies, where natives sometimes outcompete the parsnip. Plants can be hand pulled but be certain to wear long-sleeved shirts and pants, as well as gloves to avoid skin contact. The plants can be cut below the root crown before seeds set and then remove the cut plant. Prescribed burning can be followed by spot applications of herbicide since parsnip is one of the first plants to green up in the spring.

Non-Native Bush Honeysuckles

There are three species of exotic invasive honeysuckles in Minnesota: *Lonicera tartarica*, *L. morrowii*, *L. x bella*. They were introduced to North America as ornamental shrubs and beneficial to wildlife. They are readily available since commercial propagation continues with many cultivars. They become established in disturbed areas, open woodlands, and abandoned fields.

These are upright deciduous shrubs, 5 -12' high. Older stems have shaggy bark and are often hollow. Leaves are opposite on the stem, oval, and untoothed. *L. tartarica* has smooth, hairless leaves, *L. morrowii* has downy leaves. The flowers are tubular; bloom in May and June; and are white, red, but most often pink. Honeysuckles are easy to identify in summer by their paired berries which are red or yellow. Non-native honeysuckles replace native forest shrubs and herbaceous plants by their invasive nature and early leaf-out. They shade out herbaceous ground cover and deplete soil moisture. The seeds are readily dispersed by birds.

Small infestations can be pulled up by hand but this exposes the seedbed to resprouting. Chemically, you can do a cut-stump treatment with glyphosate; or cut-stump or basal bark spray around the stem with triclopyr. Prescribed burning will kill seedlings and top-kill mature shrubs, but repeated burns may be needed to be effective.

Non-Native Knotweeds

Non-native knotweeds were introduced to the U.S. in the late 1800s for ornamental purposes and erosion control. It now occurs from Maine to Minnesota and south to Louisiana and is scattered in mid-western and western states. Non-native knotweeds are a Specially Regulated Plant under the Minnesota Noxious Weed Law and due to its aggressive nature and the lack of sufficient control options to manage escapes, other (preferably native) plants should be considered in place of this species.

Non-native knotweeds are shrub-like and arching. They grow over 10' high with reddish-brown stems that are hollow and jointed where the leaf meets the stem. Leaves are large - 6" long and 3-4" wide, oval, and pointed at their tips. It grows long horizontal stems below the soil surface which form roots and produce new plants. It can pose a significant threat to riparian areas, such as disturbed stream sides, lakeshores and other low-lying areas, where it can rapidly colonize.

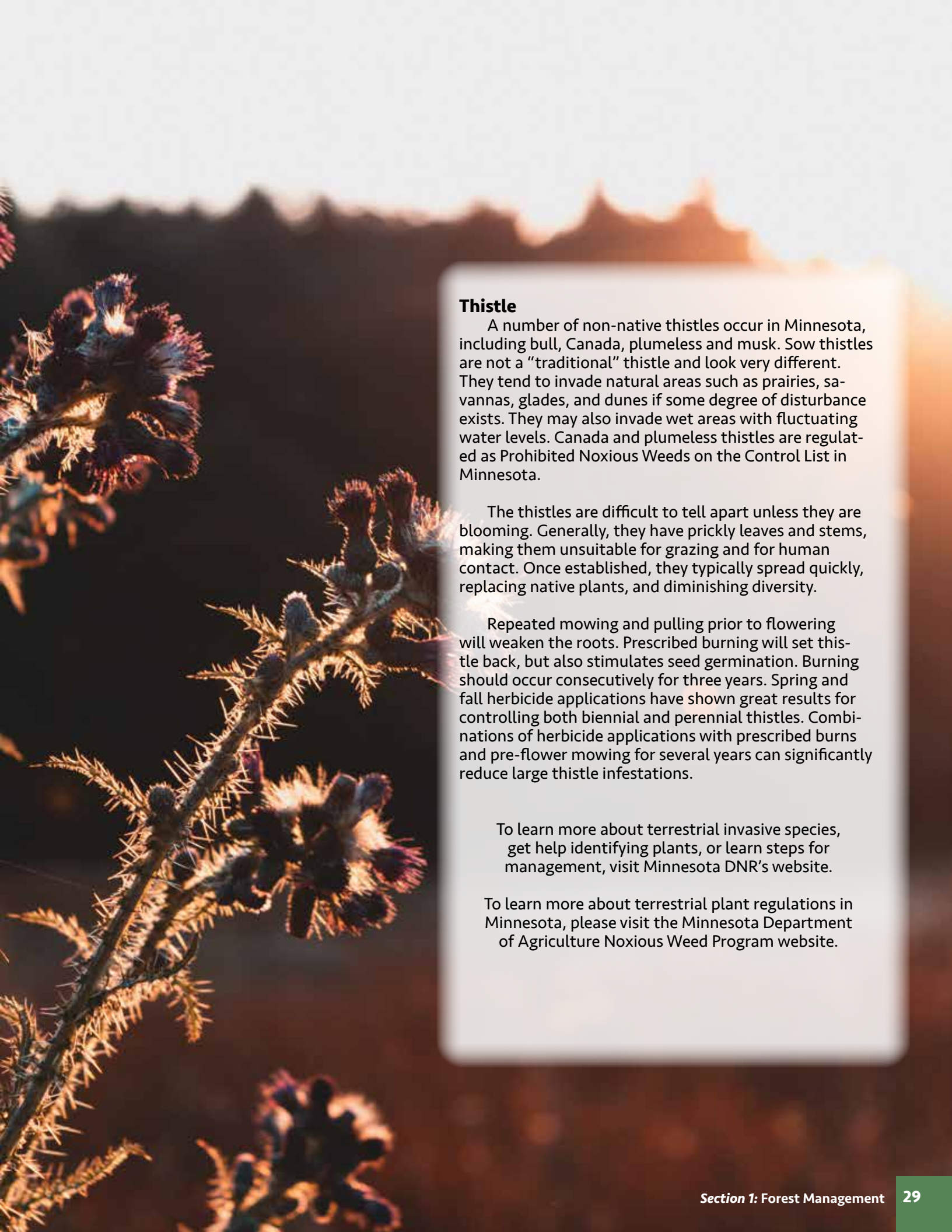
Small infestations can be hand-dug or pulled up. Herbicides (cut-stem treatment with glyphosate or triclopyr) or foliar spray can be effective in larger single species populations.

Amur Maple

Amur maple is a native of central and northern China, Manchuria and Japan. It was introduced to North America in the 1860s. It is still frequently sold commercially as an ornamental and for wildlife and shelterbelt plantings. A prolific seed producer, Amur maple is becoming invasive in the northern United States. Extensive wild populations have been found in Illinois and Missouri.

This is a small tree, up to 20' high with a broad crown which is sometimes pruned as a hedge and planted as an ornamental. Leaves are opposite, longer than wide, and have three shallow lobes and double toothed edges, turning a brilliant red in fall. Amur maple displaces native shrubs and understory trees in open woods, and shades out native grasses and herbaceous plants in a savanna habitat.

Amur maple is not easily removed once it has become established. It resprouts easily from the cut stump and prescribed burning will set it back but not eliminate it. Small infestations can be grubbed out. Chemical treatments include cut stump treatment with glyphosate; or cut-stump or basal bark spray treatment around the stem with triclopyr.



Thistle

A number of non-native thistles occur in Minnesota, including bull, Canada, plumeless and musk. Sow thistles are not a “traditional” thistle and look very different. They tend to invade natural areas such as prairies, savannas, glades, and dunes if some degree of disturbance exists. They may also invade wet areas with fluctuating water levels. Canada and plumeless thistles are regulated as Prohibited Noxious Weeds on the Control List in Minnesota.

The thistles are difficult to tell apart unless they are blooming. Generally, they have prickly leaves and stems, making them unsuitable for grazing and for human contact. Once established, they typically spread quickly, replacing native plants, and diminishing diversity.

Repeated mowing and pulling prior to flowering will weaken the roots. Prescribed burning will set thistle back, but also stimulates seed germination. Burning should occur consecutively for three years. Spring and fall herbicide applications have shown great results for controlling both biennial and perennial thistles. Combinations of herbicide applications with prescribed burns and pre-flower mowing for several years can significantly reduce large thistle infestations.

To learn more about terrestrial invasive species, get help identifying plants, or learn steps for management, visit Minnesota DNR’s website.

To learn more about terrestrial plant regulations in Minnesota, please visit the Minnesota Department of Agriculture Noxious Weed Program website.



Section 4:



Climate and Fire



Climate change is a pressing global issue characterized by long-term alterations in the Earth's climate patterns and temperature. The accumulation of greenhouse gases, particularly carbon dioxide, in the atmosphere traps heat and leads to a gradual warming of the planet. Models suggest that this will result in continued temperature increases, changes in precipitation frequency and/or intensity, and longer growing seasons. Efforts to mitigate climate change include transitioning away from fossil fuel-based energy sources, implementing sustainable land use practices, reducing emissions, and adapting to the changes that are already underway. Suitable habitat for specific tree species will likely change through time, some species will lose dominance in certain areas, while other species will find new habitat niches.

Forests are considered vulnerable to climate change if they cannot tolerate impacts without significant change. Factors that may increase vulnerability are soils and topographic position, species or structural composition, management history, and presence of non-native species, pests, or disease. Adaptation is a forest manager's response to vulnerability and includes planned activities to respond to climate change. Adaptation is unique to each property and forest because site conditions vary and each landowner will have different goals and appetite for risk. Due to this, adaptation actions will be customized to local conditions and require foresters with local knowledge and experience to make informed decisions.

Sustainably managed forests are among our most important tools for addressing climate change. Vigorous and healthy forests that are sustainably managed are more resilient to the impacts of climate change. SFI-certified organizations ensure forest management activities address climate change adaptation and mitigation measures. The SFI Forest Management Standard requires a number of practices with direct climate benefits, such as ensuring forests remain vigorous and healthy, requiring harvested areas to be promptly reforested, and requiring programs and practices that reduce the likelihood of wildfire and reduce the spread of damaging invasive species.

Keep Your Woods Healthy for Tomorrow

Below is an excerpt from a landowner guide entitled *Keep Your Woods Healthy for Tomorrow*, available at <https://conservancy.umn.edu/handle/11299/214930>.

Climate change will alter the frequency and intensity of threats, such as pest outbreaks, invasive species, wildfires, and storms. Our Minnesota woodlands face threats from pests like the emerald ash borer, spruce budworm, oak wilt, eastern larch beetle and more. A changing climate, combined with existing threats, can further jeopardize the health of your woods. Here are some principles to keep in mind as you consider how to cope with the unpredictable conditions that lie ahead. A forester or other natural resource professional can help you determine the specific practices for the unique conditions on your land.

Principles of Resilient Woodland Management

1. Keep Woodlands as Woodlands.

Woodlands provide many benefits, such as clean water, wildlife habitat, carbon sequestration, and wood products. But woodlands can only provide these goods and services if they remain as woodlands. To continue your legacy and protect your woods from development and other land use change consider the future of your land. Contact the Minnesota Land Trust or a similar organization about conservation easements. The University of Minnesota Extension has information on woodland transition planning that can help you work with your heirs. Your long-term planning will be fruitful only if the woodland is there for the long-term.

2. Maintain Woodland Health and Vigor.

Maintaining a healthy, vigorous woodland is one of the best protections against risks. Actively managing your woodland to promote growth, species diversity, and a complex stand structure reduces vulnerability to pests. The changing climate is expected to create more stress. For example, more frequent drought stress is expected for Minnesota, and this can create attractive conditions for some invasive species, forest pests, and pathogens. A woodland with a diverse mix of species may be able to withstand climate change and the accompanying stressors.

3. Address Vulnerabilities.

Your woods may be vulnerable to climate change if there is a risk of declining health, productivity, or forest cover, or if there may be a substantial shift in species composition (one forest type converting to another). These risks can be addressed over time. Some risk factors, such as lower than expected species diversity, may not be a sign of an immediate crisis but rather that past practices have encouraged a particular species or age class.

4. Woodland Management Can Help.

Woodland management is the purposeful intervention by humans, using ecological principles, to optimize woodland health, along with desired goods and services. If your woods are vulnerable to climate change or if they are challenged by current disturbances, management can help ensure that you have the best possible chance for a successful outcome.



Carbon in Minnesota Forests

Forests are crucial to limiting the effects of climate change. Trees absorb atmospheric carbon dioxide and convert it to carbon stored in wood, a process called “sequestration”. That carbon is then stored in five major pools of carbon in forested ecosystems: live aboveground biomass, live belowground biomass, deadwood, litter, and soil organic matter. Minnesota’s forests hold 1.35 billion tons of carbon! When trees are harvested and turned into wood products their carbon is stored for the life of that product – including the many times it is recycled or repurposed.

Forest managers can make management decisions that alter the aboveground biomass pool by promoting storage or sequestration. Carbon sequestration rates are highest in young, vigorous growing forests and slows when forests age. Carbon storage and sequestration varies by forest type. Early successional forests like aspen and jack pine live fast and die young, absorbing a lot of carbon, but then releasing it when they burn or decay. Longer-lived forests like red pine and oak initially absorb a lot of carbon, and then slow down and store it for hundreds of years. But eventually they too die and release their carbon, unless they are transformed into wood products.

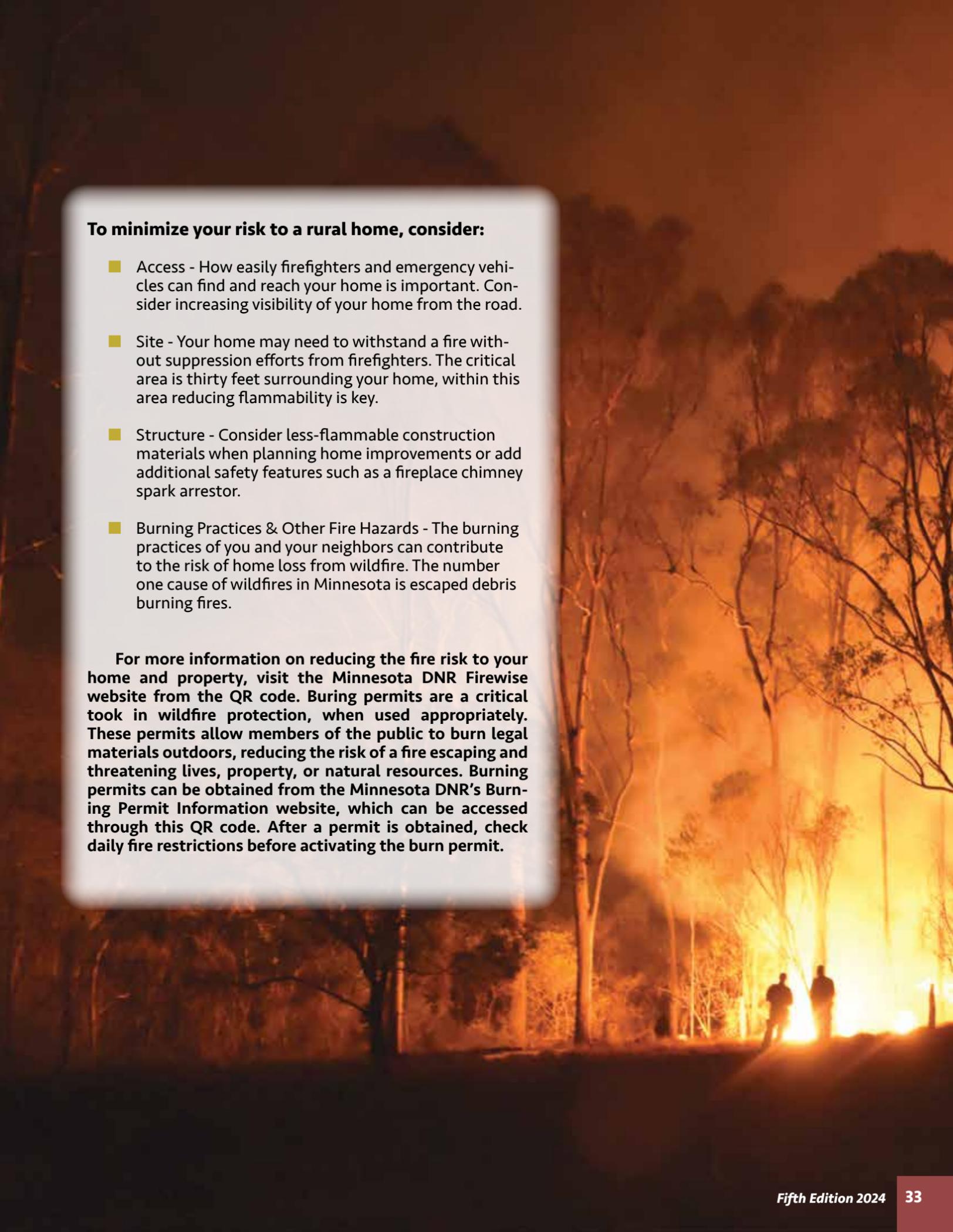
The carbon benefits of using wood products is compounded when we use them instead of fossil fuel carbon-intensive products like concrete and plastic. For every ton of wood-based carbon used, we prevent the release of another 1.2 tons of carbon produced by those other materials! Substitution effects like these for building materials, liquid transportation fuels, and electric energy production. That means sustainably managed forests fight climate change while they’re growing—and long after they’re harvested.

Wildfire

Forest fires have long played a role in the evolution and function of natural ecosystems, but we are now seeing an increase in catastrophic fires that have dire consequences for our forests, wildlife, and communities. More than a billion acres of forest are at risk of wildfire each year in the U.S.

Wildfires can be a destructive force in our woods. They can kill or damage trees, which increases the susceptibility to insects and disease, increases soil erosion, and reduces wildlife habitat, recreational opportunities, and soil fertility. Management of wildfire can also be used to manipulate forest species composition, density, or structure.

Most forest fires in the Midwest are surface fires, but Minnesota’s northeast boreal forest does occasionally carry destructive large-scale fires. Surface fires burn only the litter and other small fuels on the forest floor. They may scar the bases of large trees and kill small trees. Ground fires burn and smolder below the surface, sometimes going undetected for days or weeks. They consume soil high in organic matter including dried peat and thick litter, and can produce enough heat to kill trees by cooking their root systems. Surface fires that reach into the canopy with the help of dry winds and fuel ladders can become crown fires. They occur most often in conifer stands and are very damaging and difficult to contain.



To minimize your risk to a rural home, consider:

- **Access** - How easily firefighters and emergency vehicles can find and reach your home is important. Consider increasing visibility of your home from the road.
- **Site** - Your home may need to withstand a fire without suppression efforts from firefighters. The critical area is thirty feet surrounding your home, within this area reducing flammability is key.
- **Structure** - Consider less-flammable construction materials when planning home improvements or add additional safety features such as a fireplace chimney spark arrestor.
- **Burning Practices & Other Fire Hazards** - The burning practices of you and your neighbors can contribute to the risk of home loss from wildfire. The number one cause of wildfires in Minnesota is escaped debris burning fires.

For more information on reducing the fire risk to your home and property, visit the Minnesota DNR Firewise website from the QR code. Buring permits are a critical tool in wildfire protection, when used appropriately. These permits allow members of the public to burn legal materials outdoors, reducing the risk of a fire escaping and threatening lives, property, or natural resources. Burning permits can be obtained from the Minnesota DNR's Burning Permit Information website, which can be accessed through this QR code. After a permit is obtained, check daily fire restrictions before activating the burn permit.



Section 5:



Certification and Guidelines

What is Certification?

The Sustainable Forestry Initiative (SFI) is the single largest voluntary third-party forest certification standard in North America. It is globally recognized as a standard for supporting sustainable forest management and responsible fiber sourcing.

Background

Voluntary third-party forest certification began in the 1990s in response to illegal logging (primarily in developing countries) and market concerns about forest management. Consumers wanted assurances that wood products were being produced in a manner that was economically, socially, and ecologically sustainable.

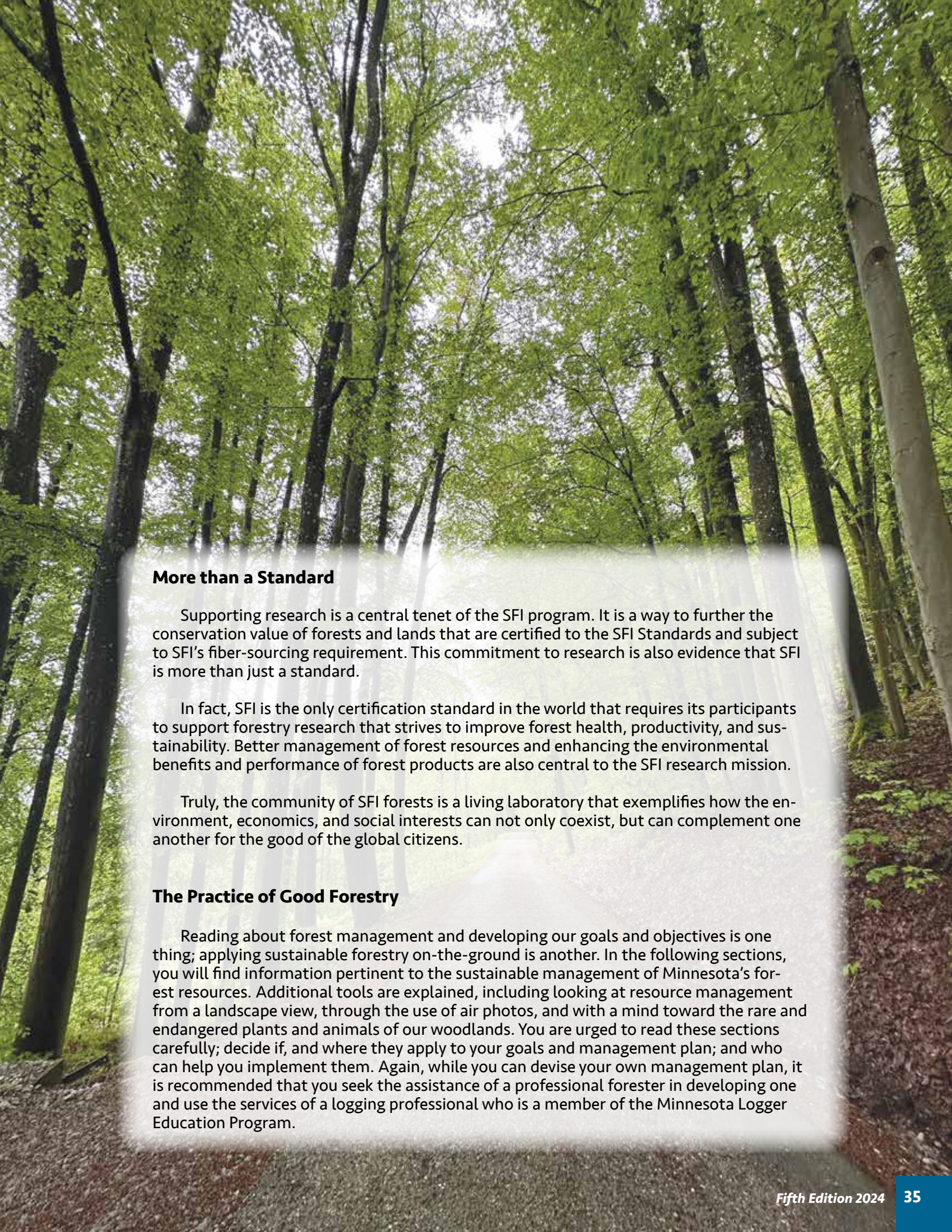
Certification Across The Globe...

The Basics of SFI

SFI Inc. is an independent, nonprofit organization that is solely responsible for maintaining, overseeing and improving the internationally recognized Sustainable Forestry Initiative® (SFI®) program. SFI Inc. is governed by a three-chamber board of directors; those directors equally represent the environmental, social, and economic sectors.

Across Canada and the United States, 350 million acres (140 million hectares) are certified to the SFI forest management standard, the largest single forest standard in the world. Minnesota is a leader in SFI certification, with the Minnesota Department of Natural Resources as one of the largest holders of SFI certified lands.

The unique SFI Fiber Sourcing standard requirements promote responsible forest management on all suppliers' lands. SFI chain-of-custody (COC) certification tracks the percentage of fiber from certified forests, certified sourcing, and post-consumer recycled content. SFI on-product labels identify both certified sourcing and COC claims to help consumers make responsible purchasing decisions.



More than a Standard

Supporting research is a central tenet of the SFI program. It is a way to further the conservation value of forests and lands that are certified to the SFI Standards and subject to SFI's fiber-sourcing requirement. This commitment to research is also evidence that SFI is more than just a standard.

In fact, SFI is the only certification standard in the world that requires its participants to support forestry research that strives to improve forest health, productivity, and sustainability. Better management of forest resources and enhancing the environmental benefits and performance of forest products are also central to the SFI research mission.

Truly, the community of SFI forests is a living laboratory that exemplifies how the environment, economics, and social interests can not only coexist, but can complement one another for the good of the global citizens.

The Practice of Good Forestry

Reading about forest management and developing our goals and objectives is one thing; applying sustainable forestry on-the-ground is another. In the following sections, you will find information pertinent to the sustainable management of Minnesota's forest resources. Additional tools are explained, including looking at resource management from a landscape view, through the use of air photos, and with a mind toward the rare and endangered plants and animals of our woodlands. You are urged to read these sections carefully; decide if, and where they apply to your goals and management plan; and who can help you implement them. Again, while you can devise your own management plan, it is recommended that you seek the assistance of a professional forester in developing one and use the services of a logging professional who is a member of the Minnesota Logger Education Program.

Minnesota's Voluntary Site-Level Forest Management Guidelines

Regardless of the specific reasons why you own your forestland, active forest management can help you sustain these values while maintaining a healthy forest. To help facilitate that sustainability, the Minnesota Forest Resources Council (MFRC) coordinated the development of voluntary, site-level forest management guidelines. These guidelines incorporate and build upon Best Management Practices (BMPs).

What do the Guidelines address?

The Guidelines focus on six key components of a healthy forest:

- Cultural resources
- Forest soils
- Riparian areas
- Visual quality
- Water quality and wetlands
- Wildlife habitat

What are the Forest Management Guidelines?

The Guidelines are strategies for maintaining healthy, productive forests. They are designed to be incorporated into your management plan and considered along with your ownership goals. As such, they provide a guide for landowners, professional foresters and loggers when conducting any forest management activity. When planning your forest management activities, work with your professional forester and logger to determine which combination of Guidelines best fit your particular site.

There are general guidelines, which apply to many forest management activities. Other Guidelines are activity-specific and include:

- Site preparation
- Reforestation
- Forest road construction and maintenance
- Timber harvesting
- Enhancing forest recreation
- Biomass harvesting



Minnesota Forest Resources Council

The Minnesota Forest Resources Council (MFRC) was formed as a result of the Sustainable Forest Resources Act, enacted by the Minnesota Legislature in 1995. The purpose of the act is “to pursue the sustainable management, use, and protection of the state’s forest resources to achieve the state’s economic, environmental, and social goals.” The MFRC is responsible for coordinating the implementation of that Act. In addition, the Council advises the Governor, as well as federal, state, county, and local governments on sustainable forest resource policies and practices.

You can reach the MFRC at mn.gov/frc

Sample Guidelines



Maintaining Water Quality

Avoid disturbances such as ruts, soil compaction, excessive disturbance to the litter layer, and addition of fill which can interrupt or redirect the flow of water through a wetland. Additionally, management is limited within Riparian Management Zones (RMZs), which are the transition area from aquatic to terrestrial ecosystem along streams, lakes, and open water wetlands. RMZs are important for plant and animal diversity, habitat, water quality, and forest recreation. Proper placement of roads, landings, and skid trails, and application of erosion-control structures can potentially reduce erosion which can negatively impact water quality and soil productivity.



On-site Meetings

Conduct on-site meetings with a qualified logging professional, landowner, and professional forester prior to moving equipment onto a site. Such meetings can help assure common understanding of landowner objectives, timber harvest regulations, contract specifications, and site conditions. During meetings with the forester or logger, determine the preferred operating season for a specific site to help avoid unwanted impacts to the site, as well as the costly process of moving equipment from a site if negative impacts are occurring. Harvesting on frozen ground is one example of timing management to protect soil and cultural resources.



Wildlife & Visual Quality

Guidelines help to maintain and enhance wildlife and scenic quality in forested areas for your enjoyment as well as by tourists, recreation users, and local travelers. Visual quality is maintained by limiting apparent harvest size and dispersing the slash left on a harvest site. For wildlife habitat, a minimum of six cavity trees, potential cavity trees, and/or standing dead trees per acre should be left in the un-harvested portion of the forest.

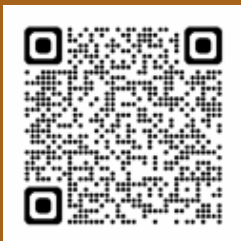


Public Concerns Registration Process

The Public Concerns Registration Process (PCRP) is a way for citizens to register concerns they have about specific timber harvesting and forest management practices they see in Minnesota. Its primary purpose is to investigate forest management activities that may result in a negative impact on forest resources.

The PCRP is intended to be educational in nature; it precludes becoming involved in contract disputes or issues such as trespass that would more appropriately be dealt with in civil courts.

If you have concerns call 888-234-3702 or visit <https://mn.gov/frc/>.



Section 6:



Private Forest Management

Planning Across Landscapes

The word 'landscape' evokes images of vast stretches of land, hurrying by us as they are viewed through a car window. The word also evokes images of that yard, right outside our front and back doors, that needs some special attention in the spring of the year. Those landscapes have been shaped by glaciation, climate, soils, fire and many other factors.

In the world of forestry, 'landscape' is a word that has been placed into a special category of interest and focus of forest management. In Minnesota, thousands of acres of forestland are owned by a patchwork of private landowners, county governments, various agencies of the state and federal governments, Indian tribes, forest industries, and investment corporations. Historically, these forests have been managed to the property line of a particular owner. Step across the property line and you may step into a different forest management scheme.

Such a patchwork of ownership, and therefore piecemeal management, is not always the best plan for the productivity, health, and sustainability of the state's woodlands.

Landscape planning is an effort to collect information on the resources of a region, identify local issues, and agree upon collective desired future forest conditions and strategies to attain future forest goals. It involves communication among the various landowners and managers within a region to identify priority areas in which to apply strategies identified through landscape planning.

This is accomplished through the state's Minnesota Forest Resources Council's Landscape Program. It is a voluntary grassroots effort that builds relationships and strengthens partnerships to address both regional and local needs. Six regional Landscape Committees meet on a quarterly, or more often, basis. Private landowner involvement on each committee is encouraged. You are encouraged to look at the landscape that surrounds you and determine where your woodland is located. Or contact the Minnesota Landscape Coordinator who can connect you with the landscape group nearest you.

The Minnesota DNR has created a series of Woodland Handbooks to help you understand the issues facing your woods and how to manage them. These regionally-based handbooks contain information on the past and present condition of land in each region, insight into some of the biggest challenges local woodland owners face, tips for making and accomplishing goals for your woods, and a workbook to help you envision what your legacy will be.



Finding Maps & Air Photos of Your Minnesota Woods

A quality map or air photo can give you a whole new perspective on your property. Seeing your land and the surrounding landscape from above can help you plan wildlife habitat improvement projects, new recreational trails, access to remote parts of the property, and much more. To the well-trained eye, a high-resolution air photo also quickly conveys information about tree species distribution and even timber volume across the property. A basic map is essential to communicate with a professional forester or logger about a possible timber harvest. Aerial photographs can provide details that are extremely useful in forest management activities.

Find and Creating Quality Maps

Air photos and maps can both be valuable planning tools and open a whole new view of your Minnesota woodland. Depending on the mapping tool, they can show changes in vegetation, waterbodies, parcel boundaries, topography, roads, buildings and much more. There are many free sites online to offer quality maps and images of your property, allowing you to make a custom map of your property. The two following sites described here are great places to start.

Chances are, you've used Google Maps before to get directions or to find a business. But to make your own custom map, you'll first need to create a free Google account. Once you've got an account set up, search for a Google My Maps tutorial which will guide you through each step. You'll be able to add point, line, or polygon features to your map. You can add names, descriptive text, and even photos to each feature.

The Minnesota DNR's Landview allows you to create customized maps based on DNR data layers that you select. Choose from public lands, water bodies, roads, aerial photos, and much more. Historic air photos can be of great interest and can help you see how your land has changed over time; these photos can be accessed from the Landview website on the left-side menu.

Finding Historic Air Photos:

Historic air photos can be of great interest and can help you see how your land has changed over time. Visit the Landview link (<https://www.dnr.state.mn.us/maps/landview/index.html>) and look on the left-side menu for "Aerial photography" and underneath that listing, "Historic air photos." Follow the menu prompts to find the area(s) and year(s) of interest.

A Plan To Harvest

Landowners have many management objectives, including: wildlife management, generating income, recreation (including hunting), aesthetics, and others. A timber harvest may be prescribed in your forest management plan to help you achieve these objectives. Following are some of the primary reasons for conducting a timber harvest.

- **Forest and Wildlife Management:** Logging is a tool for improving the health and vigor of the forest, promoting natural regeneration, developing wildlife habitat, controlling stand density, releasing desirable trees from shade, altering tree species composition, establishing planting areas, and creating vistas and trails.
- **Generating Income:** Periodically selling timber products from the land can provide a steady stream of income for a family while also keeping the land in a forested state. For example, a pine plantation can be thinned many times over the life of the stand. Or a final harvest of a mature stand with reforestation can provide a substantial one-time gain to help with large expenses like tuition, retirement, etc. while facilitating future management opportunities.
- **Salvaging Damage:** Forests can be severely damaged by fire, wind, snow and ice, and insects and disease. A timber harvest can be used to remove trees when the likelihood of damage is very high, or to salvage the remaining value from a severely damaged stand; this will set the stage for regeneration of the next stand.
- **Maintain Forest Health:** Factors such as insects, forest pests, invasive species, snow and ice damage, etc. can reduce the health and vigor of a forest. Monitoring your forest for evidence of forest health issues, modifying decisions to try to avoid potential concerns, and managing your trees to sustain a healthy, vigorous forest can help maintain forest health. That management can include reducing competition and over-mature conditions through a timber harvest.

Harvesting Assistance

Most landowners will only sell timber once or twice in their lifetime, and are therefore not experts in woodland management or timber marketing. The good news is that there are resources available to help landowners make informed harvesting decisions while meeting forest management goals and getting a fair market price. To achieve your woodland management objectives, you should work with a qualified logging professional. To identify logging professionals, check the listings of the Minnesota Logger Education Program (MLEP).

Marketing Your Timber

A professional forester can assist you managing your woodland. Some of the services available include:

- locating boundary lines
- preparing a forest stewardship plan
- estimating how much timber is there
- giving you information about the market
- preparing and marketing timber sale packages
- developing a timber sale contract

Writing a Good Contract

There are many important components in a good timber sale contract including:

- what timber is being sold
- the price and terms of the timber sale
- limitations on the logging operation
- where log landings, roads, and skid trails will be built
- erosion controls and other Best Management Practices (BMPs)
- how to protect the timber you are not selling
- protection of sensitive areas, cultural resources, water resources, TES species habitat, etc.
- responsibility for damage

A professional forester can help you understand the many important items to consider when writing a good timber sale contract, much of which will depend on the specific nature of your woodland and your ownership management goals.

Contract for Minnesota Timber Harvests

Contracts protect woodland owners and buyers during timber sales and harvest operations. View a sample Minnesota timber harvest contract at the QR code. This sample document is for educational use only. Use it as a starting point for your own contract, but we encourage you to contact an attorney for help designing a timber sale contract that meets your specific needs.



What Can Help?

Property Tax Incentives for Landowners Who Practice Sustainable Forest Management

Property taxes – they’re always a hot topic among Minnesota forest landowners! Over the years, Minnesota has established many tax reforms and tax programs to help take the “tax bite” out of owning and managing woodlands. The reforms and programs provide forest landowners tax incentives and property tax payments that help defray the cost of forestland ownership. Currently Minnesota landowners can choose between the Sustainable Forest Incentive Act (SFIA) and 2c Managed Forest Land. Both can substantially reduce the burden of property taxes on managed forestland. A stewardship plan is required for both programs.

This table provides a quick overview of the two woodland tax programs.

Factor	Property Tax Program	
	SFIA	2C Managed Forest Land
Minimum forest land acreage	20 contiguous acres of land that is at least 50% forested	20 acres of contiguous parcels
Maximum acreage	No maximum acres	1,920 acres enrolled
Access	Public access required if > 1,920 acres enrolled	Public access not required
Property tax implications	Landowner receives an incentive payment	Property tax class rate is reduced
Enrollment period	Covenant required limiting property use to forest management activities 8, 20 and 50 year commitment Termination can be requested once enrolled for half the duration of the covenant	No covenant required 1 year minimum enrollment
Federal tax implications	Property tax qualifies for itemized deduction on federal income tax return, but SFIA payment is taxable income	Property tax qualifies for itemized deduction on federal income tax return
Type of management plan required for enrollment	Woodland Stewardship Plan required	Woodland Stewardship Plan that is less than 10 years old required
Website	https://www.revenue.state.mn.us/sustainable-forest-incentive-act https://www.dnr.state.mn.us/forest-stewardship/sfia/index.html	https://www.revenue.state.mn.us/class-2c-managed-forest-land





And Who Can Help?

As in any profession, every professional forester and logger is different. You'll probably want to talk to several foresters and loggers before you choose the one(s) you want to work with. This page has a short overview of different kinds of professional foresters.

Public Sector Foresters

In Minnesota, most public sector foresters are either with the Minnesota DNR Division of Forestry, a Soil and Water Conservation District, or the Natural Resources Conservation Service. Most often public foresters are available to answer general questions, develop forest stewardship plans, and assist in the preparation of timber harvest plans. However, public sector foresters generally are not involved in the oversight of timber sales and harvests.

Private Consulting Foresters

Private consulting foresters are available throughout the state of Minnesota. Private consultants are paid by the landowner. Although specific responsibilities are negotiable, a consulting foresters' job is to represent the landowner when planning the harvest, selecting a logger, and/or marketing products harvested from the property. In addition to these services, most consultants will work with the landowner to plan timber harvest operations. They will also solicit bids from loggers, help the landowner choose a logger, and oversee the timber harvest process. Consulting foresters are often paid a commission from harvested products. However, many consultants are open to other fee structures if those are preferable to the landowner.

Industry Foresters

Industry foresters do more than arrange a timber harvest. Many industry foresters are available to develop woodland management plans, plan wildlife habitat enhancement activities, and more. In general, there is no charge for the services of an industry forester.

Minnesota Logger Education Program

The Minnesota Logger Education Program (MLEP) was established to assist logging business owners in meeting ever-changing demands of their profession. MLEP is of invaluable assistance to private landowners by ensuring excellence in logger education and professional development within Minnesota's logging industry.

Minnesota Tree Farm Program

The mission of the Tree Farm Program is: To promote the growing of renewable forest resources on private lands while protecting environmental benefits and increasing public understanding of all benefits of productive forestry. Tree Farmers have made a commitment to protect wildlife habitat and watersheds, to conserve soil and to provide recreation for their communities while producing wood for America. The Minnesota Tree Farm is a program of the American Forest Foundation (AFF), which works in partnership with local, state and national groups to provide hands-on support for America's 10 million family forest owners, giving them the tools they need to manage healthy and sustainable woodlands. Tree Farm works with landowners having 10 to 10,000 contiguous acres of forestland, who are committed to following the American Forest Foundation's Standards of Sustainability, and assure their compliance through qualified Tree Farm Program Inspectors.



Minnesota Forestry Association

The Minnesota Forestry Association (MFA) informs, educates and advocates for woodland owners and others on issues related to good woodland stewardship. Under their Call Before Your Cut program a private woodland owner can have a professional forester spend approximately two hours visiting their land.

American Bird Conservancy

The American Bird Conservancy (ABC) has a partnership with the Natural Resources Conservation Service (NRCS) to assist forest landowners in managing their land for young forest wildlife within the breeding range of Golden-winged warblers. Please contact your local NRCS field office for more information.

Questions To Ask a Forester

A woodland management plan is one of the most basic and important tools you can use to help manage your land and prepare for a harvest. Listed here are some important questions to ask your forester:

- Thinking about cultural resources, forest soil productivity, riparian zone management, visual quality, water quality, wetlands and wildlife, which guidelines apply to your woodland?
- How are the concepts of Forests of Exceptional Conservation Value (FECV) incorporated into the plan?
- Which timber harvesting system(s) is most appropriate for your land and objectives?
- What plans do they have for reforestation?
- Are there concerns about threatened and/or endangered species in your woodland? If so, what steps are they taking to safeguard the species?
- Where would they recommend the roads and landings be located? Consider how that location serves other useful purposes you may have after a harvest.
- Which types of harvesting equipment may be most appropriate on your property?
- How would they handle a dispute over timber trespass (the inadvertent or willful theft of timber) or cutting practices?



- What would they recommend be done with the slash following a harvest?
- Where will the timber go once it is harvested? Are those mills certified?
- Can they provide information about how to join the Minnesota Forestry Association or the Minnesota Tree Farm program?
- Can you provide references of previous landowners that you have worked with?

Questions To Ask a Logger

- How long have they been in business? How long have current crew members been with them?
- Is everyone in their business covered by workers' compensation and liability insurance? What are the dollar limits, and what kinds of accidents are covered? Will they provide you with certificates of workers' compensation and liability insurance coverage?
- What kinds of equipment do they use? How does it match up with the conditions and requirements of your site?
- Do they handle the entire logging process, or use subcontractors for part of the work? If the latter, how do they ensure that your quality goals are met?
- What types of roads and skid trails do they normally construct? What equipment do they use to build them? How will my skid trails, landings, and haul roads look when they have completed the logging operation?
- How do they verify if there are sensitive species, cultural resources or Forests of Exceptional Conservation Value on the land?
- Do they have a Qualified Logging Professional (QLP) on every crew?
- What options do I have if my or my neighbor's property is damaged?
- Which Forest Management Guidelines do they normally implement? Which ones would be needed on my forest?
- Can they supply you with references of previous jobs and to some of the mills they deal with?
- Are they a member of the Minnesota Logger Education Program?

Methods of Payment

There are several different ways to be paid for your timber. Two common ways, described below, are "consumer scale" and "lump-sum." Regardless of the type of payment, you should get competitive bids to assure that the buyer is paying a fair price for the timber. Your forester can help you obtain those bids.

1. Sell the timber by "consumer scale," which means the purchaser would have the wood scaled by a third party to determine its quantity. If the consumer scale method is used, the contract should specify the amount to be paid per unit (board feet or cords) for each species (aspen, red pine, jack pine, etc.) and the product type (saw-timber or pulpwood).
2. Sell the timber as a "lump-sum" amount (i.e., the buyer pays one price, based on the estimated volume of timber).

Timber Harvesting Equipment



Feller Buncher



Cut to Length Harvester



Skidder



Forwarder



Slasher/Loader



Stroke Delimber



Glossary

Acre: An area of land containing 43,560 square feet. This is approximately 209 feet by 209 feet.

Best Management Practices (BMPs): Guidelines that help to ensure that timber harvesting has minimum impact on water quality. Generally, BMPs recommend the use of pre-harvest planning and careful design for construction of roads and other activities that expose bare soil, minimizing traffic in areas of bare soil, maintaining streamside management zones, and ensuring rapid revegetation following harvesting.

Biodiversity: The variety of different types of life. It can refer to genetic variation or species variation (number of species) within a certain area.

Biomass: Biomass is a renewable energy source. The word refers to living and recently dead biological material that can be used as fuel or for industrial production. Sources include logging residue, dead standing trees and downed logs, residue from mills, and brushland materials.

Canopy: The layer formed by tree crowns as they grow together. The canopy excludes much of the sunlight from the forest floor.

Certification: In forestry, this refers to a voluntary process through which landowners agree to have their lands and their management activities evaluated by a neutral auditor, against the standards of a particular certification system. The Sustainable Forestry Initiative® and the Forest Stewardship Council are two of the most common certification systems operating in Minnesota.

Climate Change Adaptation: The options and actions taken for managing ecosystems to cope with the negative effects of climate change.

Clearcut: A harvesting method that removes all the trees in an area in one operation. Clearcutting is used most often with species that require full sunlight to reproduce and grow well.

Conifers: Trees that bear seeds in cones (e.g., pines, firs, spruces, cedars, junipers, hemlocks, and tamaracks).

Crop tree: A tree that will be grown to economic or physical maturity. Usually selected on the basis of its species, location with respect to other trees, and quality.

Crown: The leaves and branches of a tree.

Deciduous tree: A tree that loses its leaves during the winter.

Disturbance: A natural or human-induced environmental change that affects species and structural composition in a stand (e.g., fire, harvest, insect outbreaks).

Dominant: A tree that occupies a position in a forest where its crown is nearly completely exposed to sunlight.

Emigration: This refers to an animal leaving an area or habitat, as opposed to “immigrate,” where an animal comes into an area or habitat.

Endangered species: A plant or animal that is in danger of going extinct throughout all or part of its range.

Forests of Exceptional Conservation Value (FECV): Forests that include areas with critically imperiled and imperiled species and communities.

Game (species): Species of birds, mammals, and reptiles that typically have an open season for hunting or trapping.

Landing: Area on a harvested site where wood is transferred from the skidders or forwarders to trucks for road transport. In some operations the trees are processed or stored on the landing before transport.

Late successional: Succession is the observed process of change in species. Late successional species are those that remain essentially unchanged in terms of species composition for as long as a site remains undisturbed (by fire, wind, harvesting, etc.). They are the most shade-tolerant species of trees.

Nongame (species): Species of birds, mammals, and reptiles which usually do not have an open season for hunting or trapping.

Prescription: The planned treatment of a forest site designed to change the current stand structure or condition, to one that meets management goals.

Qualified Logging Professional (QLP): – someone with specialized skills in timber harvesting gained through experience or formal training who has completed membership and continuing education requirements specified by the Minnesota Logger Education Program (MLEP).

Reforestation: Reestablishing a stand of trees on an area where forest vegetation has been removed.

Regeneration: The process by which a stand is replaced by natural seed fall, stump sprouts, root suckers, or by artificial planting of seeds or seedlings.

Riparian: An area adjoining a body of water, such as a lake or stream. These areas have special value and warrant careful management to protect their function as a buffer zone for controlling flooding and the input of nutrients, sediment, and other pollutants.

Root sucker: Shoot that arises from a dormant bud on a lateral tree root but grows above ground as a new tree.

Salvage cut: Harvesting trees that have been killed or are in danger of being killed by insects, disease, fire, wind, flood, or other unexpected causes to recover their economic value.

Seed tree: A tree left standing after a timber harvest as a source of seed for reproducing a new stand.

Shade-tolerant: Trees that prefer or require shaded conditions for establishment.

Silviculture: The art and science of tending a forest.

Site preparation: A set of practices (for example, brush clearing, chemical vegetation control, and prescribed burning) that improve a seedbed or suppress competing vegetation to increase the chances for successfully establishing a new stand of trees.

Skid trails: Usually a temporary, unimproved roadway that enables skidders or forwarders to transport logs from the interior of a woodland to a landing.

Slash: Stems and branches remaining on the ground after logging.

Snag: Standing dead tree.

Stand: A group of trees occupying a given area and sufficiently uniform in species composition, tree size distribution, number of trees per acre, and soil characteristics so as to be distinguishable from the adjoining forest.

Thinning: A tree removal practice that reduces tree density and competition between trees in a stand. Thinning concentrates growth on fewer, high-quality trees, provides periodic income, and generally enhances tree vigor. Heavy thinning can benefit wildlife through the increased growth of ground vegetation.

Timber stand improvement (TSI): Improving the quality of a forest stand by removing or deadening undesirable species to achieve desired stocking and species composition. TSI practices include applying herbicides, burning, girdling, or cutting.

Vulnerability: The susceptibility of a system to adverse effects from climate change.

