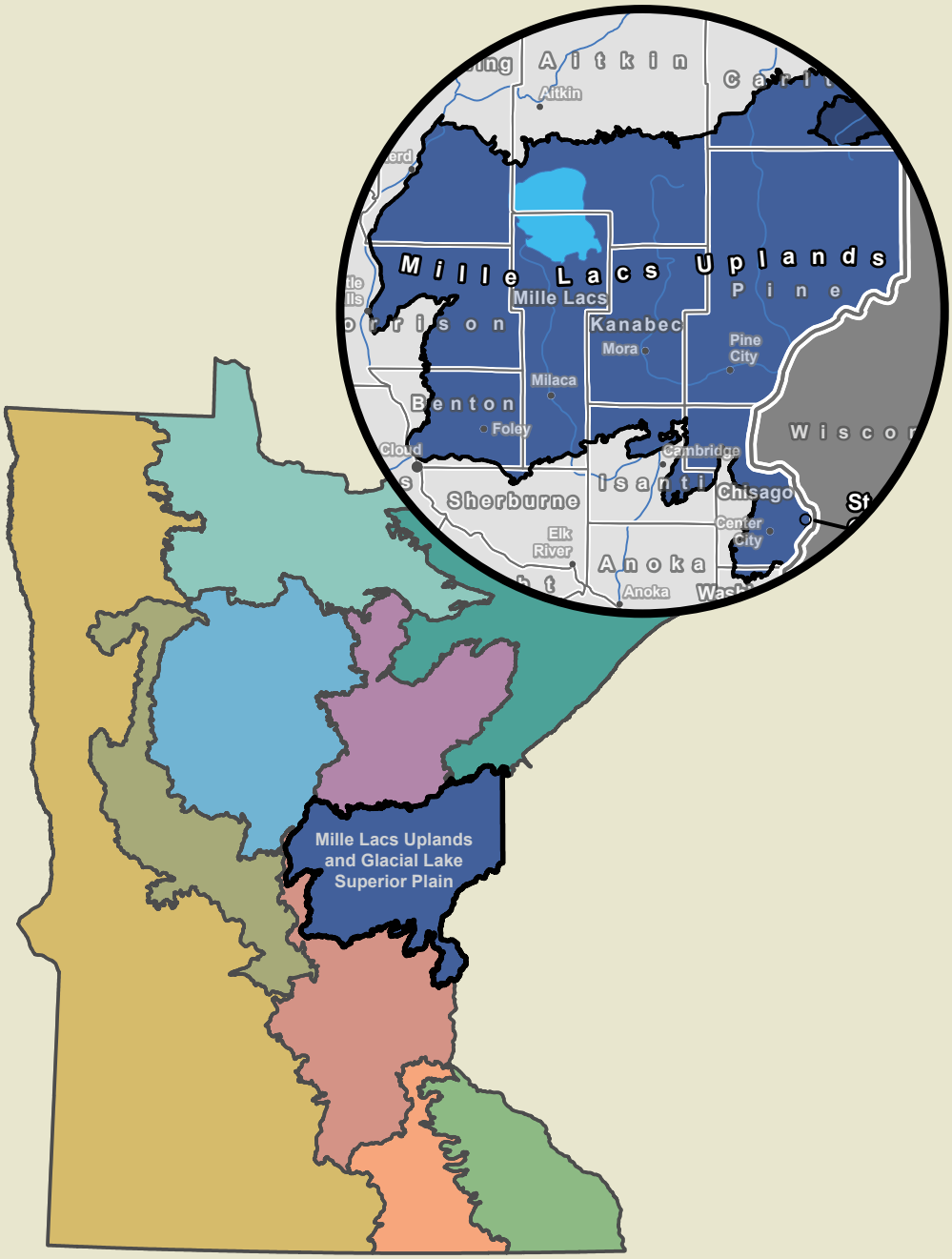
WOODLANDS OF MINNESOTA

Landowner

HANDBOOK

Mille Lacs Uplands and Glacial Lake Superior Plain

MNDNR



About the Woodlands of Minnesota Series

This handbook is for people who own woodland in Minnesota's Mille Lacs Uplands and Glacial Lake Superior Plain subsections that are indicated on the map in purple. If you own woods in other parts of the state, see **mndnr.gov/woodlands** for other publications designed for your area.

Cover photo: Banning State Park is located within the Mille Lacs Uplands subsection.

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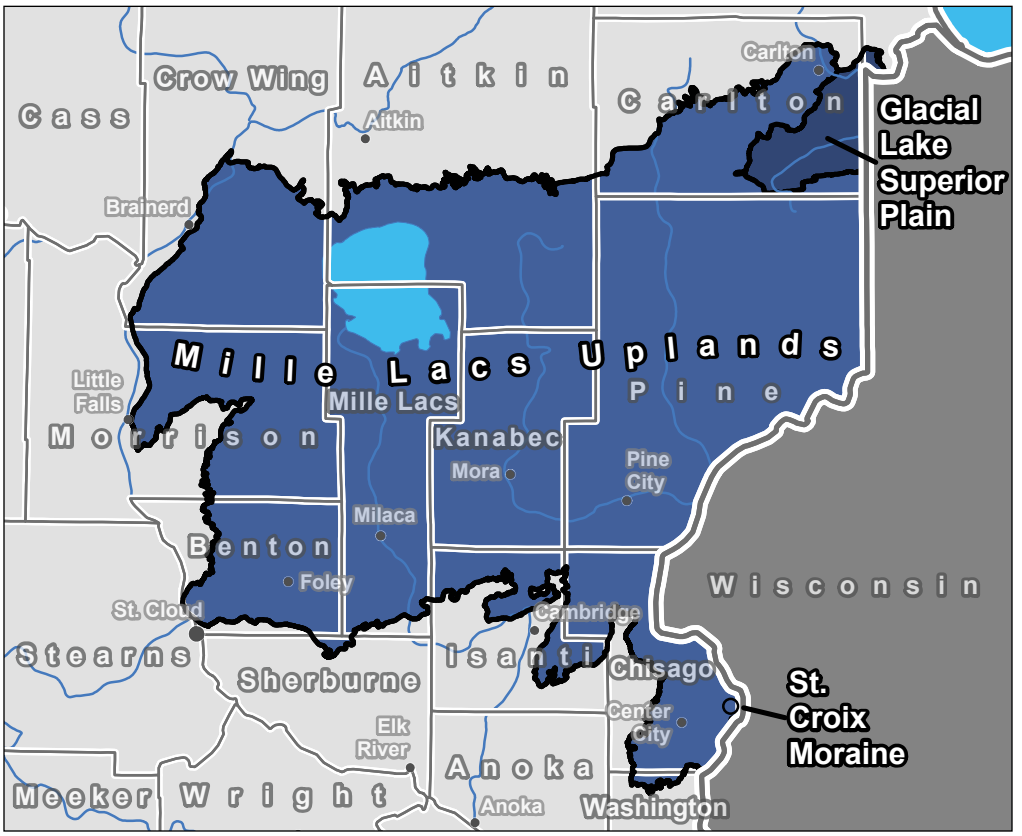
Introduction

More than 190,000 private woodland owners in Minnesota collectively own more than 6 million acres (about one-third) of the state's total forest land.[1] These are individuals, families, cooperatives, or small businesses that own woods for a wide range of reasons such as recreation, hunting, investment, timber, or simply to have a quiet family getaway in the North Woods. You are a part of this landowner community.

Private woodlands provide important benefits such as clean air and water, scenic beauty, hunting, angling, birdwatching, and provide wood, paper, and other products. Minnesota's landowners help enhance these benefits for themselves and others through active involvement in caring for the health of their woods. As a landowner in east-central Minnesota, many resources are available to help you take care of your woods. Whether you are looking for new ideas or just looking for a place to start, this handbook can help you to accomplish your goals.

Land Covered in this Handbook

This handbook is specially designed for those who own land in areas of east-central Minnesota known by ecologists as the **Mille Lacs Uplands** and **Glacial Lake Superior Plain**. These ecologically rich places are home to abundant wetlands, large areas of intact forest, diverse wildlife, and one of the state's most popular lakes for fishing—Mille Lacs Lake. These areas span all or parts of Aitkin, Benton, Carlton, Chisago, Crow Wing, Isanti, Kanabec, Mille Lacs, Morrison, Pine, and Sherburne counties.



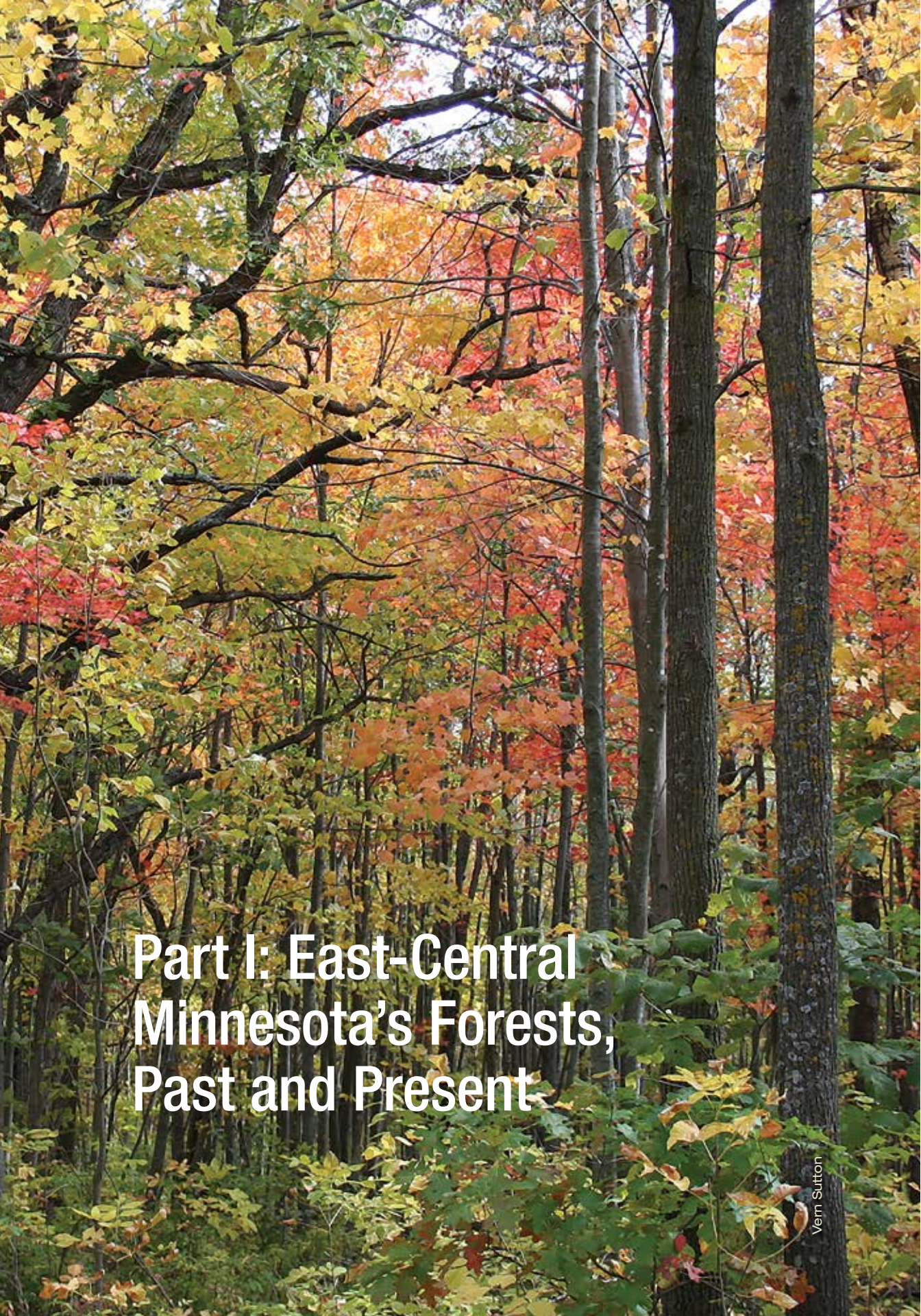
How to Use This Handbook

This handbook is both a reference and a workbook. It contains information on the past and present condition of land in this region, insight into some of the biggest challenges woodland owners face here, and tips for making and accomplishing goals for your woods.

This handbook includes:

- **Landowner Spotlights**—Meet a few of your east-central Minnesota neighbors! Their stories, experiences, and words of wisdom may inspire ideas for your own woods.
- **Woods Workbook**—The workbook on pages 64-67 guides you through setting goals for your woods and how to get them done. A digital version can be found on **mndnr.gov/woodlands**.
- **Glossary**—The words in **purple**, bold are defined in the glossary at the end of this book.
- **Handbook Website**—The handbook website contains additional resources including contact information for your local natural resource professionals and ideas for woodland projects.

mndnr.gov/woodlands



Part I: East-Central Minnesota's Forests, Past and Present

Vern Sutton

Chapter 1: The Forest Landscape Around You

If you peered out of an airplane window as it passed over your woodland in the summer, you might be hard-pressed to pick out your own trees from the patchy sea of green below. Your property is one piece of a much larger landscape. A **landscape** consists of all land uses (forest, wetland, agriculture, urban) and ownerships (public, private, tribal) within a defined area that can cover millions of acres. Taking a good look at the forests in your surrounding landscape can teach you a lot about what you might expect to find in your own woods.

Describing Your Landscape

If someone asked you where your property is located, how would you answer? Often people use political boundaries to define their area such as "Benton County" or "east of Sandstone." Sometimes they use nearby natural features as reference points such as "just south of Mille Lacs Lake" or "along the Kettle River." Based on the soils, climate, water, and plants in this region, ecologists call most of this area the Mille Lacs Uplands **subsection**, while the northeastern corner is called the Glacial Lake Superior Plain subsection. But before we get into current classifications, let's take a trip back in time.

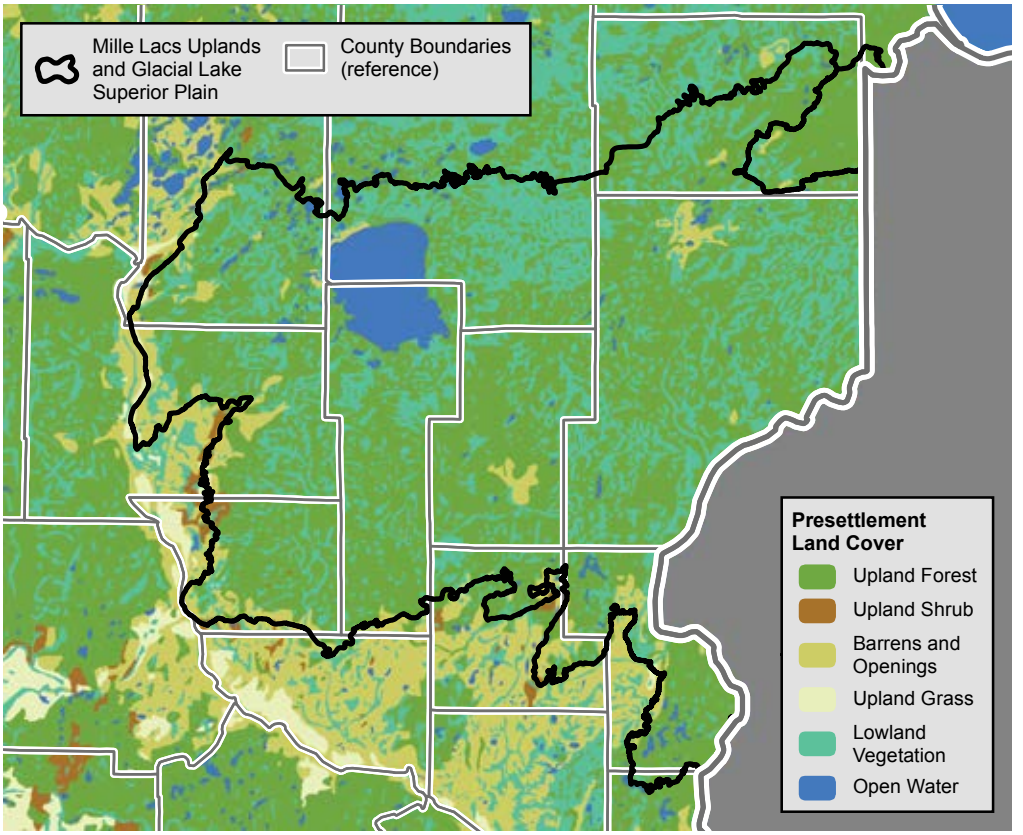
From the air, you can see that your woods is part of the larger landscape.

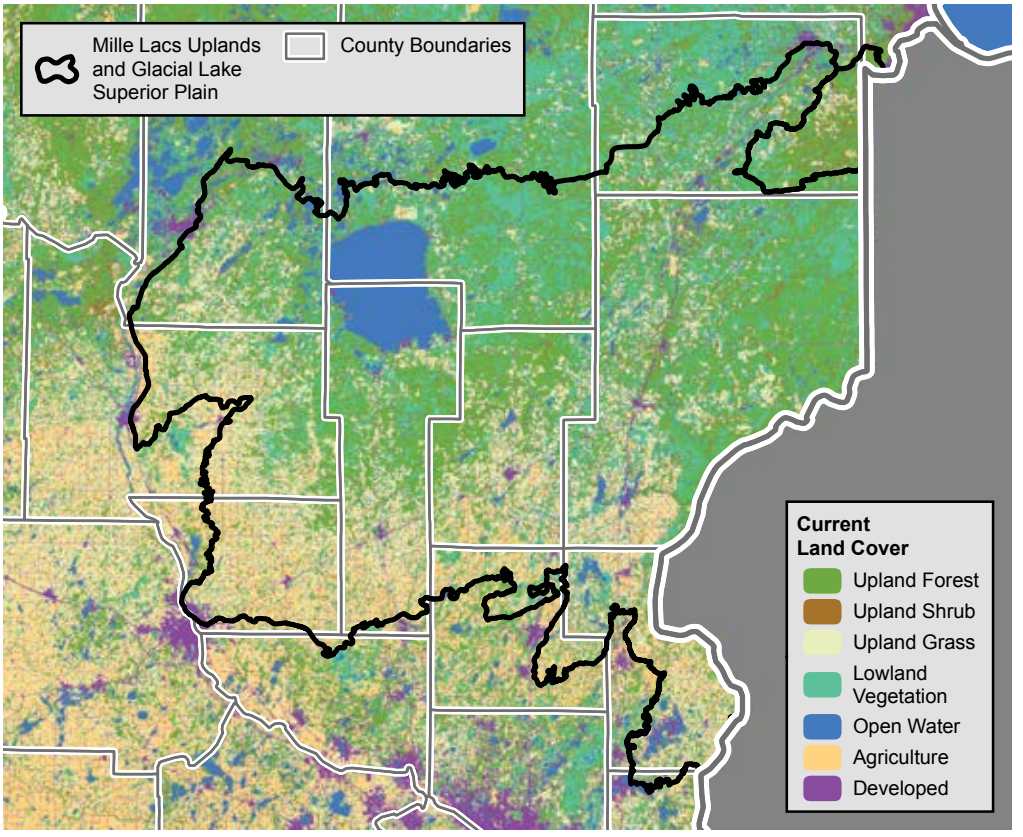
Historic Land Cover and Current Land Use

The Mille Lacs Uplands and the Glacial Lake Superior Plain subsections covered in this handbook encompass approximately 3.5 million acres. This area consists of gently rolling plains covered by glacial sediment deposits called **drift** or **till** formed into hills and ridges called **drumlins** or **moraines** that are separated by shallow **peat**-filled depressions. These features are relics of the last ice age when glaciers compressed the landscape. Soils in this region are acidic sandy or silty **loams** and are usually rocky from glacial deposits. The Glacial Lake Superior Plain has abundant red clay sediments that wash into Lake Superior.

The glacial moraines also formed natural dams that were responsible for forming most of the region's large lakes. The region contains 100 lakes over 160 acres in size, including Mille Lacs Lake, the second largest lake in Minnesota. Notably, there are no natural lakes in the small Glacial Lake Superior Plain area, only deeply carved rivers such as the Nemadji River. Total annual precipitation in the region ranges from 27 inches in the west to 30 inches in the east. Snowfall is relatively light throughout the region except for a small area close to Lake Superior, where moist air from the lake brings an average of 10 additional inches of snow and a slightly longer growing season than the rest of the region.

Before European settlement, a mix of coniferous and deciduous forests dominated this landscape. Along the southern boundary, maple-basswood forests were prevalent. In the northeastern corner, the forests were dominated by conifers such as spruce, fir, cedar, white pine, and eastern hemlock (marking the farthest west this species extends in the United States). Peatlands were present in the valleys between drumlins throughout the region and were inhabited by black spruce, white cedar, black ash, sphagnum mosses, and a variety of wetland shrubs and sedges.


Mille Lacs Uplands and Glacial Lake Superior Plain
County Boundaries (reference)
Presettlement Land Cover
Upland Forest
Upland Shrub
Barrens and Openings
Upland Grass
Lowland Vegetation
Open Water

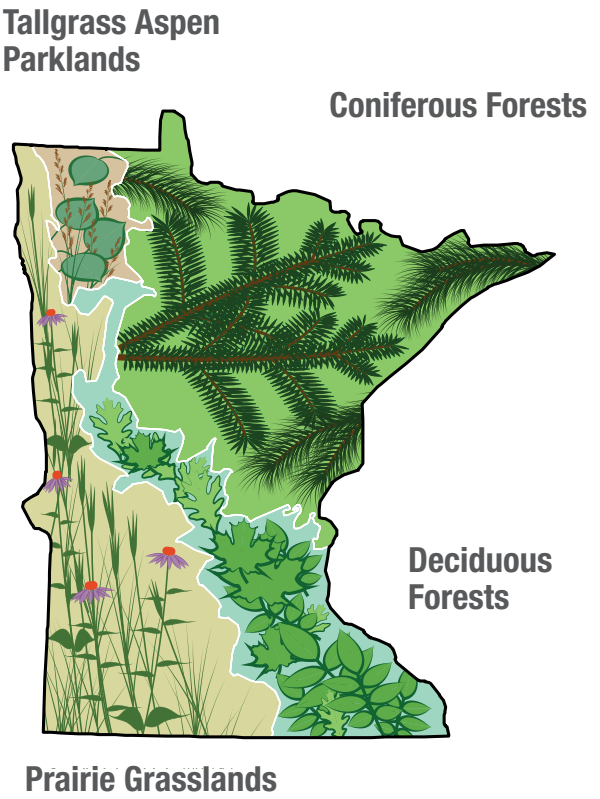

Mille Lacs Uplands and Glacial Lake Superior Plain
County Boundaries
Current Land Cover
Upland Forest
Upland Shrub
Upland Grass
Lowland Vegetation
Open Water
Agriculture
Developed

The landscape has changed in recent times, particularly nearest to the Twin Cities metro area where pressure from residential development is highest. Agriculture is also a major land use in the region today with over 1 million acres (nearly 30 percent) of the area used for growing crops or pasture.[2] Despite ongoing development pressure, forestry remains an important driver of the local economy. The diversity of tree species found in the region are used in the production of pulp, paper, lumber, **biomass**, and other products. Recreation is also an important regional industry. Fishing for walleye in Mille Lacs Lake and trout in the Nemadji River and tributaries are especially popular.

How We Classify Forests Today

Minnesota is located at a great North American transition zone where grassland, deciduous (hardwood) forest, and coniferous forest converge and intermingle. As such, tree-covered landscapes can vary greatly. For example, sparsely wooded oak savannas are common in south-central Minnesota. Mixed grass and aspen parklands dominate the northwest. Bluffs blanketed by hardwood trees cover southeast Minnesota. Dense forests filled with pine, spruce, fir, aspen, and birch characterize the northeast. Finally, mixes of these landscapes can be found throughout the central parts of Minnesota.

While there are other systems in use today that define Minnesota's landscapes, this handbook refers to the **Ecological Classification System**.

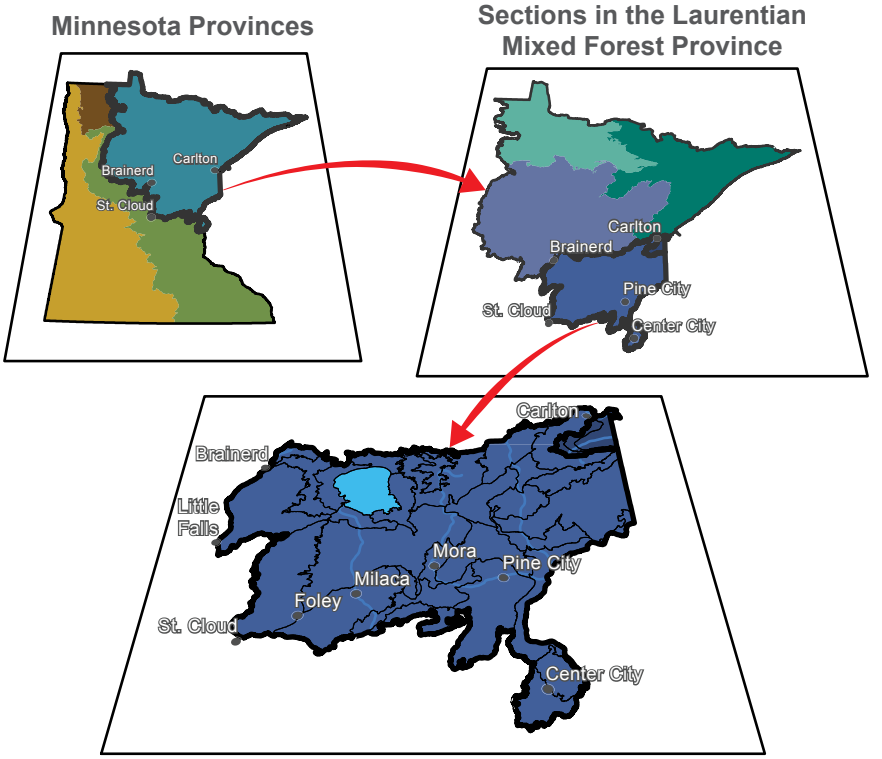


Ecological Classification System

A statewide land mapping project known as the Ecological Classification System (ECS) was created by ecologists to help people who manage the state's natural resources (trees, wildlife, waters, etc.) identify patterns in the landscape to better understand the land's potential. The system divides the landscape into progressively smaller areas based on similarities and differences according to climate, geology, natural features, and the types of vegetation present.

The levels of the ECS hierarchy are nested within each other, similar to townships within counties and counties within states. The highest of the four ECS levels used in Minnesota is **province**, followed by **section**, subsection, and **land-type association**. Note that these ecological boundaries extend across state lines. For instance, the **Laurentian Mixed Forest Province** spans all of northeastern Minnesota and parts of Wisconsin, Michigan, New England, and Ontario.

This handbook focuses on two ecological subsections: the **Mille Lacs Uplands** (located within the **Western Superior Uplands Section**) and **Glacial Lake Superior Plain** (located within the **Southern Superior Uplands Section**), which both contain a combination of deciduous and coniferous forest.



Subsections (thick black lines) and Land-type Associations (thin black lines) in the Western and Southern Superior Uplands sections

Native Plant Communities

At an even smaller level, ecologists classify land into **native plant communities** based on native vegetation, landforms, and other local conditions such as amount of rainfall and soil richness. This system is used to describe patterns on the landscape more precisely.

The native plant community system describes an area's specific land types or **ecosystems**. A single community might cover a large area, or exist in scattered pockets. Sometimes very different native plant communities exist near each other. For example, trees and plants growing along a river may vary widely from

> "I go out in that forest and the plants tell me what that forest was and what it wants to be."
>
> —Shelley Larson, Mille Lacs Uplands

those growing several hundred feet uphill. Native plant communities are also a useful tool for telling the story of your land's history. Forests are constantly changing under the influence of time and other factors. The trees and other plants that emerge 20 years after a fire or windstorm will differ from those growing in the same area hundreds of years later. While both ecological subsections (Mille Lacs Uplands and Glacial Lake Superior Plain) contain many similar communities, you can also notice variations as you move from north to south or east to west within the region.

The names of forested native plant communities reflect their general location within the state (northern, central, or southern), the moisture or nutrient content of their soils (wet, dry, rich, poor), and the dominant trees that make up the **canopy**. Examples of forested communities that you might find in east-central Minnesota include Central Dry Oak-Aspen Woodland, Northern Mesic Hardwood Forest (**mesic** means between wet and dry), or Northern Very Wet Ash Swamp. Nine types of forested communities found in east-central Minnesota are considered "imperiled" statewide by the Department of Natural Resources (DNR), meaning they are rare or threatened within Minnesota.[3] It is especially important to protect these communities from conversion to other land uses. Several local types of forested native plant communities are highlighted in Chapter 5.

Know Your Plants

Knowing the native plant communities on your property can help you better understand your land's potential. For example, the presence of certain plants can reveal clues about the soil and climate. This can help you plan which tree species might be most productive, predict where nontimber forest products (such as mushrooms, berries, balsam boughs, etc.) might best grow, and which wildlife species might be present. To learn more, visit **mndnr.gov/woodlands**.

Serviceberry

Challenges in the North Woods

Many changes in the last few hundred years have brought challenges to forests in east-central Minnesota. Here are examples of the biggest challenges that we all must consider when making decisions about caring for and using the forests in this region.

Habitat Loss

East-central Minnesota is home to a multitude of wildlife species, including some that are rare, declining, or threatened. The DNR refers to these as **species of greatest conservation need**. There are 345 species given this classification in Minnesota.[4] Examples in your area include red-shouldered hawks, spotted salamanders, northern and southern brook lamprey, Blanding's and wood turtles, and a species of darter (a small fish) found nowhere else in North America except the St. Croix River and several of its tributaries, including the Snake, Kettle, and Sunrise rivers.

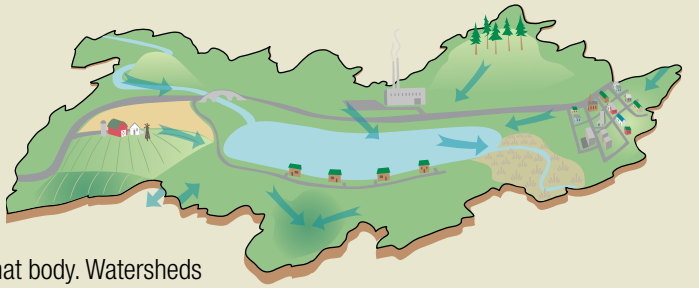
Wood turtle

The greatest threat to these species is **habitat** loss or degradation, which affects over 80 percent of these species in this area. Converting land to agriculture and residential development are the major causes of this habitat loss and degradation of native landscapes.[5]

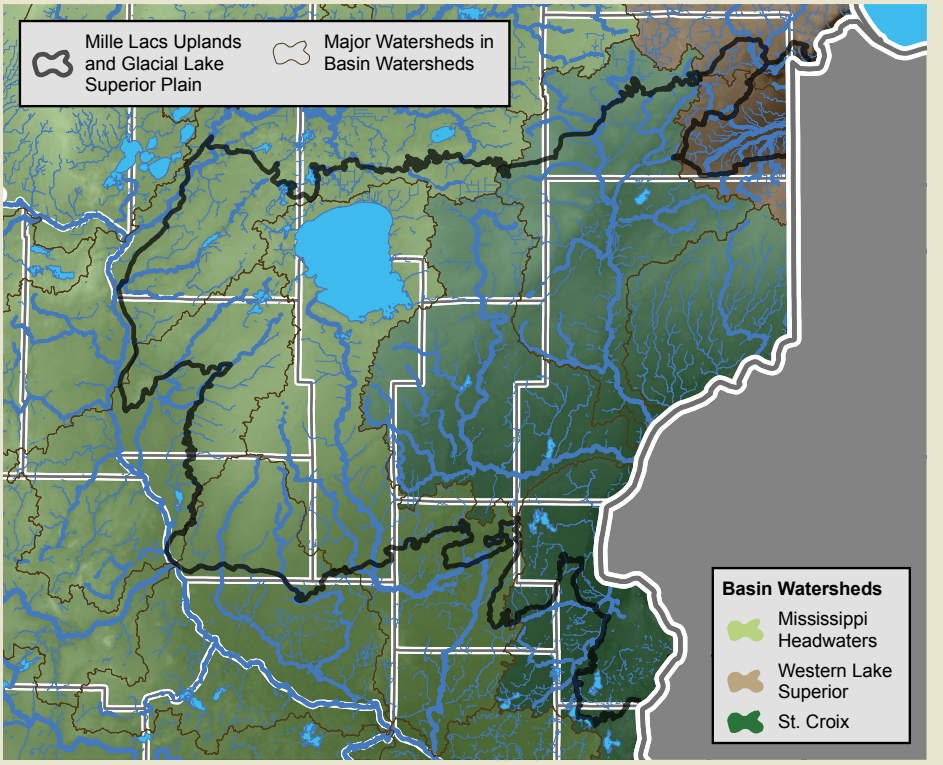
Habitat Spotlight: Deciduous Forests With Wetland Openings

Large tracts of mature deciduous forest provide important habitat for many wildlife species in your region. This habitat is particularly valuable to wildlife when it contains a diversity of scattered wetland openings. Salamanders and rare Blanding's and wood turtles make their homes in these valuable wetland forest areas. This habitat is also important for a number of bird species that depend on mature forests such as red-shouldered hawks and cerulean warblers. This habitat is under pressure from increased **fragmentation** and development that reduce the size of forest **patches** and lead to the drying of wetlands. Care should be taken to avoid creating large clearings within this important wildlife habitat that could further fragment these mature deciduous forests and contribute to changes in the local water cycle. A specific type of deciduous forest in your region is highlighted in Chapter 5.

Discover Your Watershed!



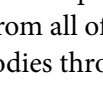
A **watershed** is the total area of land surrounding a body of water (such as a lake, river, or stream) that drains water into that body. Watersheds can be small or large. Small watersheds surrounding creeks and streams join to create larger watersheds surrounding major rivers. East-central Minnesota is located along a great divide in North American water flow. Depending on your land's exact location, your actions can affect the quality of water that will flow either into the Great Lakes and ultimately the Gulf of St. Lawrence by way of the St. Louis and Nemadji rivers, or into the Gulf of Mexico by way of the Mississippi River. To learn more, visit **mndnr.gov/woodlands**.



Declining Water Quality

Nearly 215,000 acres of lakes and rivers cover the Mille Lacs Uplands and Glacial Lake Superior Plain. These waters support wildlife as well as important fishing and tourism industries. However, many of these waters are suffering declining quality from a variety of contaminants including sediment, fertilizers, and pesticides. Some of these pollutants come from nearby sources such as homes with lawns bordering lakes, which can contribute pollutants through erosion or lawn chemicals. Other sources of pollution are less easy to pinpoint within the greater watershed such as contaminated runoff from agricultural fields, residential developments, or urban centers. Pollutants in runoff from all of these sources eventually collects in water bodies throughout the region, harms fish and other wildlife, and degrades drinking water and recreational opportunities.

As natural water filters, forests play an important role. Trees and leaves slow the movement of rain to the ground. The slower-moving rain picks up less sediment when it hits the soil. Additionally, forest soils contain large pore spaces that trap sediments and pollutants. As a result, rainwater that leaves a forest to recharge groundwater or flow into lakes and rivers is clean. Keeping forests on the landscape is one of the best ways to protect drinking water. Forests along shorelines are particularly important, as they serve as a last barrier to filter contaminated runoff before it reaches a lake.



"We've all changed the way water goes through the land. Put up a house, that obviously takes up space that could absorb water … so more of it runs into the river. It doesn't stay on that land the way it would have."

— Nancy Lunzer, Ogilvie

Invasive Species

In a part of the country where the landscape is white for much of the year, many people tend to look at the woods in summer and think, "if it's green, it's good!" Unfortunately, there are a lot of things growing in Minnesota's woods that do not belong here, and they can cause some pretty big problems. These harmful plants, insects, other animals, and fungi are called **invasive species**. Chances are good you have a few living in your woods.

The DNR describes invasive species as "species that are not native to Minnesota *and* cause economic or environmental harm or harm to human health." Not all **nonnative species** are invasive. For example, we plant many nonnative plants such as crabapple trees that do not cause trouble. The problems start when species escape cultivation and begin taking the place of native species in the wild.

Plants, animals, and fungi that become invasive have many of these characteristics:

- Fast growing (usually).
- Reproduce quickly, or have easily dispersed seeds or spores.
- Thrive in a variety of conditions.
- Lack natural predators or diseases that might otherwise keep them in check.

Many plants that are now invasive were originally brought to the United States to be sold as ornamental shrubs and flowers. On the other hand, many invasive insects, animals, and fungal diseases were introduced accidentally through international trade, though some were brought here purposely for various commercial or ecological reasons only to become problems later.

As a landowner, you can do a lot to help manage invasive species on your land. Tips for controlling invasive species can be found in Chapter 5.

European buckthorn

Intruder Alert!

Invasive species are an increasing problem in the North Woods. Here are examples of troublemakers to look for on your land.


Joseph O'Brien

Oak Wilt

Oak wilt is a nonnative fungal disease that kills thousands of oak trees in Minnesota each year. Oak wilt is a serious problem in the southernmost part of your region, and is becoming an increasing threat in counties further north. The fungus can spread in two ways. One is by traveling underground from one tree to another through roots that have grown together. This is common especially in sandy soil. A second way is by spores hitchhiking on sap-feeding beetles that fly from tree to tree seeking fresh wounds from which to feed. Oak wilt kills trees in the red oak group (northern red, northern pin) faster than trees in the white oak group (white, swamp white, bur, and black). Red oak species can die within one to three months of infection, whereas white oak group species may survive from one to several years after infection. An exception is bur oak, which dies very quickly.

The most common way to stop underground oak wilt spread is to sever grafted roots between infected and noninfected trees with a vibratory plow blade. Called a primary barrier line, this sever-line is usually placed between the diseased oaks and the healthy oaks. This must be done before infected trees are cut down because the pressure change in the roots could force infected sap from the diseased tree roots into healthy tree roots. For more details about oak wilt and how to control it, visit **extension.umn.edu/environment/trees-woodlands/oak-wilt-in-minnesota/** and **mndnr.gov/treecare/forest_health/oakwilt**.

A second way to stop the spread is to avoid wounding or pruning oak trees between April and July when the risk of transmitting oak wilt over land is highest. If you must prune or harvest during the high-risk months, immediately paint wounds with a water-based paint, a pruning sealer, or shellac. Also plan to chip or burn infected, harvested trees before the following spring. If you want to use infected trees for firewood, split, stack, and cover the wood with thick plastic and bury the edges of the plastic to prevent beetles from entering. Keep the wood covered until the end of the following summer.

Earthworms

Many people are surprised to learn that no earthworm species are native to Minnesota. While some native North American earthworms are found in states further south, if they were ever native to Minnesota, glaciers had wiped them out 11,000 years ago. The earthworms that live in Minnesota today are European or Asian species that have been introduced through imported soils and plants and through fishing bait. Because Minnesota's modern forests evolved in earthworm-free soils after the glaciers receded, our forests are not adapted to the impacts earthworms have on forest ecosystems.

Minnesota's hardwood forests have fairly loose soils created in part by thick layers of leaf litter or **duff**. As earthworms eat the duff, they actually create more compact soils, which leads to a variety of problems. Native wildflowers and tree seedlings do not grow well in these altered conditions. Ground-dwelling birds and other animals lose their protective cover. Also, bare, hardened soil absorbs rain less effectively, which leads to erosion. The results are clear: an earthworm-invaded woods looks different from an earthworm-free woods. The good news is that earthworms spread very slowly on their own—only about ½ mile every 100 years. You can prevent the spread of earthworms by not moving infested soil, dumping your fishing bait in the trash where it can't escape into the soil, and choosing non-earthworm bait.

After earthworms infest forest soils, vegetation on the forest floor changes from lush (left) to barren (right).

A Changing Climate

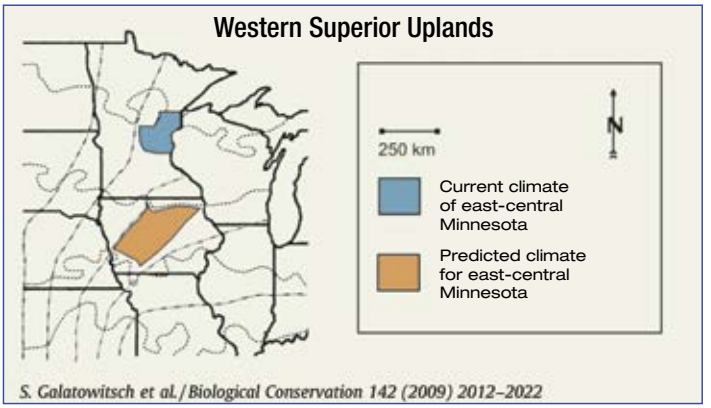
Scientists predict that at observed rates of global temperature increase, Minnesota is likely to experience significant changes in climate over the next several decades. These changes include warmer year-round temperatures—with winter warming faster than other seasons—and potential changes to rainfall patterns, which will likely lead to drier summers, wetter springs and winters, and a greater number of severe storms. Some of these changes are already being seen in east-central Minnesota where historical climate records show that average low winter temperatures have increased by as much as 5 degrees Fahrenheit since 1901.[6]

As native trees struggle to adapt or migrate in response to the changing local climate, invasive species that thrive in the new conditions may gain further ground. Increased temperatures may cause moisture stress in trees, making them more susceptible to invasive and native insects and diseases, which may be more

abundant if warmer winters prevent the usual levels of pest dieback. Changing rainfall patterns and warmer summer temperatures may also create more frequent wildfire-inducing conditions and an increase in storm severity could lead to more erosion and blowdowns.

Even small shifts in average temperature and precipitation could mean big changes to the type of forests you are used to seeing. For example, under higher temperatures tree species such as balsam fir, tamarack, quaking aspen, and paper birch, are likely to experience more stress and be replaced by deciduous forest species such as oak, hickory, elm, and maple.[7]

Future Climate Prediction



The area in brown represents the blue area's predicted climate by 2060. When selecting trees for your land, consider the future climate. By 2060, it is predicted that the climate of east-central Minnesota will most resemble that of present-day north-central Iowa.[8]

Warmer Winters, More Bugs

Minnesota's bitterly cold winters may sometimes have you longing for warmer Januaries. But our forests rely on these frigid temperatures to keep insect populations in check. Eastern larch beetle is a native insect that attacks tamarack, an iconic North Woods tree species that extends across 1.1 million acres of northern Minnesota.[9] Warmer temperatures stress tamarack and allow eastern larch beetles to produce more offspring in summer and survive in greater numbers over winter. As a result, more than 20 percent of Minnesota's tamarack forests have been killed in the last 15 years. This type of large-scale tamarack death from eastern larch beetle is unprecedented in Minnesota and elsewhere on the continent.

Eastern larch beetles

While all of this may sound daunting, understanding the changes that may happen on your property over the next few decades can help you proactively choose tree species and strategies that are best suited to the future landscape. Carefully monitoring changes in your woods such as noting tree deaths and the presence of new, possibly invasive species can help you catch problems early. Maintaining diversity in the native species and ages of your trees can help make your woods more able to adapt to change. Occasionally thinning your trees may help decrease competition and increase vigor of the remaining trees. Favoring species that are predicted to do well in the new conditions may help your woods compete with potential invaders and keep native forest on the landscape. These actions, taken by you and other landowners, could help set the stage for healthy, productive, resilient forests in the face of a changing climate.[10]

"We had a fella' come out here maybe a month-and-a-half ago, and he said that the climate trend has been for warmer weather. So he recommended that we plant some trees that are more suitable for a little warmer climate. Our forester has a whole list of trees and shrubs that he recommended that we could put here. We'll put some of that in."

— Jerry Nelson
Cloverdale

Privately owned forests are an important source of wood and all the products made from trees. Your forest may also be a great source of berries, nuts, mushrooms, or balsam boughs for wreaths. Or you may value your forest as a place to hunt, watch wildlife, or find serenity.

Brian Black

Climate Change Response Framework

Since 2009, a collaboration of the USDA Forest Service and other partners known as the Northern Institute of Applied Climate Science has been working with foresters and landowners across northeastern United States to understand and adapt to the impending changes that the shifting climate will bring to forests. In Minnesota, several pilot projects are underway with large and small private landowners to test these strategies and determine the range of available options to help both people and forests adapt to change. Learn more at mndnr.gov/woodlands.

Chapter 2: Why Your Woods Matter

In this chapter, start thinking about specific goals you may have and what you'd like to see on your property in 10, 20, or 50 years.

Benefits of Forests to You and Your Community

Wood and Pulp

Advancements in technology are expanding the number of ways we can use wood. For example, pine and mixed hardwoods including aspen are used to create engineered products such as oriented strand board (OSB), which is used to make building panels and siding. The Sappi Mill in Cloquet has specialized machines that can switch production between papermaking pulp and a dissolvable wood pulp that is used to make clothing, textiles, and cellophane.[11] The primary trees used to make these materials are aspen and spruce—the most common tree species in the Mille Lacs Upland region.

In the future, more facilities in Minnesota (such as pulp and paper mills, schools, and nature centers), may burn wood waste and low-grade wood as biomass to produce local, renewable energy. For example, Minnesota Power has a plant in Duluth that converts branches and low-grade wood left over from traditional timber harvests and mill byproducts such as sawdust into steam for the nearby paper mill and electricity


Lyn Toth

"The main goal is just forest management, and to me that means maintaining a healthy forest system. For our particular woods, that involves logging. The reality is, we purchased property that had been previously logged and probably clear-cut in many areas, and so we have a fairly evenly aged forest. For me, the idea of just setting it aside and watching it grow does not reach our objective, because we want to be able to maintain a healthy forest. So that means logging some areas. We've also done a ton of regeneration work planting thousands of trees."

— Donna Perleberg, Pierz

for its regional customers. The innovative ways that Minnesota entrepreneurs are using this renewable wood resource is incredibly diverse and continually evolving.

Sheets of specialized cellulose.

Wood: A Local Industry

Forest-based industries are important contributors to the economy in east-central Minnesota. These businesses provide over 3,300 regional jobs in logging; forest consulting; and pulp, paper, and wood product manufacturing industries.[12] The Sappi pulp and paper mill, located on the banks of the St. Louis River in Cloquet since 1898, relies heavily on Minnesota wood and employs around 780 local people. The mill buys aspen, birch, maple, and other tree species from hundreds of landowners to produce products that are distributed throughout the world. Having a healthy forest economy in your region supports local communities, creates a higher demand for your wood, and greater support for maintaining healthy forests. The trees you grow and sustainably manage today may someday become the high-end paper you see in advertising brochures and fine art books or even the clothes on your back—all while supporting jobs in your region.

Nonwood Products

Forests can provide many other products from the decorative to the delicious. Spring foragers might find tasty morel mushrooms or ramps (wild onions) poking out from under the damp leaf litter. Summer berries and other fruits include blueberries, blackberries, raspberries, strawberries, gooseberries, and chokecherries, just to name a few. Wild hazelnuts are a fall favorite of wildlife and some people too, as they can be roasted and eaten like commercial filberts. As winter approaches, balsam boughs can be collected and turned into holiday décor for your home, or sold to the wreath-making industry. And as winter fades and the tree sap begins to flow once more, maple trees can be tapped for making sweet, sticky maple syrup.

> "The fact that we produce maple syrup sustainably is another aspect of how we use our woods. It's a nice excuse to get outside when most people are just whining because winter's not over with."
>
> — Jim Morrison, Mora

Forest Ecosystem Services

Forests provide a great many **ecosystem services**, which are "free" services provided by nature that we often take for granted: clean air, clean water, healthy soils, erosion control, and wildlife habitat. Forests also help control weather patterns by regulating temperature and the water cycle.

Importantly, forests store large amounts of carbon in roots, trunks, limbs, and soils. In fact, about half of the weight of a tree is carbon. Healthy, growing forests absorb carbon from the atmosphere in the form of **carbon dioxide**, a **greenhouse gas** that traps sunlight and warms our planet. Because excess carbon dioxide is building up in the atmosphere as a result of human activities, global temperatures are increasing. Maintaining healthy forests helps store more carbon in wood and soils, which can help slow down current climatic changes.

Ecosystem services cannot be replaced without a lot of expensive infrastructure. In fact, some economists are working on seeking ways to estimate the economic worth of the carbon stored in forests or the value of undiscovered species and genetic information. Creating and growing markets for these less tangible forest benefits might be an important step toward conserving forests in the future.[13]

Forest Foragers

Spotlight: Jim Chamberlin—Deerwood, Minn.

Mille Lacs Uplands

Shiitake mushrooms

The Chamberlain homestead might best be described in two words: life everywhere. Dozens of acres of sprawling wetland are a haven for wildlife such as ospreys and green herons. A 16-acre woodlot is home to old-growth sugar maple, basswood, and a den where Jim Chamberlin has spied fox kits venturing out of the darkness. In the field behind the house a crop of asparagus noses its way through the soil as fruit trees and hybrid hazelnut bushes awaken after a long winter. Kids—both human and goat varieties—play in the backyard. One of the goats hops on the table to investigate a conversation. "There's a small natural lake on the back of the property. We have about a half mile of shoreline on the lake," Jim says while affectionately petting the inquisitive creature. "We've got a little sitting spot down on the lake that's pretty special."

"We've got a little sitting spot down on the lake that's pretty special."

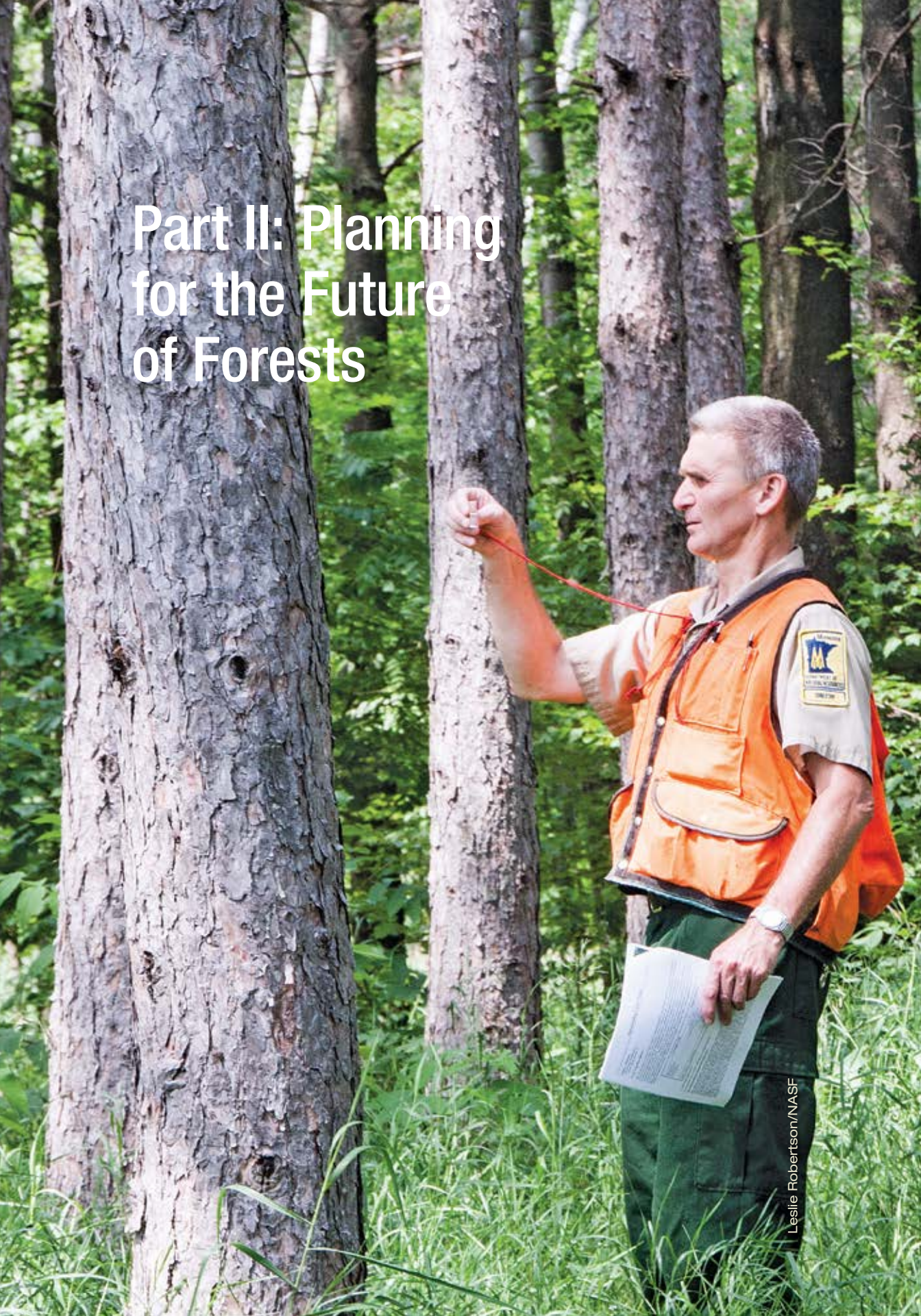
Jim and his wife Audra ran a bakery before moving to their property in 1995 with their children, some of whom are grown now with young children of their own. "I'd been in food service for 20 years, and I was tired of standing on concrete all the time and wanted a change of career. Always been interested in farming, gardening in particular, ever since I was a kid in 4-H." Jim got off the concrete, but not out of food service entirely. For a while, the couple ran a community supported agriculture (CSA) program selling produce and other products from their farm and woods. "I know where the trees are that produce the best mushrooms: chicken of the woods and maitakes (hen-of-the-woods)." In addition, Jim

cultivates shiitake mushrooms on oak and ironwood logs in his woods. He became interested in growing shiitakes after attending a Minnesota Forestry Association workshop and bringing home a few logs that were inoculated with shiitake spores. Today he keeps about 500 logs at a time, replacing them as their productivity wanes. During his best year, he was harvesting 20 pounds of mushrooms per week.


Shiitake mushroom

Jim says that shiitake cultivation requires a sheltered space and lots of water—the logs need to be either soaked or irrigated somewhat regularly to produce mushrooms. This can be hard work, but Jim says that it's easy to try on a small scale. "When we started off, we just grew them right behind the shed here. We had like a hundred logs … and we had all the mushrooms we could use and put up for the winter. You can freeze and dry them. We've pickled them." Jim says that the cost of log-inoculation supplies (spore-infused dowel rods and a bit of wax to seal the rods into the log) cost about $1 to $1.50, and one log can produce four or five pounds of mushrooms before it loses its productivity. Jim sold his mushrooms to local restaurants and through the CSA for a while. These days he is less interested in profiting from his operation. Rather, the main benefit of growing mushrooms is eating them. "In the springtime when you got shiitake mushrooms, fresh asparagus, and a little goat cheese, put it all in an omelet and cook it up—it's pretty good." ◆

Part II: Planning for the Future of Forests



Leslie Robertson/NASF

Chapter 3: Goals for the Landscape, Caring for Your Woods

Your woods are part of a larger landscape. Understanding more about that landscape can help you make decisions about your own property. This chapter introduces you to these landscape goals and helps you consider top priorities for your land.

Private landowners like you own over 68 percent of the forested land in the Mille Lacs Uplands and Glacial Lake Superior Plain.[14] Therefore, your decisions and the decisions of all woodland owners in the region have a big impact on the health and beauty of the North Woods.

"Letting nature take its course" on your woodland is a decision that impacts the forest landscape. Current forces—including suppression of natural wildfire, changes in wildlife populations and forest size, changing climate patterns, and invasive insects, diseases, and plants—have already disrupted nature's "course." So taking no action against these forces may result in less healthy and diverse forests than nature would have produced hundreds of years ago.[15] However, as a woodland owner, you can restore some of the natural balance through **woodland management**—actively shaping and directing your woodland to keep it healthy, productive, and resilient.

> "Get to know your woods. Spend time in it. Don't rush out and have a timber sale. Nothing wrong with timber sales, but it's not the first thing you want to do."
>
> —Jim Chamberlin, Deerwood

Jim Steele

The Big Picture—Thinking From a Landscape Perspective

Knowing how your woods fit into the larger landscape can provide a useful perspective.[16] For example:

"I try to look at this from a sustainability and legacy standpoint. If I cut down a tree or if I brush a trail, that has an impact. And some people may say I'm altering nature. Well, by virtue of breathing oxygen, I'm altering nature. I tend to think that we are part of nature. That we need to be good stewards of what God gave us. And if I can, in my limited time, at least see that this biodiversity carries forward in a healthy way, that's my hope and legacy."

—Jim Morrison, Mora

- The wildlife on your property is influenced by habitat conditions beyond your property lines.
- The movement of wildlife can be helped or hindered by how your land connects with surrounding forest and other habitat.
- Your property may be home to unique plants, animals, forest habitat, cultural resources, or other features that are rare in the broader landscape.
- Water quality in other parts of the watershed is influenced by how you manage your streambanks, hillsides, and wetlands.
- The visual quality of the area is impacted by your management choices.
- Allowing access to your road may reduce the need for additional roads in the area, thus reducing disturbance to forests.
- Surrounding trails may provide opportunities for you to link to a broader trail network.

The actions you take on your land can help support broader goals for forests in your region. Likewise, you may see opportunities to enhance your own objectives by tying them in with landscape features found beyond your property lines.

Goals for the Landscape

Before determining goals for your own back-forty, it's a good idea to understand the landscape management goals developed by natural resource professionals, land managers, and local community members. (Collectively this group is known as the Minnesota Forest Resources Council's "East Central Regional Committee." More information about the MFRC is in Chapter 7.) The goals[17] for the Mille Lacs Uplands and Glacial Lake Superior Plain were developed over the years through large-scale forest planning efforts. They show a long-term vision of what future forests in this area could look like and provide for wildlife, the local economy, and society.

- **Increase continuous forest cover.** Forest fragmentation—the reduction of forest land into small, isolated patches disrupted by other land uses—is a leading cause of forest habitat loss and degradation. Maintaining and expanding large blocks of forest that are not interrupted by development can result in higher quality habitat and recreational opportunities than is possible with smaller patches of forest.

- **Encourage diverse, native forests.** Diverse forests tend to be healthier and more resistant to stress. Encouraging forest diversity means increasing the variety of native trees adapted to the growing conditions of your land and maintaining a balance of young and old forest on the landscape.
- **Protect water quality.** Forests and water are intimately linked, especially within the water-rich east-central region of Minnesota. Forests play a key role in the water cycle by regulating the flow of water across the land. They also filter drinking water and prevent erosion from polluting aquatic habitats. Protecting forests near wetlands, seasonal ponds, natural shorelines, and streams is key to protecting local water quality.
- **Manage for wildlife and habitat.** There are over 500 wildlife species in your region.[18] Natural resource professionals are trying to ensure that each of these species can maintain a healthy population while reducing adverse effects that some species may have on forests. Special steps are often taken to protect the region's rare and threatened species.
- **Foster productive forests.** We rely on our state's forests as an important source of wood products. Managing forests to increase their production of quality timber helps ensure a steady supply of wood products and a healthy forest-based economy.
- **Protect forest health.** Forest health underpins many of the goals above such as maintaining diverse and productive forests. Keeping forests healthy means protecting them from invasive pests, planning for the effects of climate change, and monitoring the effects of large-scale disturbances caused by fire, windstorms, insects, and diseases.
- **Preserve cultural resources.** Forests are special places for many Minnesotans, providing peace, beauty, recreation, and the opportunity to visit important historical artifacts and unique natural features. Natural resource professionals in Minnesota strive to manage forests in ways that preserve these cultural resources and reduce negative visual impacts on the landscape.


Bekah Hanes

Eastern bluebird


Michael Lynch

What Are Your Goals?

You may have other goals for your woodland such as making a sound investment, maintaining privacy, or passing your land onto the next generation. When setting your goals, consider the broader landscape goals made by natural resource professionals. Doing so will help you succeed long term because you are using a basic framework for what tends to work best in your region. In other words, landscape goals provide the foundation. It is up to you to build the rest.

"We planted over 200 trees that were good for birds. We wanted something for everything. There's grouse out here, so we wanted to provide the berries and leaves that they eat. We also planted stuff out there for turkeys."

— Jerry Nelson, Cloverdale

Setting Goals for Your Woodland Using the "Woods Workbook"

The workbook at the back of this book and on **mndnr.gov/woodlands** is designed to help you record your observations and woodland goals. Use this workbook as a field tool—don't be afraid to take it outside and get it dirty!

Speaking of dirt, the best way to get to know your woods is to get out and explore them. Perhaps you already do this regularly, but in case you are not familiar with what lies in your back-forty, you may have some questions. For example, what kinds of trees make up the canopy and what species are growing underneath? How old are your trees? What does the **understory** look like: is it brushy or open? Are there any invasive species growing in your woods? The Woods Workbook will help guide you through these and other important questions.

Once you have a feel for the lay of your woodland, it is time to consider your main reasons for owning it. Perhaps the land has been in your family for generations and you inherited it. Maybe you purchased it recently as an investment or as a place to hunt deer every autumn. It could be a part of your home that you enjoy for the solitude and visual beauty that it provides. Or maybe your woodland is simply a part of your property that you have not thought much about. The Woods Workbook will help you think about your reasons for owning woodland and the benefits that you want from that land.

Biodiversity Counts

When developing goals for the landscape, biodiversity counts. The Minnesota Biological Survey is an ongoing effort by the state to collect detailed information on rare plants and animals, native plant communities, and local landscapes. The surveying began in 1987 and has been completed for most counties at the time of this printing. The results of this work have taught us a lot about the locations and abundance of Minnesota's flora and fauna. Visit mndnr.gov/woodlands to learn more.

Choosing a Strategy

Once you have identified your top goals for your woodland, you can begin to develop a strategy for achieving those goals. You may not be able to accomplish all of your goals on one piece of woodland, but having a central focus can help you prioritize your efforts. Following are examples of three common themes that many woodland owners use to guide their decisions.

Theme 1: Wildlife habitat

Your main goal for your woodland may be to make it a good place for wildlife. Perhaps you are interested in attracting game species such as deer and grouse. Or maybe you are an avid birder and wish to make your land a desirable stopover location for migrating songbirds and waterfowl. You might value providing habitat for rare species. Whatever your interests, you can take steps to make your woods a more wildlife-friendly place.

Your land needs some key features to make it attractive to wildlife: food, water, shelter, and space. Trees and shrubs that produce nuts and soft fruits are an important source of wildlife food for many species. Acorns are especially popular among deer, squirrels, and some birds. Small native trees and shrubs, such as dogwood, serviceberry, blueberry, northern bush honeysuckle, and chokecherry, produce soft fruits that are eaten by many creatures including songbirds, wood ducks, foxes, and black bears. Certain animals, such as grouse, prefer buds and flowers of aspen. Some landowners also choose to develop **wildlife openings** to attract wildlife. (Learn how to create wildlife openings and choose vegetation for wildlife in Chapter 5.) Wildlife can generally find their own water sources, given suitable habitat.

Know Your Critters

Visit mndnr.gov/woodlands to learn more about the animals living in your area, how to look for them, and how to provide suitable habitat.

Dead trees—or **snags**— provide shelter and food for a variety of wildlife species. Brush piles and understory trees and shrubs can provide protected areas for birds and small mammals. Maintaining large, connected woodland patches provides space and attracts wildlife that cannot live near forest edges. Maintaining wooded **corridors** between smaller patches of woods provides shelter for wildlife passing between them. Finally, preserving any wetlands, bogs, or swamps on your property provides shelter, food, and water for many types of creatures.

Different wildlife species have different needs, so any action that you take will inevitably favor certain species over others. Be sure that you are clear about what kinds of wildlife you wish to attract before making any changes to your land.

Black bear

Theme 2: Recreation

Perhaps you want to use your woods as a place to hunt, hike, watch wildlife, snowmobile, or do some other form of recreation. If recreation is your theme, make sure that your management strategy includes increasing access to key places on your property. Where trees have become too crowded, strategically thinning your woods can help you travel through it and improve the health and quality of the remaining trees. Also, removing invasive plants can improve your recreational experience and the health of your woodland. Building trails creates accessibility. The design of your trails will depend on their purpose, who will use them, and your land's features. Your land's shape, size, slope, and ecology will determine the best route for the trail, points of interest to highlight or protect, and steps you need to take to prevent erosion and spreading invasive species.[19] Chapter 5 provides more information on how to do this.

Learning how to identify your woodland's native and invasive trees and plants helps you learn more about your land, and is a fun activity in any season. To learn more, visit **mndnr.gov/woodlands**.

> "Make some trails. You don't need a bulldozer or power equipment. You could go out there with a pair of loppers, clippers, whatever, and just make a walking trail. It doesn't have to be a straight line, it can be meandering. Walk in your woods."
>
> — Patrick Lanin, Brainerd


Michael Lynch

PlayCleanGo

While important for recreation, trails also provide pathways for invasive species to infiltrate your woods. To help prevent this, clean dirt, bugs, and plant material from shoes, clothes, equipment, vehicles, and pets before and after trail use. playcleango.org

Play Clean Go™
STOP INVASIVE SPECIES IN YOUR TRACKS.

Theme 3: Income

Your woodland is an investment that, if properly cared for, can provide economic returns for generations to come. One way to generate income from your woods is through harvesting timber. To get the most out of your woodland's timber-producing capability, you want to do **timber stand improvement** activities. Timber stand improvement helps your forest grow faster, become healthier, and allow you to profit from harvest sooner and more frequently. Depending on your land and your specific goals, these improvements may involve tree planting, thinning out lower quality or overcrowded trees, pruning trees, and protecting trees from damage. (See Chapter 5 for tips.)

Your woods may also provide "nontimber" forest products, and some have established markets such as balsam fir boughs (branches). After the second hard frost of the year, you can harvest balsam boughs from mature balsam fir trees and sell them for making holiday wreaths—a $20 million industry in Minnesota.[20] You could also collect acorns, seeds, and cones and sell them to the Department of Natural Resources, the USDA Forest Service, or private nurseries for growing seedlings. The University of Minnesota Extension Service's *Minnesota Harvester Handbook* provides many more examples.

> "Financially, to pay taxes and afford owning that large area of forested land, having income from forest harvest has been very helpful."
>
> —Donna Perleberg, Pierz

Finally, you might be able to defray your land ownership costs by enrolling in a woodland cost-share, tax-relief, or incentive payment program. Because your forest provides public benefits, public funds are available to help you pay for some of the costs incurred from improving your woods. These programs are discussed in Chapter 6.

Leslie Robertson/NASF

Combination Approach: Multiple Benefits

Often, management themes overlap, and you want to incorporate elements of most or all of them into your approach. You might have different goals for different areas of your woods, or perhaps your goals do not fit into one of these categories. Examples might include planting a shelterbelt around your farm or improving the water quality in your woodland creek. Every management activity has pros and cons, but certain activities—such as clearing invasive species, thinning the understory, and planting diverse native tree and understory species—can support multiple strategies because they benefit everything from forest health to timber production to wildlife. Thinning woods that are within 100 feet of homes, barns, and garages can also help protect expensive structures from wildfire danger.

"People might say, 'I want to return this land to the way it was.' Well, when are you talking about? Are you talking 50 years ago? 100 years ago? 1,000 years ago? The land is dynamic. It became apparent to me I want as much diversity as possible. That's probably a safe bet. If I'm going to plant things, I'll plant as many different things as I can."

— Jim Morrison, Mora

The purpose of this chapter was to get you thinking about how you use your woods and what you want them to be like in the future. If you need more information (rare plants and animals, trees to harvest, property taxes), Chapter 4 will help answer those questions.

Chapter 4: Choosing a Strategy

Chess players know that good strategy is the key to winning the game. Like chess, managing a woodland requires foresight. While you can't predict the future and may need to adjust your plans, having an organized, long-term strategic approach increases your chances of success.

Once you have determined goals and a management theme for your woodland, achieving those goals depends on your interests and available resources. Options range from a simple walk through your woods with a forester to enrolling your land in a long-term conservation program. This chapter covers some helpful first steps. As you become more interested in investing in your woods, see Chapter 6.

Who to Know: Key Players

Your key players are people you can contact to help you reach your goals. There are many agencies and organizations in Minnesota that can help.

Professional Foresters: These people can help you plan your strategy through property visits and project implementation.

- *Minnesota Department of Natural Resources (DNR)*—The DNR is a state agency that helps take care of Minnesota's natural resources. DNR foresters protect and manage 4.2 million acres of public forestland, and are also available to assist Minnesota's private landowners with woodland decisions and

Leslie Robertson/NASF

projects. Specifically, the DNR's Cooperative Forest Management program is a centralized hub of information that can direct you to many other resources and people including other agencies and private sector consultants. Local DNR Forestry offices often have long-standing relationships with a network of private foresters and loggers. If you decide to have a plan written for your property or a timber harvest performed, contact your local DNR Forestry office at **mndnr.gov/areas/forestry**.

- *Soil and Water Conservation Districts (SWCDs)*—SWCDs are local government agencies that help private landowners manage their natural resources. Some SWCDs have foresters who can visit your woods and provide advice. There are 90 SWCDs in Minnesota, one for each county (a few counties have two). **maswcd.org**
- *Private Consulting and Industry Foresters*—There are private, independent consulting foresters and foresters who are employed by timber harvesting companies. The Minnesota Association of Consulting Foresters can help you find a trained, experienced consulting forester in your area. **web.paulbunyan.net/norfor/Index.htm**

Information and Education: These organizations provide printed materials, online resources, classes, workshops, field days, and other professional advice. They can sometimes help you access funding, which is discussed in Chapter 6.

- *University of Minnesota Extension Service*—The University of Minnesota delivers practical, research-based education programs and information to landowners. Extension also manages the MyMinnesotaWoods website and other free electronic communications for landowners. **myminnesotawoods.umn.edu**

- *Minnesota Forestry Association (MFA)*—MFA is an organization for private woodland owners that offers educational opportunities and other services. MFA administers the "Call Before You Cut" program, which encourages landowners to call a hotline before harvesting their timber and get free information that includes lists of foresters, certified loggers, and other resources. **minnesotaforestry.org**
- *Minnesota Logger Education Program (MLEP)*—MLEP educates loggers on sustainable forestry practices. MLEP also certifies loggers who meet certain performance standards as Minnesota Master Loggers, which allows timber harvested by these loggers from private lands to be marketed as certified wood. **mlep.org**

Other sources of information include the federally administered Natural Resources Conservation Service and Farm Service Agency, and the state-administered Board of Water and Soil Resources. Financial assistance is often available through these agencies.

What to Do: Create Your Strategy

There are a few basic steps you should take as you develop your woodland management strategy. Keep in mind that these may involve working with a natural resource professional.

1. **Get advice.** Schedule a time for a professional forester to visit your property and walk through your woods with you. They can help you learn more about your woods' potential for wildlife management, timber harvest, recreation, and so on. A forester may also identify invasive species growing in your woods, areas in need of thinning or restoration, and areas that contain important natural features. This process can help you choose specific projects you want to do in your woods.
2. **Have a management plan prepared.** The DNR's Forest Stewardship Program helps landowners finalize goals and prepare a professional, voluntary **management plan** for their woodland. A management plan (also known as a **Woodland Stewardship Plan** when written by a certified plan writer), is a nonbinding, written document that lists your land's potential, what you want to accomplish, and specific actions you can take to accomplish those goals within a given timeframe. Woodland Stewardship Plans are discussed in Chapter 6. However, at this stage you may be interested in something simpler. Ask your forester about having a brief or streamlined management plan

"When I started to think about producing maple syrup, I didn't even know which trees were maples. Our forester came out in winter, and we tromped around when there weren't any leaves on the trees. One day, we spent the better part of the day just surveying all the trees on our property, just finding all of the maple trees. I learned a lot about that."

—Jim Morrison, Mora

Leslie Robertson/NASF

A professional forester checks in with a Minnesota Master Logger on a timber harvest.

prepared for your land, using the ideas that you have recorded in your Woods Workbook.

3. **Decide how the work will get done.** A "project" may include activities such as tree planting, timber stand improvement, invasive species removal, wildlife habitat improvement, development of recreational trails, or timber harvesting. When planning how the work will get done, consider your available time and budget. Doing the work yourself is one option. This saves money, but requires more time investment. Many landowners enjoy doing their own management activities, as it provides an opportunity to be out in their woods (and is often great exercise!).

   If you can't do the projects yourself, you can hire a contractor. Several organizations maintain directories of forestry professionals and logging contractors in Minnesota.

   - The Minnesota Logger Education Program has a free, online directory of its trained members including a list of Minnesota Master Loggers. **mlep.org**
   - The Minnesota Association of Consulting Foresters has a similar directory of professional foresters, along with descriptions of their experience and service areas. **web.paulbunyan.net/norfor/Index.htm**
   - Your local DNR Forestry office also has lists of contractors for your surrounding area. **mndnr.gov/areas/forestry**
   - You might also consider asking your neighboring landowners if they've had woodland work done and what their experiences were like.

Part II covered some of the goals for the forested landscape of which your land is part, how your own goals intersect with these landscape goals, and how to develop a strategy for doing the work necessary to reach your woodland goals. Part III starts you down the path of becoming a more active woodland manager by giving you the tools you need to begin your first project, and pointing you in the right direction for getting more involved in the future.

Working Woodlands

Spotlight: Shelley and Eric Larson—Milaca, Minn.

Mille Lacs Uplands

The 80-acre parcel that Shelley and Eric Larson purchased in 1976 appealed to them for multiple reasons: it was cheap, it was relatively close to the Twin Cities, and best of all the property was nestled in the middle of the Rum River State Forest. "We've got a 65,000-acre backyard," says Shelley.

From the beginning, the Larsons' goals have focused on forest health and habitat. "I guess our favorite activity is caretaking," Eric says. "That's how we spend our winters. Just out on snowshoes and handcutting trees." Shelley adds, "Thinning, pruning, felling." It is clear they enjoy the work. "We do!" they laugh, "It's a lot of fun." The Larsons have spent the last few decades slowly removing large, old aspen trees to make room for higher value hardwoods such as oak and butternut to grow. "Part of our desire is to reduce the time needed to regenerate a mixed-species forest" they say, noting that livestock had grazed their woods before they purchased it. "We've got a lot of glorious stuff goin' on the parcel now," says Eric. "We have wonderful regeneration of hardwoods," Shelley adds.

The Larsons have become experienced woodland managers over the years, but they learned some hard lessons early on. They did their first harvest in the 1980s while aspen was in especially high demand. "We had people knocking on our door monthly because we had really desirable aspen," Eric recalls. Their woodland stewardship plan recommended a clearcut, but weather got in the way. The harvest happened while the soil was too wet and caused long-lasting damage. Removing too many trees too quickly caused the soggy soils to pond, delayed regeneration, and stimulated a fungal disease in the new aspen that they continue to battle today. "It was a major disruption," Eric notes. Since then, research has led to development of better harvesting practices that have lower impacts. "The state of Minnesota did a lot of research

on forest management guidelines to protect the soil," Shelley remembers, "and that's when they started recommending that people stay out of the woods when they're wet, and [use] balloon tire equipment."

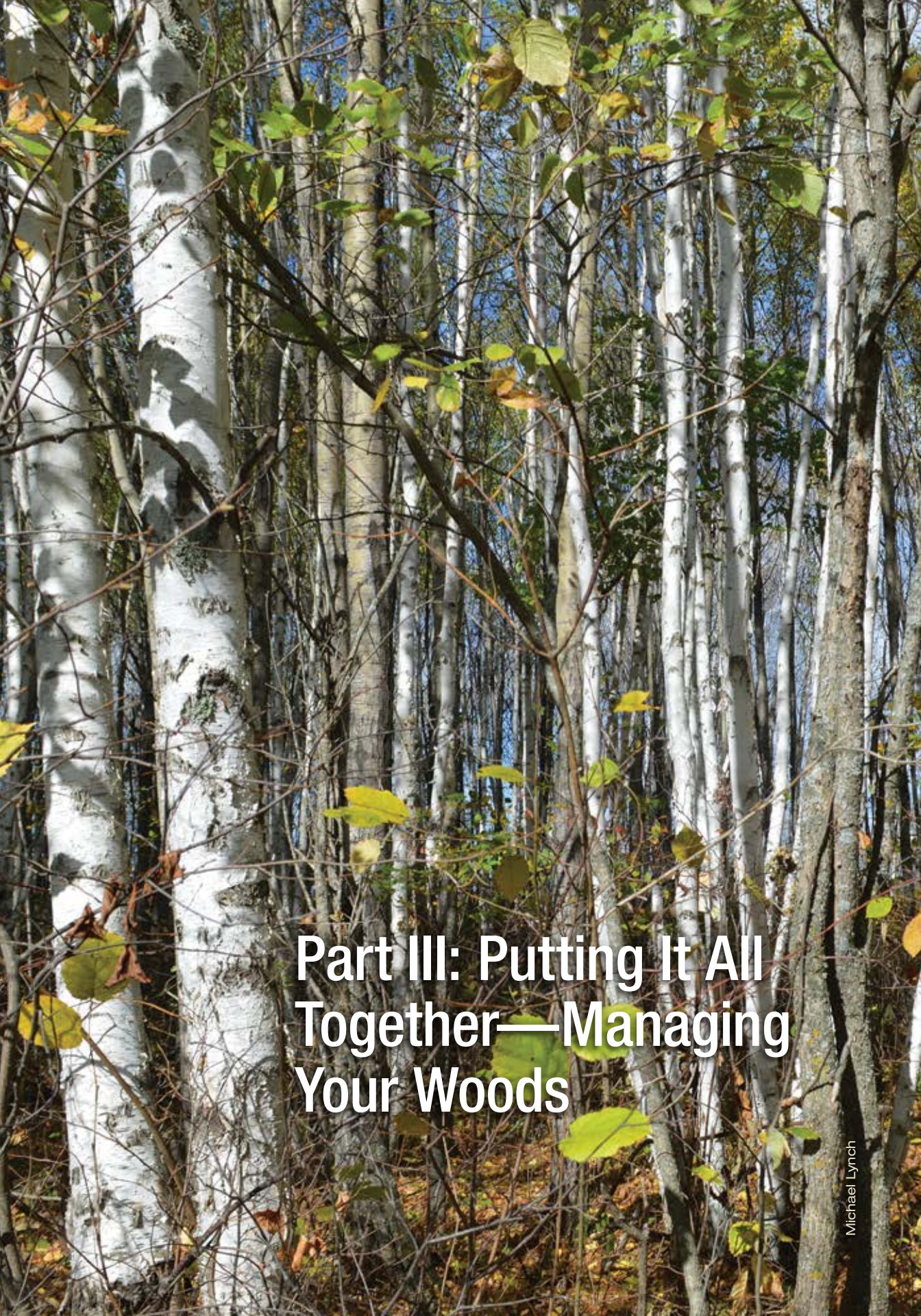
Since the Larsons' ill-fated harvest, researchers and natural resources professionals now better understand the ecology of the Mille Lacs Lake area. Today, we use tools such as native plant communities and the Ecological Classification System (ECS) to guide how we manage natural resources.

The Larsons have been interested in native plants for decades. "I'm a plant person," Shelley says. "I go out into the forest and the plants tell me what that forest was and what it wants to be."

Seeing a need for greater availability of local native woodland plants, Shelley created Hayland Woods Nursery in the 1980s. She grows native woodland plants such as blue cohosh, trillium, wild ginger, Solomon's seal, and leeks (wild onions) which she sells mainly for woodland and lakeshore restoration projects on private lands. Shelley lists reasons to protect and grow native plants: they have adapted to the weather, soil, and landscape; they don't need fertilizing; they are low-maintenance; and they support local pollinators and wildlife that may be disappearing from the landscape.

In recent years, the Larsons have worked with Peter Bundy, a forester who shares their ecological interests. For other landowners seeking to work with a contractor and who are concerned about the potential impact of a work project, the Larsons recommend researching your land's history and ecology, and getting in touch with others who are doing the type of management you are interested in. Shelley suggests contacting a local woodland owner organization that can connect you with a low-impact logger. "Line up your philosophy with the company that's going to do the work," says Eric. "There are some fabulous resources out there. You can get individual cutters, even horse loggers. Find a management style that matches your philosophy." ◆

"You can get individual cutters, even horse loggers. Find a management style that matches your philosophy."



Part III: Putting It All Together—Managing Your Woods

Michael Lynch

Chapter 5: Woodland Projects

"Safety, safety, safety. Don't pick up a chain saw without wearing proper protective gear. Spend at least as much on safety equipment as you do on your first chain saw. With 300 bucks you can get a hard hat, chaps, and a good pair of boots."

— Jim Chamberlin, Deerwood

A wide variety of resources can help you develop a strategy to manage your woodlands. This chapter provides you with a few ideas to develop and execute your first project.

Tools and Budget

First, you need to prepare your toolbox. This involves more than just sharpening your chain saw! The most powerful tool at your disposal is knowledge. Visit **mndnr.gov/woodlands** for resources that can help.

Other tools you may wish to gather include aerial photographs of your property, soils information, mechanical equipment, names and contact information of resource professionals or other landowners who can help, and a management or **project plan**. Online planning tools such as the American Forest Foundation's "My Land Plan" can also help.

You also need to determine your budget, which will influence the size and scope of the project you choose. Several options for financial assistance that may help stretch your management dollars are discussed in Chapter 6. Record your budget in your Woods Workbook on pages 64-67.

Safety First!


Michael Lynch

Working in the woods can involve some inherently dangerous activities such as operating chain saws or other mechanical equipment, using herbicides, handling noxious plants such as wild parsnip and poison ivy, and working around deer ticks and other biting insects. Arm yourself with the proper equipment (e.g., hard hat, eye protection, gloves, long sleeves, chain saw chaps, insect repellent) and the right knowledge before trying any of these activities. Some organizations offer short courses on chain saw safety and herbicide application. Visit mndnr.gov/woodlands.

Choosing a Work Project

Choose a project that fits your budget, timeline, and long-term goals. Projects range from simple tree pruning to in-depth lakeshore restoration. Here are a few examples that correspond to the wildlife, recreation, income, and combination themes described in Chapter 3. Each of these projects may be tailored to meet multiple goals.

Option 1, wildlife habitat focus: Creating a wildlife opening

If you want to attract wildlife to your property, you might consider creating a wildlife opening as your first woodland project. Unlike traditional **food plots**, which usually consist of planted nonnative grasses or crops, wildlife openings use native vegetation and are therefore more suitable to meet the needs of native wildlife.

Wildlife openings are small clearings in your woodland—ranging from ½ to 5 acres, but usually 1 acre or smaller in size—that mimic the type of openings created by natural disturbances such as fires or wind. Disturbance is nature's way of renewing a forest, and many creatures depend on specific habitats created by a forest disturbance. Methods for creating and maintaining your wildlife opening could include hand-cutting trees and shrubs, brush mowing, and controlled burning with the help of a professional. Maintaining your opening is best done outside of the primary nesting season for birds, which is mid-May through early August. A natural resource professional can help you decide which method(s) work best and the best location for the opening.

You do not need to remove all of the trees and shrubs in your opening. It benefits wildlife to leave—or plant, if absent—nut- and fruit-bearing species, a few snags, fallen logs, and brush piles for shelter. The opening should be about three times as long as it is wide, irregular in shape, and placed on a south- or southeast-facing slope to take advantage of the sun.

When choosing the location of your wildlife opening, it may not be necessary to clear new areas if you have existing openings that can be improved by planting or regenerating native species. Pre-existing openings may include yards, old pastures, edges between forest and agricultural fields, and open areas near lakeshore. You might also consider improving an existing food plot. Using pre-existing openings can prevent unnecessary fragmentation of your woods.

Native Plant Community Spotlight: Central Dry Oak-Aspen (Pine) Woodland

This native plant community is considered imperiled based on its rarity and threats facing the remaining parcels. The plant community develops on level, permeable (porous), sandy soils that do not retain snowmelt or rainfall for very long. These environmental conditions occur in this region, most notably on terraces along the St. Croix River. Historically, fires that reached the crowns (tops) of trees and mild surface fires were common, occurring approximately every 9 years. Frequent fire disturbance in this community lead to a more open canopy that covered only about 50-75 percent of the forest ceiling. Forests were most often dominated by deciduous trees, especially northern pin oak and quaking aspen, however some sites were dominated by jack pine. The shrub layer is often dense, with abundant American hazelnut and tall blackberries.

The historical disturbance regime has been greatly altered with modern fire suppression. To keep this rare native plant community healthy, you should consider management activities that mimic the frequent mild to severe fires that once shaped this ecosystem. You might consider a strategy of creating openings to maintain the interrupted canopy cover and perform **prescribed burning** in these openings when possible.

Option 2, recreation focus: Controlling invasive plants

Nonnative species can be a big problem for forests when they displace native species. Invasive plants can crowd the understory of your woods or proliferate along your trails, making recreational access difficult. The first and least costly step you can take to combat any invasive species—plant, insect, or disease—is to prevent them. Here are some steps you can take:[21]

- Identify invasive species and recognize clues about their presence.
- Avoid spreading seeds, insects, and microbes (found in wood or soil) to new areas by cleaning boots, tires, pets, and equipment between uses.
- Minimize disturbance to native vegetation where possible, and maintain healthy communities of native species.
- Monitor high-risk areas such as roads, trails, and disturbed ground.
- Detect new outbreaks of invasive species early and eradicate them quickly.

If you have confirmed that there are invasive plants in your woods, taking steps to control these pests is a good first woodland management project. Catching an infestation early can be critical to successful eradication. The best time to tackle removing an invasive plant is when it's present, but not yet well-established in your woods. Once an invasive plant becomes well-established, eradication is more difficult, but you can still manage the problem and give your native plants a chance to compete with the invader.

Woody invasive plants in your region include common buckthorn, several species of Eurasian bush honeysuckle, and weedy invaders such as common tansy, several species of nonnative thistle, and leafy spurge. Spotted knapweed and wild parsnip are becoming more common in your area, and should be eradicated before they become established. Another plant to watch out for is garlic mustard, which is a prolific understory plant with clusters of small, four-petaled white flowers and a garlicky scent to its leaves. While it is present, it's not yet prevalent in your region. Garlic mustard has already invaded other parts of Minnesota and the United States. If you spot garlic mustard, act quickly to remove it. If it becomes established in your woods, it will become highly problematic. Visit **mndnr.gov/woodlands** to help you identify these and other invaders that might be present in your region, as well as tips for distinguishing invasive from native species.

A variety of methods are used to control invasive plants.

- *Hand-pulling:* Small seedlings can be pulled up by hand in the spring when the soil is moist, taking care to remove the entire root so the plant does not resprout.
- *Herbicide:* The stems of large woody plants can be cut at the base and treated with the appropriate herbicide to prevent resprouting. For small-diameter trees, herbicide can be sprayed on the bark around the lower portion of the

Buckthorn, if left unmanaged, can take over nearly any wooded areas.

plant's stem. You can also spray the leaves of invasive woody plants, preferably after native plants have lost their leaves and gone dormant. This works well for young sprouts and seedlings. Infestations of weedy plants may be controlled with spot herbicide treatments. As always, be sure you're treating the correct plant and take care to protect native plants. Before applying any herbicides, it is best to talk to your forester to make sure you select the most effective treatment and the best product for your site. Finally, wear protective clothing and always follow instructions on the product label when applying herbicides—it's the law.

Arrest the Pest: 888-545-6684

The Minnesota Department of Agriculture has a hotline for reporting newly detected invasive plants and insects. If you can, provide digital photographs and GPS coordinates of the infested site.

- *Fire:* Prescribed burning can be effective at killing seedlings and resprouted plants. Burns need to be repeated every few years to keep new invasions from taking hold. Just as with the use of herbicides, it is best to talk to a professional before tackling a prescribed burn. You will also need to get a burning permit. **mndnr.gov/forestry/fire**
- *Mowing or grazing:* Some invasive plants can be deterred by repeatedly mowing the plants before they go to seed. Alternatively, livestock such as cows, sheep, or goats can be used to graze heavily infested areas of certain invasive species. Talk to your forester if grazing might be an option.

- Insects: In a few cases, scientists have identified insects that selectively attack particular invasive plants. **Biological controls**, such as some insects, can target invasive species while sparing native species. For example, two types of weevil are used to control spotted knapweed, an aggressive invader of open or disturbed areas. One weevil attacks the seedhead. Another weevil attacks the roots of the knapweed, weakening or killing those plants.[22] Both weevils are needed to control knapweed. For information on applying biological controls on your property, contact your county agricultural inspector or the Minnesota Department of Agriculture.

Adding dye to your herbicide helps keep track of which plants you have treated.

Fire can be a great management tool if you get a permit and take appropriate precautions.

Saying 'Baa-Bye' to Buckthorn

Spotlight: Nancy Lunzer—Ogilvie, Minn.

Mille Lacs Uplands

Nancy Lunzer is no fan of invasive European buckthorn. "Buckthorn's nasty stuff. It makes a thicket, you can't get through it, it's thorny, and it's horrible!" Unfortunately, Nancy and her husband, Scott, are all too familiar with woods taken over by buckthorn. "There was an area in the northwest corner where only buckthorn grew under the canopy of aspens. And it had pretty much shaded out everything else except for a few ferns … so that the ground was nearly bare except for a little bit of leaf litter." Because a bare forest floor can lead to soil erosion, Nancy and Scott were concerned about the impact on their ponds and local stream. They were also concerned about how using herbicide may affect the water, so they chose a different strategy to manage their buckthorn problem—livestock grazing.

Using a grant from the Sustainable Agriculture Research and Education program, Nancy bought hogs to graze the most invaded places where few native plants remained, rotating the pens through the woods until all understory vegetation had been removed. Nancy notes that using hogs is a last resort, as they disrupt the soil by removing all stems, roots, and seeds that they can find. Sheep however, are slightly more selective and impact the soil a bit less. Nancy grazes sheep in areas where buckthorn plants are smaller and some native species remain, but takes care not to let them overgraze. "If you cut buckthorn, it just grows back thicker and bushier. But if you keep grazing it, you kill the buckthorn. I cut it to sheep-height, and then they graze it off and kill anything that regrows. I've been doing that for 2 years and it's pretty effective. And some of the native species that the sheep don't eat are coming back."

"…if you keep grazing it, you kill the buckthorn…"

Nancy feels that their work helps protect the rest of her property, which is mostly buckthorn-free. She wants to teach other landowners how to remove small buckthorn infestations. "It's worth it." ◆

Sheep eating buckthorn.

Remember that seeds in the soil can germinate for several years after you remove mature plants. You must be persistent in removing new plants until the seedbed is exhausted or the infestation will return. After you remove an invasive species, you may need to plant native species to fill the void, otherwise new invaders may quickly return to the disturbed area. Native trees and shrubs that could replace buckthorn and honeysuckle include highbush cranberry, nannyberry, pagoda dogwood, American hazelnut, common elderberry, and native bush honeysuckle. Native **forbs** in your region are many, and might include bloodroot, wild ginger, Canada tick trefoil, black-eyed Susan, and whorled milkweed. More information about choosing native plants is on **mndnr.gov/woodlands** and **mndnr.gov/plants**.

Unfortunately, new invasive plants are constantly popping up in areas where they have not been spotted before, and troublesome invaders are always changing. Collect up-to-date information about the forest invaders, including insects and diseases, that you need to look out for in your woods. Projects that increase the diversity of plant species and ages will help strengthen your woodland's resiliency.

Native Plant Community Spotlight: Northern Wet Ash Swamp

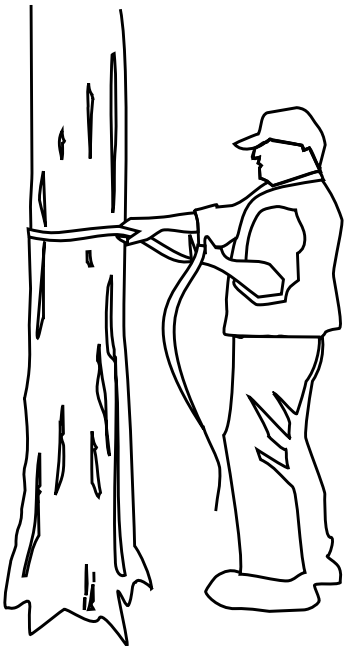
Northern wet ash swamps are primarily found on mucky soils in shallow basins and on low, level terrain near rivers, lakes, or wetlands that typically have standing water in the spring that drains by late summer. The shrub, subcanopy, and canopy layers of this plant community are all dominated by black ash, often at the near exclusion of other species. In the Mille Lacs Uplands, however, this plant community may also contain some yellow birch, red maple, quaking aspen, and balsam poplar in the canopy. Lady fern, dwarf raspberry, and alpine enchanter's nightshade are common and often abundant in the ground layer.

Concern for this plant community is especially high due to the threat posed by a small green beetle from Asia called the emerald ash borer, or EAB. EAB has been found on two edges of your region in the Twin Cities, in northern Wisconsin (along Lake Superior), and in Duluth. This wet forest community would be significantly altered or eliminated if EAB spreads from these areas due to the dominance of black ash. EAB can be quickly spread through moving firewood, so to protect this important plant community you should only burn local firewood and report suspected outbreaks of EAB in your area. This community is also vulnerable to aggressive invasive plants such as glossy buckthorn, narrow-leaved cattail, hybrid cattail, and reed canary grass. Monitoring the understory and edges of your northern wet ash swamp for these invasive plants—and taking fast action to control them—can help protect this biologically unique Minnesota ecosystem.

Option 3, income focus: Harvesting firewood

If you enjoy keeping the hearth crackling throughout the long Minnesota winter, a timber stand improvement harvest will give you abundant firewood from your property.

Harvesting firewood on your property saves money. To maintain a forest that will stay healthy, produce income, and look good, choose your firewood trees strategically.[23] Mark trees that are:



- *On the small side*—Trees that measure 6 to 8 inches in diameter (or 19 to 25 inches in circumference) at 4½ feet from the ground are good choices for firewood harvests.
- *Dying or dead*—Choose trees that have been infested by disease or insects, as they will likely not survive to be part of your future forest. You may also choose to harvest dead trees, but remember that you may wish to leave some of these for wildlife habitat.
- *Low timber quality*—Choose trees that are crooked, damaged, or have trunks that fork close to the ground. Choose species that are less desired by timber markets. These trees will not fetch high prices if you choose to harvest your future forest.
- *Crowded high quality trees*—If the trees in your woodland are too crowded, they compete for resources. Thinning some of the trees that surround your best quality trees allows those remaining trees to thrive and grow more quickly. To identify overcrowded trees, look up at the crowns (the tops) of the trees. Make sure that your best trees have plenty of room for their crowns to grow.

Don't Move Firewood!

You may be tempted to transport firewood from your land to another location for storage or use. Resist the urge! Remember, moving firewood from one area to another can quickly move invasive forest pests such as oak wilt, gypsy moth, emerald ash borer, and other organisms that kill trees. This is true even if the wood is burned shortly after being moved. For many of these pests, we don't have an effective way to remove them once they are established in an area. Preventing further spread is the most effective means of control. Note that some Minnesota counties have quarantines that prohibit moving firewood and violations can result in hefty fines.

"If you decide you want some firewood or to cut trees, cut the worst first. You got a twisted tree, or it's taking sunlight, it's taking moisture, it's extracting material from the soils—get rid of it."

—Patrick Lanin, Brainerd

Logs harvested from dead or dying trees may contain insects or fungi that can harm remaining trees, and some insects are attracted to recently harvested logs from healthy trees. To prevent these organisms from spreading, it is best to harvest and process your firewood in cold weather. Split, stack, and cure the wood on site for 2 years before moving it to another area.

If you choose to harvest trees yourself, having a project plan prepared by a professional forester can help you identify where, how many, and which trees to harvest. Visit **mndnr.gov/woodlands** for information.

Be Firewise

Protect your home, barn, and other structures from wildfire by removing flammable materials such as trees, overhanging branches, brush, and firewood that are growing or placed too close to walls. Maintain a 10-foot minimum space to prevent fire from jumping between trees and homes. Reducing fuels in the wooded area 100 feet beyond each structure will reduce the intensity of an approaching wildfire. Mow grasses, reduce underbrush, and prune remaining trees up to 6 to 10 feet, or one-third of the tree height. www.firewise.org

Native Plant Community Spotlight: Central Mesic Hardwood Forest

The canopy of this common east-central Minnesota plant community was historically dominated by northern red oak, basswood, and sugar maple. Common understory plants include chokecherry, pagoda dogwood, prickly gooseberry, and beaked hazelnut, along with sugar maple, basswood, ironwood, and northern red oak seedlings and saplings.

Historically, catastrophic disturbances were rare. Events that resulted in partial loss of the tree canopy, especially light surface fires, would have occurred approximately every 40 years. The consequence of fire suppression and settlement in the past century has promoted more sugar maple, ironwood, and quaking aspen than was typical for this community. These increases came mostly at the expense of red oak, which no longer dominates this plant community like it once did. Oak trees can outcompete sugar maple and ironwood in large gaps. If you want to keep oak in your woods, you can tailor your firewood harvesting strategy to achieve this goal. Creating gaps that are a ¼- to ½-acre in size are best for regenerating red oak. Larger gaps allow aspen to dominate. For best results, target this activity in areas where some oak saplings and seedlings are already present. In contrast, creating small gaps by removing single trees or small clusters will favor sugar maple, red maple, and basswood. Similar to the effects of fire in the past, either strategy helps create diverse age groups among your trees, which creates better wildlife habitat and helps your woods resist environmental stress.

Option 4, combination focus: Lakeshore restoration

Forests play a critical role in maintaining the health and beauty of east-central Minnesota's many lakes. If you own lakeshore property and are interested in a "combination approach" to your woodland management strategy, a lakeshore restoration project may be a good fit. Maintaining healthy lakeshore provides habitat for birds, fish, and other wildlife. It also improves recreational opportunities by maintaining good water quality and can potentially increase the value of your land by improving visual quality.

There are several steps you might take to improve the quality of your shoreline.

- *Stabilize the soil bank*—If the shore is eroded or sensitive to erosion, you need to stabilize the soil to keep it from muddying the water. Planting native trees, other woody vegetation, or deep-rooted perennial forbs and grasses is one way

to secure the bank. Visit **mndnr.gov/woodlands** for tips on selecting native plants for your county and methods to protect your young trees from deer and rabbit browsing.

- *Control invasive plants*—Aggressive invasive species, such as reed canary grass and purple loosestrife, plague the shores of lakes and other water bodies in your area. Controlling invasive plants helps native plants compete for space.
- *Create wildlife habitat structures*—If the area has few snags and downed logs, you might consider installing some habitat structures for wildlife such as tree boxes for wood ducks or floating nest platforms for loons and other waterfowl.

Specific recommendations for a lakeshore restoration project vary depending on the condition of your shore, the local ecology, your goals, and regulations governing your shoreline. The DNR's online Restore Your Shore tool on **mndnr.gov/restoreyourshore** is an excellent resource to assess the current condition of your lakeshore and find tips to increase ecosystem health along your water's edge. For grant funding and general planning assistance, check with your local county soil and water conservation district, watershed district, lake association, or with a DNR fisheries habitat specialist for more information.

"We've planted several thousand trees over the years. White pine, red pine, and spruce. Not surprisingly in central Minnesota the deer were really hard on the white and red pine seedlings. So I've bud-capped trees until they were 6 feet tall. It was fairly effective, but we found there were areas where the deer browse was so heavy we had to also put wire cages around the trees, because the deer were actually biting off the bud caps."

—Donna Perleberg, Pierz

Native shoreline vegetation can help reduce runnoff, create important wildlife habitat, and add visual appeal to your property.

Native Plant Community Spotlight: Lakeshore

Lakeshore is prevalent in east-central Minnesota. Shores may be sandy or muddy and could contain a variety of terrestrial and aquatic plants depending on the season and current water level. Just above the normal water level you may find shrubs and forbs such as sandbar willow, spotted touch-me-not, and swamp milkweed. Below the normal water level you may find broad-leaved cattail, an assortment of sedges and rushes, and floating plants like water lilies and pondweeds.

A variety of ecosystems, from upland forest to lowland swamp, surround these lakes. While proper management along the shore can protect it from wave damage, how land is managed near shorelines also plays a key role in erosion control. Forests help filter runoff and hold soil in place, whereas agriculture and lawns can add soil, fertilizer, and pesticides to the runoff that flows into lakes. It is important to consider the impacts that all land use and management activities have on your lake, even beyond the shores.

Once you have chosen your project, record it in your Woods Workbook. Write your expected timeline and the contact information of any professionals with whom you are working. Next, consider breaking your project into concrete steps and record these as well. As you progress, keep track of observed changes and accomplishments. You might also consider taking "before" and "after" photographs of your woods. Be proud of your work! Becoming an active woodland manager benefits you, your family, society, and nature—so you will have earned some bragging rights.

Chapter 6: Next Steps

"When we were looking at which trees to plant, we went through the Woodland Stewardship Plan book. It explained what we should plant in some of the areas here. We've got a mixture of all different soils, and the book recommended trees that are best adapted for certain types of soil."

— Jerry Nelson, Cloverdale

If you want to take the next step to actively manage your woodland, there are programs and resources that can help you develop an in-depth property plan, use sustainable practices, save money, and protect your land long-term.

Getting a Woodland Stewardship Plan

The DNR's Forest Stewardship Program helps woodland owners create and use voluntary management plans for their property. A **Woodland Stewardship Plan** that is written by a certified plan writer and registered with the DNR qualifies landowners to apply for one of Minnesota's cost-saving woodland tax-relief or incentive programs. To qualify for one of these programs, a landowner must have at least 20 qualifying acres of land, which includes at least 10 acres that are currently wooded or will be converted to woodland or woody vegetation. Those with registered Woodland Stewardship Plans may also qualify for other benefits including access to cost-share funding to support some of the forestry recommendations outlined in their plans.

Leslie Robertson/NASF

Many entities provide plan-writing services: the DNR, private consulting foresters, industry foresters, some county soil and water conservation districts, and certain environmental organizations. Costs for plan-writing services vary by provider. To get a Woodland Stewardship Plan, visit **www.myminnesotawoods.umn.edu/minnesota-stewardship-plan-preparers**. This website, which is updated by the University of Minnesota's Sustainable Forestry Education Cooperative, lists certified plan writers.

To write your plan, a forester visits your property, walks through your woods with you, discusses your goals, and makes notes about your woodland's current status and its potential. You may wish to have your Woods Workbook on hand as a reference for your goals and interests. The forester then prepares a written plan specifically for your land, usually including elements such as forest diversity and health observations, timber quality and species, rare species and historical sites, specific project suggestions, aerial photographs and maps of your property, and information about the surrounding landscape. Recommendations made in these plans are voluntary. However, if you enroll your plan in a tax-relief or incentive payment program, you are expected to follow these recommendations.

> "Find a management style and plan that matches your philosophy."
>
> — Eric Larson, Mille Lacs Uplands

Management Plan Options for Landowners with Less Than 20 Acres

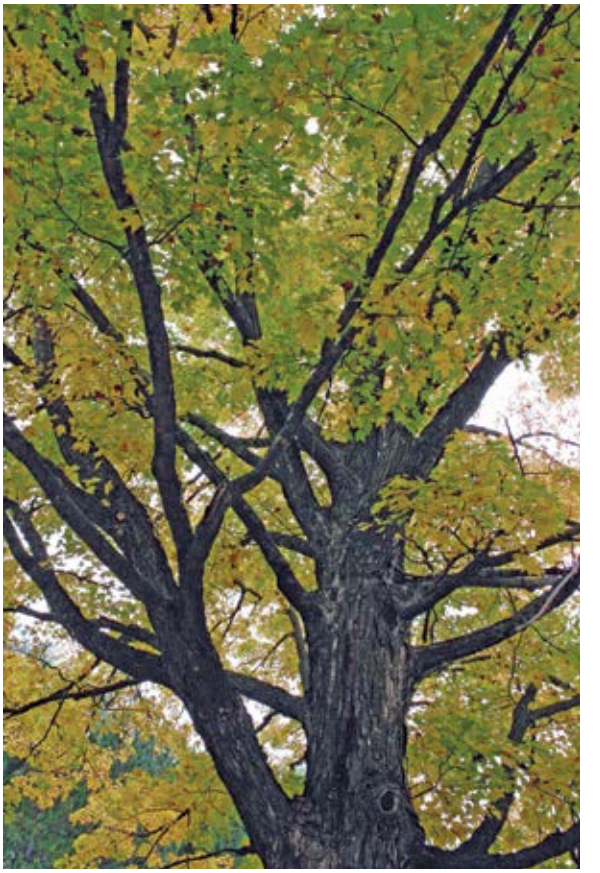
Managing smaller woodlots is becoming more important every year as large wooded plots become subdivided into smaller ownerships. All woodland owners, regardless of acreage, can contact a DNR forester or other professional to schedule a woods walk and get a streamlined management plan or a plan for a specific project. A streamlined management plan provides a list of work projects. A project plan focuses on a single project such as tree planting, harvest, or invasive species control. It describes the current and desired future conditions of the project area and specific steps for completing the project. Another option is to team up with your neighbors and have an in-depth Woodland Stewardship Plan written for multiple properties. Owners with less than 20 qualifying acres are not eligible to enroll in a tax-relief or incentive payment program. For more information, ask your forester.

Voluntary Guidelines

The *Minnesota Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers, and Resource Managers* contains research-based guidelines for activities such as timber stand improvement, timber harvest, site preparation, pesticide use, reforestation, managing for recreation, managing with fire, and building roads. A digital copy of the guidelines is available free on **mndnr.gov/woodlands**.

"A neighbor had his property logged this last year, and then the logger called me and asked me if I wanted anything done too. I didn't have that much, maybe 40 acres that he was going to take birch out. My neighbor probably had 250 acres. The logger probably wouldn't have come out here just to cut mine."

— Jerry Nelson, Cloverdale



Sugar maple

Minnesota Forest Management Guidelines: Quick Reference Field Guide

A condensed version of the guidelines that focuses on timber harvesting is available in a durable, pocket-sized format. The field guide presents key guidelines for woodland, water, and soil protection in a concise, user-friendly format that includes picture examples, general rules of thumb, and a comprehensive resource directory. A free paper copy of the field guide is available from the Minnesota Forest Resources Council.[24]

Financial Assistance

Because private woodland management provides many benefits to nature and society, public financial assistance is available. You can also visit **mndnr.gov/woodlands** for other resources. These programs are always changing, so be sure to visit the website or ask your local forester for the most up-to-date information.

Cost-share programs:

Federal

- *Conservation Reserve Program (CRP)*—Administered through the Farm Service Agency, the CRP provides annual compensation payments to farmers who remove environmentally sensitive land from agricultural production and plant perennial species such as trees that improve soil and water quality and wildlife habitat. Contracts last 10–15 years.
- *Environmental Quality Incentive Program (EQIP)*—EQIP is a program of the Natural Resources Conservation Service (NRCS) that provides reimbursement to landowners who implement certain conservation practices. Technical assistance is also provided. Requirements include a "practice" plan or project plan that has a schedule of planned activities. Contracts last up to 10 years.

State

- *DNR Division of Forestry*—Cost-share funding may be available for woodland management activities performed by landowners who have a Woodland Stewardship Plan registered with the DNR.

County

- *Soil and Water Conservation Districts (SWCDs)*—Cost-share funding may be available through your local SWCD, which receives cost-share funds from the state of Minnesota's Board of Soil and Water Resources and can sometimes access funding sources such as those generated by Minnesota's Legacy Amendment.

Minnesota State Forest Nursery

The Minnesota State Forest Nursery sells native, bareroot seedlings that are grown from seeds collected in Minnesota. Seed source locations are noted and tracked. Seedlings are shipped to the same region from where the seeds were collected. This way the seedlings are well-adapted to local growing conditions and have a better chance to survive. Seedling sales begin in mid-August and seedlings are shipped for planting in the spring. More information is available at **mndnr.gov/forestry/nursery**.

Tax and Incentive programs:

Federal

- *Reforestation tax credit*—If you treat your woods like an investment or a business, you may be eligible for certain federal tax incentives. For example, the IRS allows landowners to deduct eligible reforestation costs from their income—up to $10,000 per year, with the option to amortize (write off) additional expenses over 7 years.

"The Green Acres program just worked better for our circumstance. Are we doing it for the tax break? No. But if we're making maple syrup anyway and there is a tax break, why not use it?"

—Jim Morrison, Mora

State

- *Sustainable Forest Incentive Act (SFIA)*—The SFIA was passed in 2001. Landowners receive a fixed annual payment per acre of land enrolled in the program. As of this printing, the payment per acre is $7. Requirements include a minimum enrollment of 20 qualifying acres, an 8-year minimum commitment, and a Woodland Stewardship Plan that was written in the last 10 years, registered with the DNR, and includes a schedule of planned activities.
- *2c Managed Forest Land*—Created in 2008, 2c is a property tax designation that offers woodland owners a reduced rate of 0.65 percent on actively managed woodland. Requirements include a minimum enrollment of 20 qualifying acres and a Woodland Stewardship Plan that was written in the last 10 years, is registered with the DNR, and includes a schedule of planned activities.
- *Green Acres (2a Productive Agricultural Land) and Rural Preserve (2b Nonproductive Agricultural Land)*—These programs provide reduced taxes on woodland that produces agricultural products (maple syrup, biomass) or is adjacent to a landowner's farm land.

Conservation Easements

Some landowners want to make sure that their land will never be developed or converted to another use by selling or donating a **conservation easement**. Conservation easements serve a variety of conservation purposes and are generally intended to protect important features of a property. They are voluntary, legal agreements by the landowner to give up some of the rights associated with their property such as the right to develop, divide, mine, or farm the land to protect the land, water, habitat, and other conservation features. Conservation easements vary, depending on the host organization and the landowner's specifications. Perpetual conservation easements are intended to last forever. Term easements are for a specified length of time. Since the agreements are tied to the land and not the owner, the property will be kept in a largely natural state no matter who owns it in the future. Easements are visited regularly (usually annually) by the organization holding the easement to monitor the conditions of the property. Easements can last 20 or 30 years, but most are permanent.

Public agencies and some nonprofit organizations whose purposes include conservation preservation can hold conservation easements. Interested landowners can either sell or donate an easement to one of these organizations.

Here are some examples of organizations that have conservation easement programs. Visit **mndnr.gov/woodlands** for more information.

- *Agricultural Conservation Easement Program (ACEP)*—Administered by the Natural Resources Conservation Service (NRCS), ACEP protects agricultural and nonindustrial private woodlands from development through agricultural conservation easements. The easements can be temporary (30 years) or permanent. The program also offers wetland conservation easements that are purchased and then maintained by NRCS. Easement plans are required.
- *Forest Legacy Program (FLP) and Minnesota Forests for the Future (MFF)*—The FLP and MFF programs are administered by the DNR to protect the conversion of forests to nonforest uses. Working forests provide an array of public benefits including habitat, clean water, recreational opportunities, timber, and other forest products. The FLP is a national program administered in partnership with the USDA Forest Service while the MFF is strictly a Minnesota easement program. Both programs are intended to conserve and protect private forests that provide economic, recreational, and environmental benefits to the state and its citizens. Conservation easements are permanent and easement rights are either purchased or donated.
- *Reinvest in Minnesota (RIM)*—RIM is administered by the state Board of Water and Soil Resources and local soil and water conservation districts. The program focuses on restoring wetlands and sensitive agricultural lands such as those along rivers. An easement plan is mandatory. The landowner is responsible for maintaining any conservation projects in the plan, but the program can provide financial assistance. Conservation easement rights are purchased. Most easements are permanent, but some may be temporary (20 years or more).
- *Nonprofit organizations*—Some nonprofit organizations purchase or accept donated conservation easements on land that fits certain criteria. Examples include Minnesota Land Trust, Ducks Unlimited/ Wetlands America Trust, and The Nature Conservancy.

Transferring Land to the Next Generation

If you want to keep your woodland in the family and make sure it remains intact, consider creating a family limited liability company (FLLC or LLC) for your land. An LLC is a business entity that can hold land and can be used to manage the land while shielding the owners from certain personal liability issues. Placing woodland in an LLC also helps landowners transfer their property to the next generation while minimizing the risk that the property will be forcefully sold upon demand of one of the heirs—known as "avoidance of partition" in legal terms. Rather, the land is titled in the name of the company, which is divided into units of membership, similar to the way a corporation is divided into shares. Using this model, you as the owner can gift portions of the value of the land in the form of company units to your heirs over time. You retain decision-making power over the land as a majority partner until such time that you see fit to pass on responsibility. Passing land on in this way—as annual gifts below a certain maximum value—can help landowners potentially decrease the estate taxes associated with high-value property.[25]

> "That's why I'm planting these trees, because I want my great-grandsons to look up at 70-foot tall white pines someday. That would be our legacy for them."
>
> —Patrick Lanin, Brainerd

Importantly, LLCs offer opportunities to engage the next generation to care and manage the land during your lifetime, and may provide a good platform to pass on your goals and values for the land as well as the property itself. While LLCs are easy to create, you may need to take many steps to ensure that the LLC functions as you intend. Further, inheritance and tax law can be complicated and may change frequently. For these reasons, it is important to work with a certified public accountant or attorney who is familiar with the specific needs of Minnesota woodland owners. Again, visit **mndnr.gov/woodlands** for details.


Misi Stine

Now that you know more about investing in and protecting your land, continue to Chapter 7 to connect with other landowners and become more involved in your local landowner community.

Chapter 7: Your Landowner Community

Many activities are more fun when you are part of a community. Anglers, stamp collectors, sports fans, book lovers, birders, and ballroom dancers all have their own communities. Woodland management is no different. There are more than 190,000 private woodland owners like you in Minnesota. This chapter outlines some programs and organizations that can connect you with other woodland owners and local natural resource professionals.

Minnesota Forestry Association (MFA)

The MFA is a private, member-funded woodland owner organization and Minnesota's oldest conservation organization, founded in 1876. Working on behalf of family forest owners through education and advocacy to promote stewardship of woodlands, MFA offers educational opportunities such as field days on member properties. **minnesotaforestry.org**

Minnesota Women's Woodland Network

The Minnesota Women's Woodland Network is a landowner organization that focuses on engaging women, a historically underserved population in the woodland owner community, in woodland management. The organization hosts gatherings and courses designed to provide a comfortable environment for Minnesota's women woodland owners to learn management skills and connect with professionals and other landowners. **mnwwn.org**

University of Minnesota Extension Service Woodland Owner Programs

The University of Minnesota Extension Service has long served as a resource for Minnesota's landowners. Extension offers a wide variety of educational opportunities for landowners ranging from conferences and workshops to citizen science and volunteer programs. **myminnesotawoods.org**

- *Minnesota Family Woodland Conference*—These two-day conferences, held in multiple locations around the state, provide workshops, field tours, and presentations from experts on a variety of topics designed to support landowners in their woodland management goals.

"Those hands-on field demonstration days are really informative, and also a chance to meet other landowners who have similar issues. For example, somebody had a small winch system and showed how it was used in the woods. You could see it was minimally impacting, it wasn't going to dig up a bunch of ground, and one or two people could easily handle it. Seeing it demonstrated in the field was better than going to some indoor show or just seeing a picture of it."

—Donna Perleberg, Pierz

- *Forest Pest First Detector*—This program provides an opportunity for forest health-savvy citizens to receive specific training on Minnesota's most threatening forest invasive species and to become leaders in their communities in early detection of these woodland pests.

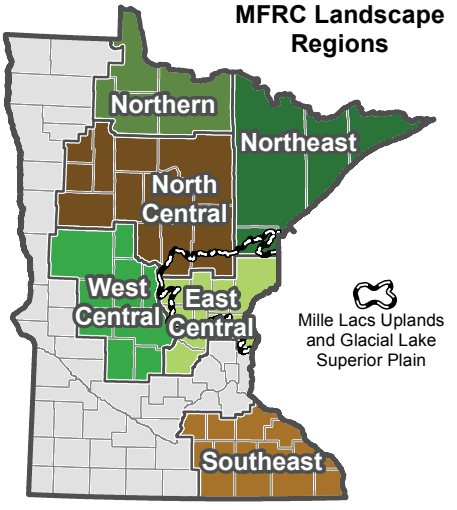
Urban and Community Forestry Organizations

If you want to help protect the trees that grow in urban and community areas, consider these organizations.

- *Minnesota Shade Tree Advisory Committee (MnSTAC)*— MnSTAC is a nationally recognized organization that was created in 1974 at the recommendation of Governor Wendell Anderson. The committee works with policy makers and community leaders to identify legislative priorities and lead initiatives to protect urban and community trees and forests. **mnstac.org**
- *Tree City USA*—Tree City USA is a national program of the Arbor Day Foundation that recognizes communities with tree management plans and programs, and encourages action and public education around sustainable community forests. Nearly 100 cities in Minnesota participate in the program. To see if your city has a Tree City USA designation, visit **arborday.org/treecityusa**.
- *Tree Care Advisors*—Tree Care Advisors are a group of citizen volunteers trained in basic tree care skills by the University of Minnesota's Department of Forest Resources. The program connects trained volunteers with volunteer opportunities. Many advisors become strong advocates for how their community cares for its trees. The Tree Care Advisor website has a searchable directory of volunteer advisors who can answer questions and assist in local tree management and outreach projects. **mntca.org/tree-care-advisor**

Minnesota Forest Resources Council (MFRC) Landscape Committees

The MFRC is a state-appointed council established by Minnesota statute that exists "to promote long-term sustainable management of Minnesota's forests." The council consists of 17 members who represent different forest-related interests in the state, including timber, conservation, and needs of private woodland owners. A small staff manages several different programs to support the council including a program focused on landscape-level management. The Landscape Program provides support and guidance to six regional Landscape Committees that span the forested areas of the state.



The Landscape Committees are made up of volunteers from the public and private sectors including natural resource professionals, landowners, and other interested community members. These committees partner with local natural resource groups to do forestry projects based on the broader landscape plans that the MFRC has designed for the regions. Landowners bring important on-the-ground perspectives to these committees. Most of your region is covered by the East-Central Committee. The Northeast Committee covers the Carlton County part of your region. Finally, the North-Central Committee covers the Aitkin and Crow Wing county parts of your region. Most committees meet quarterly and meetings are open to the public.
mn.gov/frc/regional-landscape-committees.html

Minnesota Tree Farm

Minnesota Tree Farm is a chapter of the American Tree Farm system, a program of the American Forest Foundation. The program recognizes woodland owners who adhere to a set of sustainable forestry principles including protecting forests from disease and grazing, protecting soil and water quality, growing productive forests, and maintaining biodiversity and wildlife habitat. Applicants must have at least 10 acres of woodland and a management plan for their property. Membership is free and includes benefits such as free technical advice from volunteer foresters during inspections and opportunities to network with other landowners and educators through workshops, field days, seminars, and an annual national convention.
mntreefarm.org

Landowner Cooperatives

Woodland owner cooperatives provide services to members such as education, equipment-sharing, and access to markets. One example is the Northwoods Forestry Cooperative, whose motto is "To promote sound woodland management and assist members in wood products marketing."

"The forestry co-op that I belong to had one of our field days, and there was a discussion about the native plant community, what kind of trees they should be managing for, what the next successional phase is. Just over the 10 or 12 years that we've been doing this, I'm amazed by the amount of knowledge that these guys have gained by really being interested and diving into really trying to understand their woods."

— Jim Chamberlin, Deerwood

Throughout this handbook, you have read the perspectives and experiences of some of your fellow landowners. Getting involved in one or more of these landowner organizations will help you meet, learn, and share your knowledge and experiences with your woodland neighbors. You may also meet local natural resource professionals, such as foresters, loggers, and scientists, who may help you throughout your woodland-owning journey.

Landowner Leader

Spotlight: Patrick Lanin—Brainerd, Minn.

Mille Lacs Uplands

Patrick Lanin's secret to eternal youth is simple—staying active in the woods. "I'm 77 going on 14," he says mischievously. Patrick hops nimbly over a tree root and trots quickly down a slope toward his creek at the base of the Mille Lacs Uplands moraine, which rises impressively above the edge of his property as a long tree-covered ridge formed by the glacier that carved out Mille Lacs Lake. He and his wife Emily bought the first piece of their now 140-acre property near Brainerd in 1973. "We saw the wooded ravine and everything and I knew we had to have it. I've stood on top of the bluff and saw ducks fly below me. When that happens, it's something you don't forgot."

"As a kid, I'd go to the co-op store with my grandparents and hear Finnish."

Patrick is proud of his Finnish heritage. His grandparents emigrated from Finland in the early 1900s. "I've got the woods thing in my DNA," he says, referring to Finland's dense forests. Patrick credits the Finns as the first people to organize the cooperative movement in Minnesota, noting that he grew up with co-ops as a part of his life: "As a kid, I'd go to the co-op store in Virginia, Minnesota with my grandparents and hear Finnish spoken

by nearly everyone there." Perhaps this is part of the reason that he was first drawn to the Northwoods Forestry Cooperative (NFC), which he joined in 2005. "It just sounded like a great idea. You know, a group of people interested in what I was interested in. That was just natural."

The NFC was founded in 2001 with a mission to "promote sound woodland management and to assist members in wood products marketing," according to the NFC's website. Patrick, who has been the NFC's president since 2011, sees an even simpler purpose. "Members helping members," he says. "Getting together with people who have the same interests." NFC members are spread throughout central Minnesota from Aitkin through Stanchfield and have a variety of opportunities to mingle. Once a year a field day is held on a member's property. In 2014 the Lanins hosted the field day and Patrick demonstrated the capabilities of his Farmi winch and Logrite log arch by extracting a freshly cut ash log from his creek. The NFC also organizes a work day about once a year. Members gather at someone's property to help out with a woodland management project, followed by lunch. The NFC also hosts an annual meeting with a speaker, monthly member meetings, and a quarterly newsletter that Patrick edits. The newsletter contains member stories, interesting woodland news, and advertisements from members looking to buy or sell woodland products and borrow equipment. NFC members can also buy shares of certain pieces of equipment such as a portable

Peterson sawmill, which currently has seven member-owners.

Emily Lanin notes the educational benefits of being involved with the NFC. "By attending the field days, the annual meeting, and just talking to other members, we all learn about the best, most efficient ways to manage our own woodlots," she says. But for Patrick, the key element remains simply the *esprit de corps*—the camaraderie he finds being among other landowners. "It's just a group of people who own woodland who help each other out."

Learn more about the Northwoods Forestry Cooperative at **www.nfcoop.org**. ◆

Woods Workbook

You can fill out this workbook online at mndnr.gov/woodlands.

1. About your property

Begin by answering a few background questions. Visit mndnr.gov/woodlands for information about your watershed and ecology of your land.

How many acres do I have? _____

Is my property in multiple parcels? If so, how many? _____

What county or counties is my property located in? _____

_____

What **Ecological Classification System** subsection is my land in?

☐ Chippewa Plains ☐ Pine Moraines–Outwash Plains ☐ Other: _____

What major watershed is my land in? _____

What minor watershed is my land in? _____

2. Evaluate your property

Take a leisurely walk through your woods. What do you notice? Consider these questions and take notes.

- What kinds of trees are there? Are they old or young?
- How dense is the tree cover in my woods? Has there recently been a harvest? Are there openings from trees that have died or blown over?
- Are there "islands" of woods surrounded by open land or is all of my woodland connected?
- What is the understory like? Is it thick with shrubs and brush or is it open?
- What wildlife is there?
- Are there any invasive species? Which species? Where are they located?
- Are there any ponds, wetlands, swamps, springs, or streams within my woodland or nearby?
- What is the terrain like? Is it hilly or flat?

Consider repeating this exercise with each new season. You may notice different plants and animals in different seasons.

3. Identify what interests you about your woodland

First, note topics, then set goals. Here is a list of topics that may interest you as a woodland owner. Check any that apply to you. This isn't an exhaustive list, so add any additional topics that are important to you.

Topics

- ☐ Game wildlife
- ☐ Nongame wildlife
- ☐ Rare plants and animals
- ☐ Recreation
- ☐ Timber harvest
- ☐ Tree planting
- ☐ Cost-share
- ☐ Tax incentive programs
- ☐ Invasive species/forest health
- ☐ Protecting important habitats
- ☐ Wetlands
- ☐ Shoreline management
- ☐ Water quality
- ☐ Prescribed burning
- ☐ Investment
- ☐ Intergenerational land transfer
- ☐ Carbon capture
- ☐ Nontimber forest products (mushrooms, maple syrup, etc.)
- ☐ _____
- ☐ _____
- ☐ _____

4. Identify your top three topics

5. Write your goals

Write a short goal statement about each of your top three topics.

Example: If "game wildlife" is one of your top three topics, then your goal might be to "Make sure my property contains wildlife openings to support more wild turkeys."

Goal 1: _____

_____

Goal 2: _____

_____

Goal 3: _____

_____

Other goals: _____

_____

6. Describe a work project

First, choose a goal you want to tackle. Your goal may involve setting up a work project. If you don't know what kind of work needs to be done to reach your goal, ask a forester. It's also a good idea to get a project plan from a forester.

Example: If your goal is to "Ensure my property contains wildlife openings to support more wild turkeys," then your project may be to "Locate existing openings and enhance them by removing trees and planting native species of plants that turkeys eat."

Describe a work project that will help you achieve your woodland goal: _____

_____

_____

_____

7. Identify action steps

If possible, break down your project into smaller action steps. Take as many steps as you need. Use extra sheets if necessary.

Example: Step 1—Locate existing openings by examining aerial photos. Step 2—Schedule walk with forester to visit openings I want to enhance. Step 3—Ask my forester to recommend times to mow or burn. Step 4—Conduct mowing or burning. Step 5—Plant shrubs and trees that are good for wildlife (ask my forester for recommendations).

Step 1: _____

_____

Step 2: _____

_____

Step 3: _____

_____

Step 4: _____

_____

Step 5: _____

_____

8. Pull it together

For each work project, use this template to list individual action steps, set a time to do each step, estimate budget needs, and record notes and observations about how things are going along the way.

Work Project (describe)					Year	
Steps (describe)	Date/ Season[1]	Tools needed[2]	Partners/ Contacts[3]	Budget estimates		Notes
				My contribution	Financial assistance	
1						
2						
3						
4						
5						

[1] Date/season considerations.

For action steps within a project, consider the season, the order of action steps, and amount of time you need to complete each step.

Example: Most harvests occur in winter when the ground is frozen to minimize damage to the soil.

In what order will you tackle your work projects?

Example: Control invasive species at trail entrance—2015; Enhance wildlife openings—2016; Incorporate as an LLC—2017; etc.

[2] Tools needed might include aerial photos, chain saws, management plan, project plan, shovels, shrubs, etc. You may want to note where you might get these tools.

[3] List names and phone numbers of people who could advise on or help with each step such as your local forester, a neighbor, etc.

Remember to take before and after photos!

Glossary

biomass – Living and recently dead material that can be used as fuel or for industrial production. Woody biomass includes logging residue (nonmerchantable tops and limbs left over from a commercial timber harvest, nonmerchantable small-diameter trees and stems, dead standing trees, and down logs), primary and secondary mill residue, dedicated energy crops, urban forest-clearing material, land-clearing material, and brushland material.

biological control – The use of natural enemies (e.g., insects, pathogens) to control nonnative pests.

canopy – The ceiling of a forest created by branches and leaves from several trees. Forests with dense canopies allow less sunlight to reach the ground than do forests with open canopies.

carbon dioxide – A colorless, odorless gas that is produced when a carbon-based fuel is burned; a *greenhouse gas*.

conservation easement – Voluntary land protection agreements that restrict development while ensuring biological diversity, sustainable timber management, and in some cases, public access.

corridors – Areas of protective vegetation such as trees, shrubs, or tall grass, connecting larger *patches* of habitat and providing shelter for wildlife traveling between these patches.

drift – Material, such as boulders, gravel, sand, silt, or clay, removed from one area by glaciers and deposited in another. Drift includes material deposited directly by glacial ice, such as *till*, as well as material deposited indirectly by water, such as outwash or lake sediments.

drumlin – An extended, oval hill or ridge of compacted sediment deposited and shaped by a glacier. Drumlins are typically about 30 meters (98 ft) high and are longer than they are wide. They have one steep and one gentle slope along their longest axis, which is parallel to the direction of the glacier's movement. The steepest slope faces the direction from which the glacier originated, and the gentler slope faces the direction in which the glacier was advancing.

duff – The partly decayed matter on the forest floor.

Ecological Classification System – A method to identify, describe, and map units of land with different capabilities to support natural resources. This is done by integrating climatic, geologic, hydrologic, topographic, soil, and vegetation data.

ecosystem – The complex of a community of organisms and their environment that functions as an ecological unit.

ecosystem service – The benefits that people obtain from ecosystems. Ecosystems provide hundreds of services such as soil formation, nutrient cycling, decomposition of wastes, regulating climate, purifying air and water, and recreational experiences.

food plots – Small areas planted to annual or perennial agricultural crops to provide a supplemental food source for wildlife. They have less value to native wildlife than *wildlife openings*.

forb – An herbaceous, flowering plant that is not a grass, sedge, or rush.

fragmentation – The splitting or isolating of *patches* of similar habitat.

Glacial Lake Superior Plain – An *Ecological Classification System subsection* in east-central Minnesota that is almost entirely contained within Carlton County. The subsection covers a very small area in Minnesota, but is part of a larger unit in Wisconsin.

greenhouse gas – A broad term for any gas present in Earth's atmosphere that contributes to planetary warming by trapping heat from the sun's energy. Examples include *carbon dioxide*, water vapor, and methane.

habitat – The place or environment where a plant or animal naturally or normally lives and grows and can access needed food, water, cover, and space.

invasive species – A *nonnative species* that invades lands or waters, particularly natural communities, causing ecological or economic problems.

landscape – All land uses (such as forests, agriculture, urban) and ownerships (public, private, tribal) within a defined area that can cover thousands or millions of acres.

land-type association – Units within *subsections* that are defined using glacial landforms, bedrock types, topographic roughness, lake and stream distributions, wetland patterns, depth to ground water table, soil parent material, and pre-European settlement vegetation. Minnesota has 291 land-type associations.

Laurentian Mixed Forest – A *province* of the *Ecological Classification System* characterized by broad areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps that traverses northern Minnesota, Wisconsin, and Michigan, southern Ontario, and the less mountainous portions of New England. In Minnesota, the province covers a little more than 23 million acres of the northeastern part of the state.

loam – Rich soil composed of a mixture of sand, clay, silt, and decaying organic material.

management plan – A nonbinding, written document, usually written by a professional forester, that lists your land's potential, what you want to accomplish, and specific actions you can take to accomplish those goals within a given timeframe. Also called a *Woodland Stewardship Plan*.

mesic – Referring to intermediate soil moisture in which moisture is not limiting to plant growth during the growing season and soils are not saturated except following rain or spring snowmelt.

Mille Lacs Uplands – An *Ecological Classification System subsection* in east-central Minnesota that encompasses the majority of Benton, Chisago, Kanabec, Mille Lacs, Morrison, and Pine counties, and parts of Aitkin, Carlton, Crow Wing, and Sherburne counties.

moraine – *Till* deposited at the terminus or edge of a glacier, appearing on the modern landscape as ranges of high hills and usually composed of unsorted materials.

native plant community – A group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native species form recognizable units, such as an oak forest, prairie, or marsh, which tend to reoccur over space and time.

nonnative species – Species that have been introduced, or moved, by human activities to a location where they do not naturally occur. A nonnative species is not necessarily harmful unless it becomes invasive.

patch – Relatively homogeneous forest units that differ from the surrounding habitat at an *ecosystem* scale.

peat – Organic material that has accumulated in a water-saturated environment as a result of incomplete decomposition due to anaerobic (oxygen-free) conditions and low temperatures.

prescribed burning – The controlled application of fire to naturally occurring vegetative fuels, under specified environmental conditions and following appropriate precautionary measures, to achieve specific objectives such as controlling brush, producing high-quality browse, or reducing fuel hazards.

province – Units of land defined using major climate zones, native vegetation, and biomes such as prairies, deciduous forest, or boreal forests. There are four provinces in Minnesota.

section – Units within *provinces* that are defined by origin of glacial deposits, regional elevation, distribution of plants, and regional climate. Minnesota has 10 sections, five of which are within the *Laurentian Mixed Forest Province*.

snag – A dead, decaying tree that provides habitat for wildlife.

species of greatest conservation need – Animals whose populations are rare, declining, or vulnerable to decline, and are below levels desirable to ensure long term health and stability.

Southern Superior Uplands – An *Ecological Classification System section* in east-central Minnesota that includes the *Glacial Lake Superior Plain Subsection*.

subsection – Units within *sections* that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief, and the distribution of plants, especially trees. Minnesota has 26 subsections, 14 of which occur in the *Laurentian Mixed Forest Province*. This handbook covers two subsections—the *Mille Lacs Uplands* and *Glacial Lake Superior Plain*.

till – Unsorted material deposited directly by a glacier. Till consists of clay, sand, gravel, or boulders mixed in any proportion.

timber stand improvement – A practice in which the quality of a residual forest stand is improved by removing less desirable trees, vines, and occasionally large shrubs to achieve the desired stocking of the best-quality trees. Loggers and foresters also refer to these activities as "forest stand improvement" or "woodland stand improvement."

understory – The vegetative layer of trees and shrubs between the forest *canopy* and the ground cover.

watershed – An area that contains all the land and water features that drain excess surface water to a specific location on the landscape such as a river.

Western Superior Uplands – An *Ecological Classification System section* in east-central Minnesota that includes the *Mille Lacs Uplands Subsection*.

wildlife opening – A small area cleared in the forest to mimic openings that naturally occur from disturbances such as wind and fire. They create less disturbance to the soil, support native plants, require less labor and expense, provide less opportunity for invasive plants to become introduced, and have greater plant diversity and structure than traditional *food plots*.

woodland management – The process of caring for woodlands so they remain healthy and vigorous and provide the products and amenities desired by the landowner. Technical definition: The application of technical forestry principles and practices and business techniques (such as accounting and cost-benefit analysis) to the management of a woodland. Also called "forest management."

Woodland Stewardship Plan – A *management plan* that is written by a certified plan writer and registered with the DNR.

Endnotes

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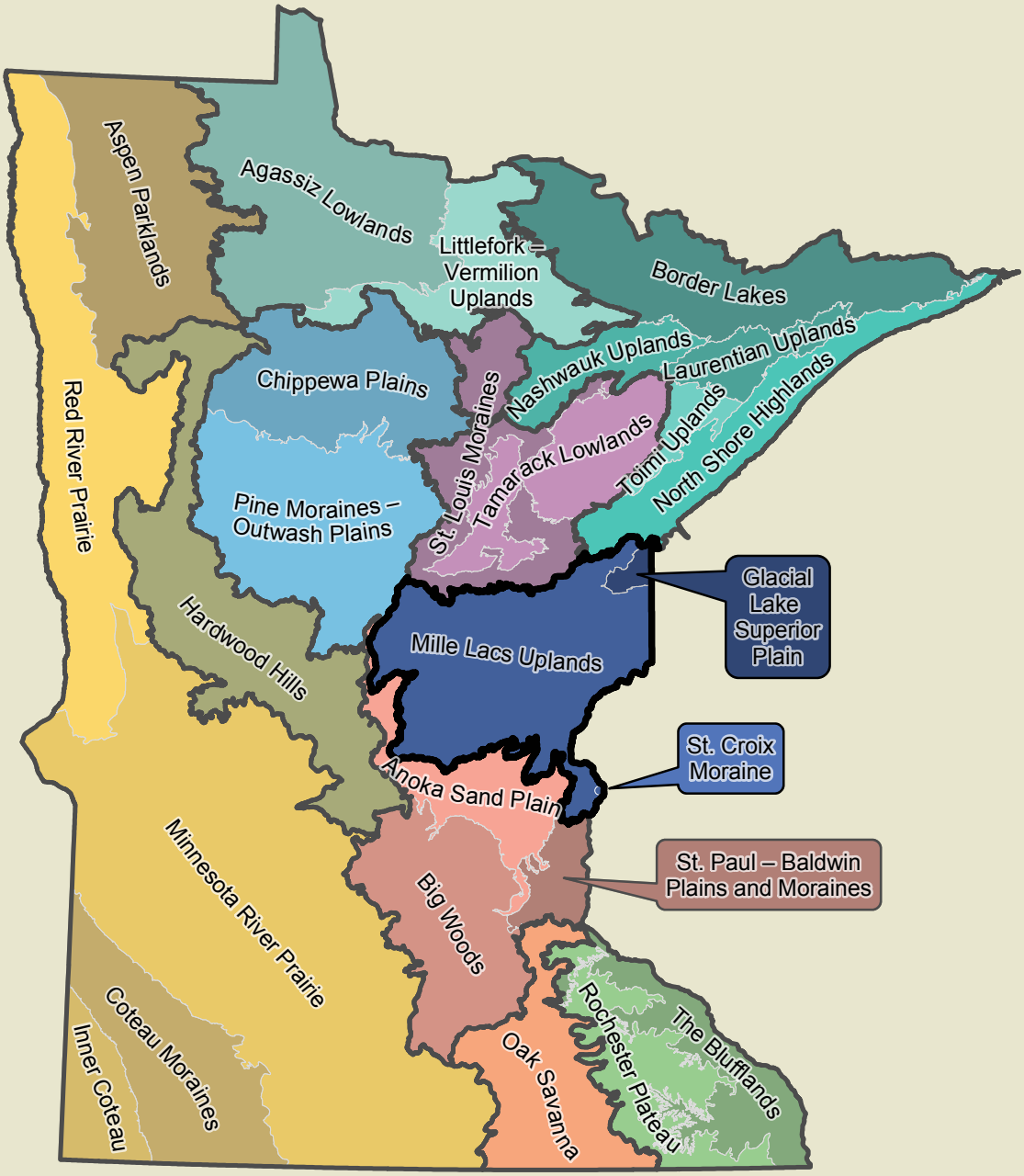
County Land Within the Mille Lacs Uplands and Glacial Lake Superior Plain Subsection

County	Total County Acres	Acres of County Within Subsection	Percent of County Within Subsection	Where Subsection is Located Within County
Aitkin	1,275,804	386,648	11.0	South one-third
Benton	264,221	202,869	5.8	Majority except northwest corner
Carlton	559,725	311,224	8.9	Southeast half
Chisago	283,030	219,526	6.3	Majority except southwest edge
Crow Wing	739,801	270,762	7.7	Central to southeast corner
Isanti	288,733	101,723	2.9	North half
Kanabec	341,285	341,285	9.7	Entire county
Mille Lacs	435,732	420,821	12.0	Majority except southeast corner
Morrison	737,783	311,646	8.9	East half
Pine	917,167	917,167	26.2	Entire county
Sherburne	288,266	5,669	0.2	Small portion of north central
St. Louis	4,312,245	5,114	0.1	Small portion of south central spur
Washington	270,980	7,127	0.2	Small portion of north central
Totals		**3,501,581**	**100.0**	

Subsections and Landowner Handbook Areas Within Minnesota's Ecological Classification System



If you own woodland in east-central Minnesota, your decisions can impact the future of this rich, unique forest landscape.

This handbook is a foundation for taking care of your woods and connecting your property to the larger landscape. It helps you identify what you have, plan for what you want to see in the future, understand what you can do to keep your woods healthy, and consider strategies for accomplishing these actions. From learning about plant communities to connecting with local foresters and sources of funding, this book shows you how to get a management plan written just for your "back-forty" so that your dreams can become a reality.

Your choices will leave a mark on your future woodlands. What will your landowning legacy be?

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