

SUSTAINABLE FORESTRY



MINNESOTA

SF-01129

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A MANAGEMENT GUIDE FOR PRIVATE FOREST LANDOWNERS

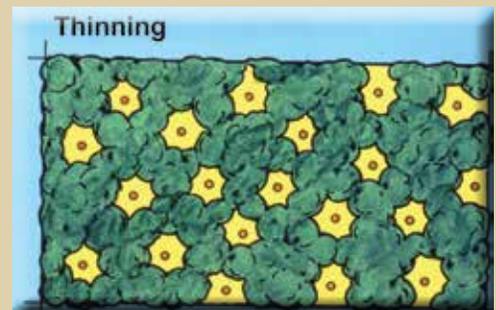
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Words found in **bold** and *italic* can be found in the glossary.

INSIDE...



Dear Forest Landowner,

Sustainable Forestry - A Management Guide for Private Forest Landowners has been published to help you, as a private landowner of Minnesota's forested land, manage your woodlands to meet your goals for your forests and to help ensure the future health and viability of those forests.

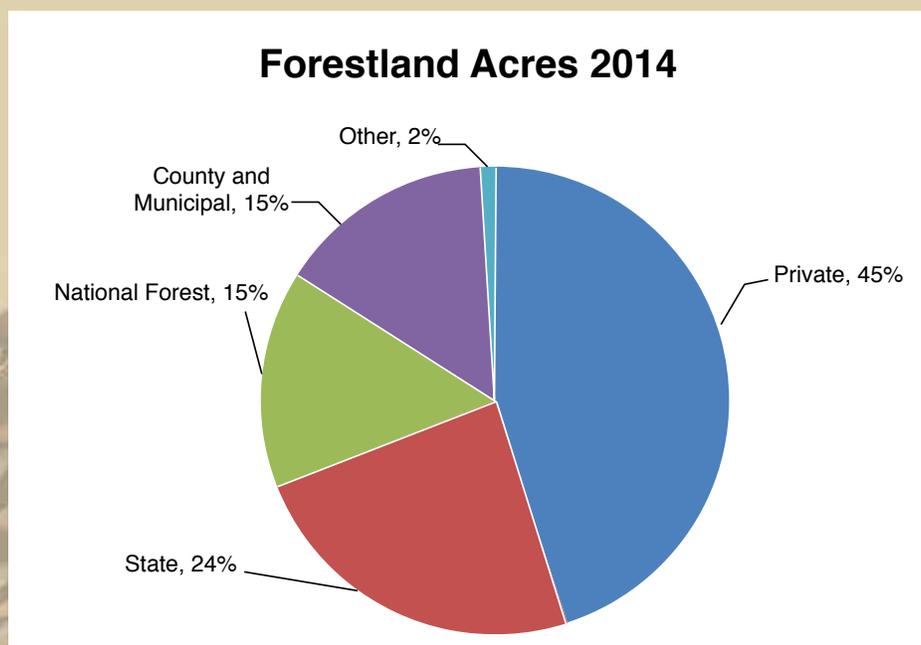
As one of over 200,000 family forest landowners in Minnesota, you play a significant role in the management responsibility for nearly 40% of the state's forested land. You own your forestland for many reasons, including: enjoying nature, hunting, recreation, or as a place to get away and enjoy the "woods." Your main concerns about owning forested land are insect and disease issues, and the potential of wildfire.

Although you may not think of loggers or foresters as 'tools' to help you meet your forestland objectives, they are just that! A forester can assist you in creating a forest management plan that helps you meet the goals you have established for your property. A logger can help you implement that plan. A forest plan can improve the health of your forest, improve habitat for many **game** and **nongame** wildlife species, create recreational opportunities, and lessen the risk of wildfire.

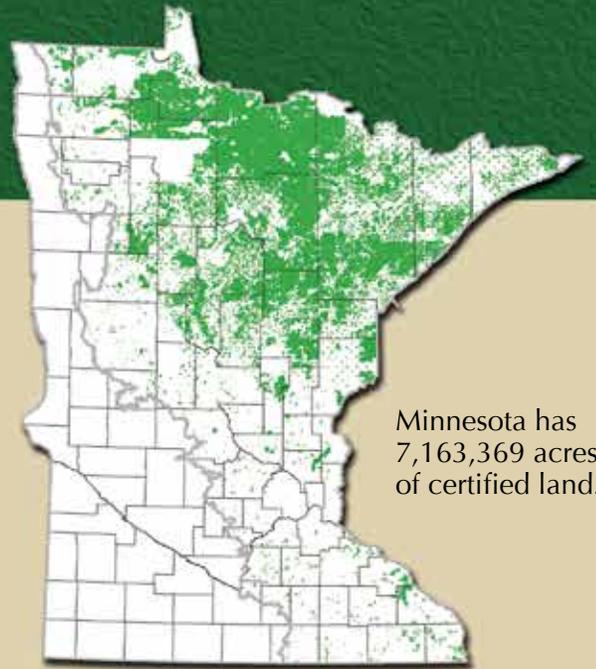
This Guide will help you understand forest management terminology and options, as well as provide you with information on additional resources related to Minnesota's forests, including its wildlife, plants, and waters.

There are challenges and opportunities inherent in owning and/or managing the woodlands of Minnesota. These include establishing goals, setting up harvest activities, following forest management guidelines, and being aware of rare and endangered plant and animal species.

Take some time to review this information. It will provide you with the knowledge you need to plan and execute a timber sale, inform you of accepted forest management guidelines, and help you ensure your forestland management activities are rewarding and worthy experiences.



CERTIFICATION: WHAT?



Minnesota has 7,163,369 acres of certified land.

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

Background

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

The SFI program was launched in 1994 as one of the U.S. forest sector's contributions to the vision of sustainable development established by the 1992 United Nations Conference on Environment and Development. Its original principles and implementation guidelines began in 1995, and it evolved as the first SFI national standard backed by third-party audits in 1998.

For more information, visit:
<http://www.sfiprogram.org>

CERTIFICATION *continued on page 4...*



CERTIFICATION ACROSS THE GLOBE...

The Basics of SFI

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

Across Canada and the United States, 250 million acres (100 million hectares) are certified to the SFI forest management standard, the largest single forest standard in the world. Minnesota is a leader in SFI certification, with the Minnesota Department of Natural Resources as one of the largest holders of SFI certified lands.

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

More than a Standard

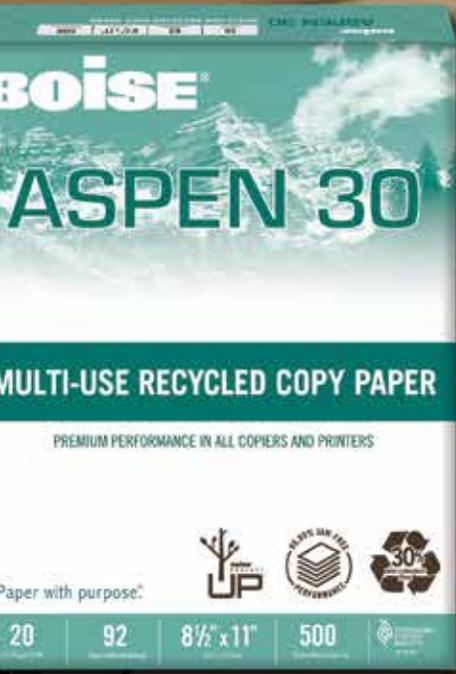
Supporting research is a central tenet of the SFI program. It is a way to further the conservation value of forests and lands that are certified to the SFI Standards and subject to SFI's fiber-sourcing requirement. This commitment to research is also evidence that SFI is more than just a standard.

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

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



MINNESOTA-MADE PRODUCTS



A PLAN TO HARVEST

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

- **Forest and Wildlife Management:** Logging is a tool for improving the health and vigor of the forest, promoting natural regeneration, developing wildlife habitat, controlling stand density, releasing desirable trees from shade, altering tree species composition, establishing planting areas, and creating vistas and trails.

- **Generating Income:** Periodically selling timber products from the land can provide a steady stream of income for a family. For example, a pine plantation can be thinned many times over the life of the stand. Or final harvest of a mature stand can provide a substantial one-time gain to help with large expenses like tuition, retirement, etc.

- **Salvaging Damage:** Forests can be severely damaged by fire, wind, snow and ice, and insects and disease. A timber harvest can be used to remove trees when the likelihood of damage is very high, or to **salvage** the remaining value from a severely damaged stand; this will set the stage for regeneration of the next stand.

Harvesting Assistance

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

Marketing Your Timber

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

- locating boundary lines
- preparing a forest management plan

- estimating how much timber is there
- giving you information about the market
- preparing and marketing timber sale packages
- developing a timber sale contract

Writing a Good Contract

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

- what timber is being sold
- the price and terms of the timber sale
- limitations on the logging operation
- where log **landings**, roads, and **skid trails** will be built
- erosion controls and other **best management practices (BMPs)**
- how the timber you are not selling will be protected
- responsibility for damages

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

Sample Harvest Plan

XYZ Timber Company

Tract Name	Crooked Creek Acres
Tract Number	123-4567
Harvest Size	22 acres
Harvest Type	Clearcut & Shelterwood
Expiration Date	12/31/20XX

Information Included On Attached Map:

- Delineate haul road(s)
- Delineate harvest unit boundaries
- Delineate shelterwood boundaries
- Mark landing areas
- Mark survey monuments
- Identify sensitive areas in yellow and explain in comments below

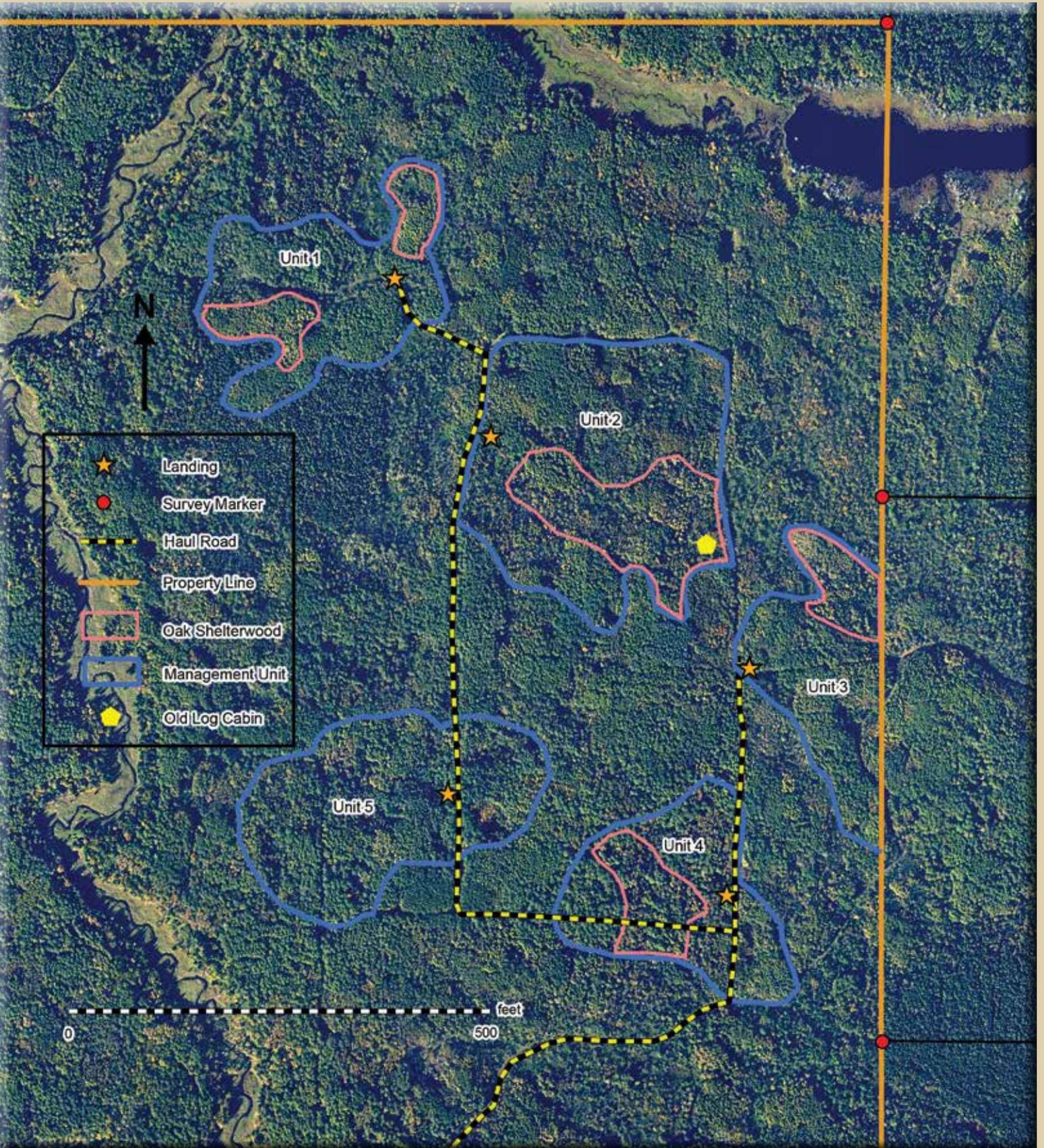
Visual Impact	None
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COMMENTS:

Harvesting: All management units are delineated by blue paint. Oak Shelterwood units within management units 1-4 are delineated with pink ribbon. Harvest should follow all Minnesota Forest Management Guidelines. In addition, take care not to harm pockets of aspen regeneration. Management units 1-4 are to be clearcut except within the oak shelterwood areas. Harvest only marked timber within the oak shelterwood areas. The oak shelterwood area of unit 2 has an old cabin in it, follow special precautions found below in "sensitive areas". Management unit 5 will be an operator selection harvest, on the west side of the haul road the operator will selectively leave the healthiest trees, on the east side of the road the operator will harvest all timber except healthy red and white pine. Management unit 5 is delineated with blue paint and will be an operator selection harvest.

Sensitive Areas: There is an old homestead log cabin in the oak shelterwood management area of unit 2. The perimeter of the cabin is flagged with blue ribbons. No management activity will occur within this flagged area. Care will be taken around the outside of the cabin perimeter to ensure that the cabin is not damaged.

SAMPLE PLAN



WHAT CAN HELP?

Property Tax Incentives for Landowners Who Practice Sustainable Forest Management

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

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

	Property Tax Programs	
	SFIA	2c Managed Forest Land
Minimum acreage	20 contiguous acres	20 acres in contiguous parcels
Maximum acreage	No maximum acres enrolled	1,920 acre maximum enrolled
Access	Public access required if > 1,920 acres enrolled	Public access not required
Property tax implications	Landowner receives an incentive payment	Property tax class rate for property is reduced
Enrollment period	Covenant required 8 year minimum enrollment 4 years to end agreement	No covenant required 1 year minimum enrollment
Federal income tax implications	Property tax qualifies for itemized deduction on federal income tax return, but SFIA payment is taxable income	Property tax qualifies for itemized deduction on federal income tax return
Type of management plan required for enrollment	Forest Management Plan required	Forest Management Plan required

Current as of FY 15. Note that tax issues change frequently. Check for current updates.

FOR MORE INFORMATION VISIT

<http://www.mnsfi.org/taxrelief.htm>

Call your local approved stewardship plan writer to learn more about the forest stewardship program, how to better manage your woodlands, and these two property tax programs. You will need a forest management plan to enroll. Contact information for your local stewardship plan writer can be found by visiting www.mnsfi.org/stewardship.htm

AND WHO CAN HELP?

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

Public Sector Foresters

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

Private Consulting Foresters

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

Industry Foresters

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

Minnesota Logger Education Program

The Minnesota Logger Education Program (MLEP) was established in 1995 to assist logging business owners in meeting ever-changing demands of their profession. MLEP is of invaluable assistance to private landowners by ensuring excellence in logger education and professional development within Minnesota's logging industry.



Every year, a logger is chosen from among the MLEP membership to receive the "Logger of the Year Award." The award recognizes outstanding independent logging contractor performance.

Minnesota Tree Farm Program

The mission of the Tree Farm Program is: To promote the growing of renewable forest resources on private lands while protecting environmental benefits and increasing public understanding of all benefits of productive forestry. Minnesota has over 1,700 Tree Farmers who have made a commitment to protect wildlife habitat and watersheds, to conserve soil and to provide recreation for their communities while producing wood for America. Minnesota Tree Farm is a program of the American Forest Foundation (AFF), which works in partnership with local, state and national groups to provide hands-on support for America's 10 million family forest owners, giving them the tools they need to manage healthy and sustainable woodlands. Tree Farm works with landowners with forestland between 10 and 10,000 continuous acres who abide by the AFF Standards of Sustainability and have their property certified through the Minnesota Tree Farm Committee or a qualified Inspector.



PRIVATE SOURCES

Minnesota Association of Consulting Foresters • www.mnsfi.org/cf.htm
Industry foresters • www.mnsfi.org/indforesters.htm

PUBLIC SOURCES

Minnesota Dept. of Natural Resources • www.mnsfi.org/dnrforesters.htm
Soil and Water Conservation Districts • www.mnsfi.org/swcd.htm
U.S. Department of Agriculture: Natural Resources Conservation Program (NRCS)
www.mnsfi.org/nrcs.htm

OTHER SOURCES

Minnesota Logger Education Program • www.mnsfi.org/mlep.htm
Minnesota Tree Farm Program • www.mnsfi.org/treefarm.htm

QUESTIONS TO ASK A FORESTER



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

- Which guidelines apply to your woodland?
- Which timber harvesting system(s) is most appropriate for your land and objectives?
- What plans do they have for **reforestation**?
- Are there concerns about threatened and/or endangered species in your woodland? If so, what steps are they taking to safeguard the species?
- Where would they recommend the roads and landings be located? Consider how that location serves other useful purposes you may have after a harvest.
- Which types of harvesting equipment may be most appropriate on your property?
- What would they recommend be done with the **slash** and stumps following a harvest?
- What are the advantages of forest certification? Is certification appropriate for your property?

TIMBER HARVESTING EQUIPMENT

Feller Buncher



Cut to Length Harvester



Forwarder



Skidder



Stroke Delimber



Slasher/Loader



STAGES OF ASPEN GROWTH

1-year-old Aspen



3-year-old Aspen



18-year-old Aspen



40-year-old Aspen



THE PRACTICE OF GOOD FORESTRY

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



The owner of this woodland wants to regenerate aspen so that he has more deer. A harvest took place that resulted in conditions favored by deer: travel corridors were created and sunlight can now reach the forest floor causing aspen and herbaceous plants to grow. These conditions are also favorable to enhancing ruffed grouse habitat.

MINNESOTA'S VOLUNTARY SITE-LEVEL FOREST MANAGEMENT GUIDELINES

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

What are the Forest Management Guidelines?

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

What do the Guidelines address?

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

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

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

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

THE MFRC

The Minnesota Forest Resources Council (MFRC) was formed as a result of the Sustainable Forest Resources Act enacted by the Minnesota Legislature in 1995. The purpose of the act is “to pursue the sustainable management, use, and protection of the state’s forest resources to achieve the state’s economic, environmental, and social goals.”

The MFRC is responsible for coordinating the implementation of that Act.

In addition, the Council advises the governor, as well as federal, state, county, and local governments on sustainable forest resource policies and practices.

You can reach the MFRC at:
Minnesota Forest Resources Council
Green Hall 201A and C
1530 Cleveland Avenue North
St. Paul, Minnesota 55108
651.603.6761 (phone) • 651.603.0110 (fax)
mfrc.info@state.mn.us

Take a look at some sample Guidelines on the next two pages. For additional information or a copy of the Guidelines, contact the MFRC.

SAMPLE GUIDELINES & HOW THEY CAN HELP MANAGE & SUSTAIN FOREST LANDS

The following photographs represent examples of some of the timber harvesting and forest management guidelines that help maintain healthy forests. In many instances, it may be possible to implement several guidelines simultaneously.



Maintaining Water Quality:

Avoid **disturbances** such as ruts, soil compaction, excessive disturbance to the litter layer, and addition of fill which can interrupt or redirect the flow of water through a wetland.



Timing of management activities:

Determine the preferred operating season for a specific site to help avoid unwanted impacts to the site, as well as the costly process of moving equipment from a site if negative impacts are occurring. Harvesting on frozen ground is one example of timing management to protect soil and cultural resources.



On-site meetings:

Conduct on-site meetings with a qualified logging professional, landowner, and professional forester prior to moving equipment onto a site. Such meetings can help assure common understanding of landowner objectives, timber harvest regulations, contract specifications, and site conditions.



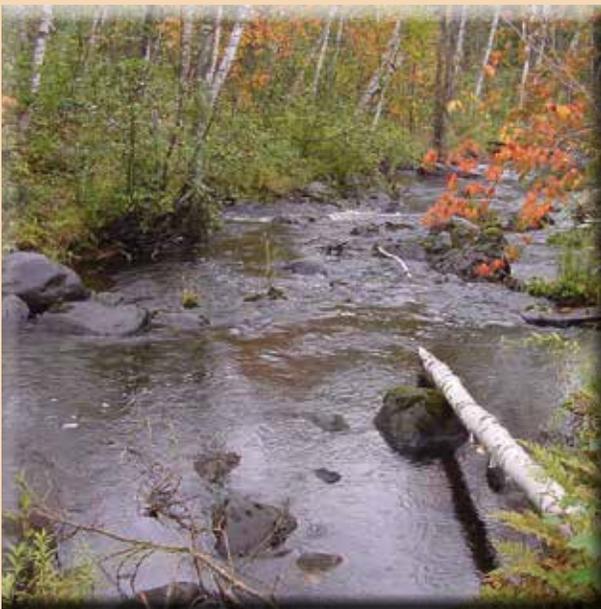
Cavity trees for wildlife:

Include a minimum of six cavity trees, potential cavity trees, and/or *snags* per *acre* within the remaining *stand* of trees on sites that have not been *clearcut*.



Visual quality:

Guidelines help to maintain and enhance scenic quality in forested areas for the enjoyment of tourists, recreational users, and local travelers. These include limiting apparent harvest size and dispersing the *slash* left on a harvest site.



Water diversions:

Proper placement of roads, landings, and skid trails, and application of erosion control structures can reduce the potential for erosion to negatively impact water quality and soil productivity.

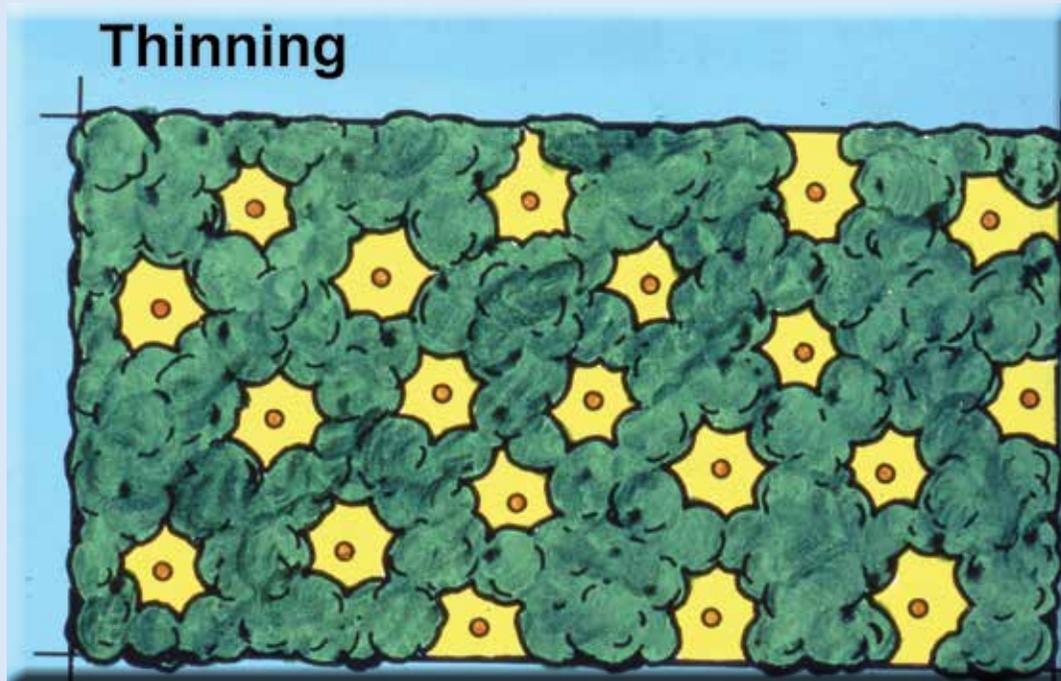
Riparian Management Zones (RMZs):

Riparian areas are areas that transition from aquatic to terrestrial ecosystem along streams, lakes, and open water wetlands. They are important for many forest resources including plant and animal diversity, habitat, water quality, and forest recreation.

FOREST MANAGEMENT (SILVICULTURE SYSTEMS)

Silviculture systems are different approaches to harvesting, regenerating and growing forests.

Harvesting alters the forest by changing the understory light environment and climate, altering understory vegetation, and disturbing humus and soil on the forest floor. Different harvest methods allow different amounts of sunlight to reach the forest floor and regenerate trees.



THE THINNING SYSTEM

HOW IT WORKS

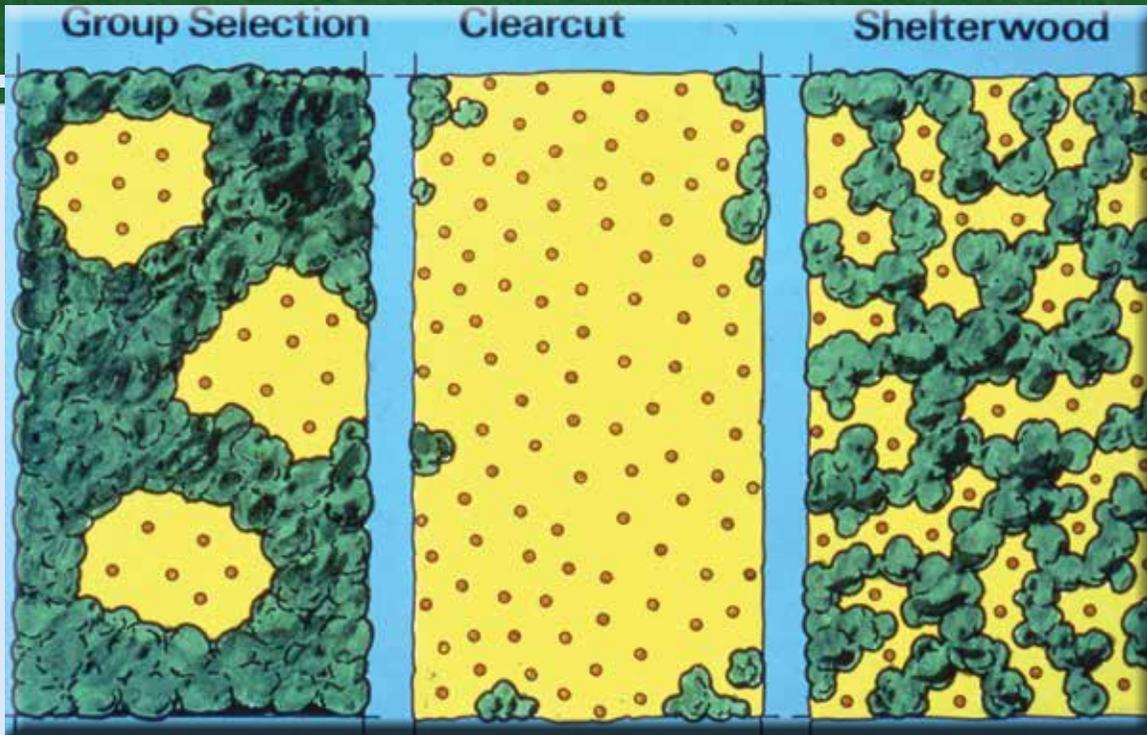
Individual trees or groups of mature, unhealthy or other selected trees are harvested periodically. Most of the trees are left to regenerate the **stand** naturally. Before any harvesting is done, an inventory of the forest is completed. The inventory identifies the tree species, the different sizes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

Based on this information, a tree marking **prescription** is written and all trees to be cut are marked. **Crop trees** are usually marked with something (e.g. paint) that identifies them. Crop trees are the trees you want to grow for their future commercial value, for their value to wildlife or as sources of seed for regenerating desired tree spe-

cies. Every eight to 15 years, the stand is **thinned** to give crop trees room to grow, and some unhealthy and mature crop trees are harvested. Care is taken during the thinning and harvesting operations to avoid damaging the site and the crop trees. Damage to young and old trees can lower the future value of the wood.

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

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



GROUP SELECTION

HOW IT WORKS

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

CLEARCUT SYSTEM

HOW IT WORKS

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

The clearcut area can be regenerated by:

- windborne seeds from nearby areas
- seeds from trees left on the site, singly, in strips or in groups
- coppice growth (the shoots that grow from the stumps of trees when they are cut or stressed)
- artificial seeding
- planting seedlings or trees

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

THE SHELTERWOOD SYSTEM

HOW IT WORKS

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

FOREST MANAGEMENT PRACTICES FOR WILDLIFE

Wildlife Management 101

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

To perform this 'art,' managers need to know how these factors affect wildlife populations and what changes can be expected after adjusting them. Forest wildlife management involves managing forest vegetation to provide for the needs of wildlife. Typically that means harvesting the right amount of trees in the right place at the right time.

The species **biodiversity** of an area increases if an abundance of different habitat types exist. The greater abundance, the more the types and number of plants and animals will be found there.

The needs of a variety of species can be met with the proper mix of stand ages, types and sizes of patches. This is not to say we need to provide everything on each patch of earth. Landscape biodiversity ensures that all the pieces of the puzzle are there, but that one area may have more diversity, or less, than another. Some forest types were essentially monotypes, arising from the devastation of a wildfire (e.g. aspen and jack pine stands). Other types have more vegetative diversity within the stand. **Late successional** forests typically are very diverse.

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

Wildlife habitat provides animals with food, water, cover and space. Other habitat attributes can determine the success of certain animals, for example terrain (hill vs. flat); soils (rocky vs. sandy); vegetation (type, density) and availability of perches and nest sites. These limiting factors can determine animal diversity and abundance.



Water – Drinking water is rarely a limiting factor for wildlife in Minnesota. Some animals rarely drink as they get water from the foods they eat or as a by-product of metabolism. For the rest, there is usually a creek, lake or marsh near enough to get water. However, landowners can increase their local animal diversity by creating a pond with abundant vegetation around it.

Food – It is important that managers know the diet and life history requirements for animals in order to manipulate food availability to increase populations. Food is rarely limiting year-round, but can be seasonally rare. For example, grouse and deer are both dietary generalists in the growing season, feeding on all manner of vegetation from buds and fruits to mushrooms and greens. However in winter, they become specialists. Deer browse on shrubs, white cedar and other woody material, whereas grouse feed on the flower buds of mature male aspen, birch or hazel brush. The land will support more of these animals if food is managed at critical times – shear brush near deer yards or retain clones of male aspen in cutting areas. Robins are another good example. They feed on insects and worms during the summer and then switch to fruits in the fall. Providing for the seasonal needs of wildlife will sustain healthy populations.

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

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

Space – Animals need a certain amount of space to meet all of their annual needs and reduce competition for resources. For example, you wouldn't expect a moose to live



in a 20-acre woodlot, but it would be plenty for a pine squirrel. Bluebirds use about 5 acres of open grasslands while American kestrels need about 100 acres. If you have a 50-acre field you might expect to have 10 pairs of bluebirds, but should not expect to support a pair of kestrels. Two components of space are home range and territory.

- Home range is the area regularly traveled by an animal as it meets its annual needs. Typically large animals have larger home ranges than small ones and predators have larger ranges than herbivores. Home ranges can become smaller if an animal meets all of its annual needs in a smaller area. Home range size can be seasonal – larger in breeding season, smaller in winter. They can also be seasonally disjointed, as when a deer goes to a deeryard for the winter.
- Territory is an area actively defended from other animals. Usually the animal is defending a finite limiting resource. When territories are full, those without must move on or take lesser territories – meaning they may not survive or may not reproduce. Providing more of the limiting resource can reduce territory sizes and allow for higher local populations and more reproduction.

Social systems can determine local animal densities. For example, solitary grouse can survive in close proximity to other grouse so long as their needs are being met. Deer live in matriarchal family groups and need bigger areas to meet the needs of the group. Wolf packs often defend large areas from other packs. However, large herds of open-ground ungulates find protection in numbers, but must move constantly to meet their needs.

Local wildlife populations increase through increased reproduction, reduced mortality and immigration from other areas. The fecundity, or reproductive potential of a species is determined by its number of young, age at first breeding, reproductive span, breeding frequency and amount of parental care. Knowing this a manager can increase a local population by taking steps to:



WILDLIFE *continued on page 22...*

FOREST MANAGEMENT PRACTICES FOR WILDLIFE



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

Local wildlife populations decrease through mortality and **emigration**. The young of many species disperse to new home ranges when they reach sexual maturity. This is nature's way of reducing inbreeding. While young clearly emigrate from an area during dispersal, the effect locally is usually offset by immigration of other young into the area, so long as attractive habitat exists to draw them. There are many causes of mortality in wild animals:

- Predation is the chief cause of mortality among animals. Managers can reduce predation by reducing predator populations (trapping furbearers) or by providing adequate escape cover for favored species.
- Human harvest can be considered predation. In some cases harvest is offset by increases in the survivors' fecundity. In other situations, limiting harvest will increase populations.
- Disease and parasites often are not a serious concern unless the population is stressed due to overcrowding. Artificially holding populations above their natural carrying capacity through supplemental feeding can lead to severe disease problems.

- Accidents are a minor source of mortality, but can be locally significant. For example when a road is built between a turtle pond and a nesting area, deer cross highways at a particular spot, or when power lines or radio towers go up in important bird flyways.
- Bad weather rarely kills significant numbers of animals, but can be important at key times of the year. Harsh winters are tough on many animals, but when provided with adequate food and cover most animals can cope. Extended cold, wet springs are tough on most birds and there is little managers can do about it.

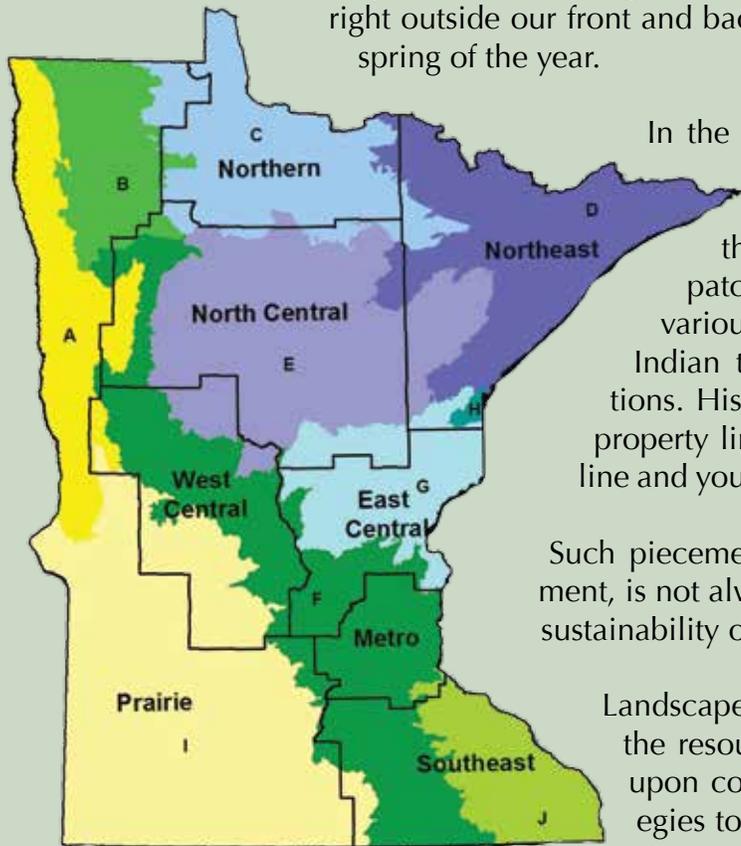
Mortality increases in certain seasons, like winter, migration time, breeding season and hunting season. In many cases, mortality is sex-specific. Male mammals die more often than females due to the rigors of defending breeding sites, displaying for females or fighting among themselves. Female birds die during incubation and brood rearing. Mortality is also age-specific, with young and old more frequently succumbing to predators, disease or weather.



Want More...?	Perform These Practices:
Deer	<ul style="list-style-type: none"> • Clearcuts, seed tree cuts, and shelterwood cuts will provide abundant deer food as well as thick escape cover to get away from predators. • Timber thinnings will allow more sunlight to reach the forest floor, increasing plant and shrub food for deer. • Timber stand improvement in oak systems releases crop trees and can lead to higher acorn production for deer, bear, turkey, squirrels, etc. • Planting 3- to 5-acre mixed conifer patches adds diversity and creates thermal cover where deer can better survive harsh winters. • Wildlife openings on old log landings can be fawning areas and important early spring feeding areas.
Ruffed Grouse	<ul style="list-style-type: none"> • Clearcutting small blocks of aspen creates ideal grouse cover. Leaving small balsam fir diversifies the future stand with additional thermal cover. • Hazel and dogwood shrubs provide important food resources. • Leave sufficient down logs after harvest to serve as drumming logs.
Wild Turkeys	<ul style="list-style-type: none"> • Clearcuts, seed tree cuts, and shelterwood cuts create temporary brood-rearing cover and nesting cover. • Older open-grown trees provide roosting cover. • Well managed hardwood stands generate a diverse mix of seeds and nuts for foraging turkeys. • In heavily forested zones wildlife openings are critically important brood-rearing areas, especially when seeded with a variety of plants.
Black Bear	<ul style="list-style-type: none"> • Bears will inhabit and use all of Minnesota's forest types at certain times of the year. • Old fields offer early growth as bears emerge from dens. • Regenerating clearcuts offer new shoots, catkins and soft mast. • Lowlands and jack pine clearings offer blueberries and cover. • Mature hardwoods offer hard mast while transition areas offer both hard and soft mast. • Wildlife openings with grass and clover will feed bears in spring.
Songbirds	<ul style="list-style-type: none"> • Songbirds occupy such a wide array of niches that you can increase bird diversity by providing a diversity of forest ages, types, and stand sizes. • Clearcuts, seed tree cuts, and shelterwood cuts favor early successional songbirds like golden-winged warblers, chestnut-sided warblers, mourning warblers, etc. • Selection cuts create smaller canopy gaps and benefit hooded warblers, flycatchers, and many forest interior species post-fledging. • Thinning older stands maintains canopy cover and forest continuity for mature forest interior species.
Forest Bats	<ul style="list-style-type: none"> • Snag trees can provide roosts for forest bats. • Clearcuts and selection cuts create openings that attract insects, thus providing feeding areas for bats. • Timber thinnings provide open flyways for bats while retaining roosting and brooding trees.

PLANNING ACROSS LANDSCAPES

The word 'landscape' evokes images of vast stretches of land, hurrying by us as they are viewed through a car window. The word also evokes images of that yard, right outside our front and back doors, that needs some special attention in the spring of the year.



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

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

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

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

Minnesota Forest Resources Council – Landscape Program



www.mnsfi.org/landscape.htm



Public Concerns Registration Process

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

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

If you have concerns call 888-234-3702

FINDING MAPS & AIRPHOTOS OF YOUR MINNESOTA WOODS

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

Aerial photographs can provide details that are extremely useful in forest management activities. This aerial shows blowdown that occurred during a windstorm.



Find and Creating Quality Maps

Create customized maps using Landview. When you go to www.mnsfi.org/landview.htm you will see the option "Landview."

At this Web site, you may choose 'get map' or 'how to use.'

Landview allows you to create customized maps based on DNR data layers that you select. Choose from public lands, water bodies, roads, aerial photos, and much more.

Step 1 involves selecting layers for your map.

Step 2 involves selecting an area using a Zoom-In icon.

You may search for "Places:"

- by name
- by type (e.g., lake)
- by public land survey (e.g., by entering township, range, section)
- by coordinate (e.g., enter an x y pair)

After you have entered your information, you will click a 'go' button. If your search terms match only one item exactly, the map will automatically zoom to that place. Otherwise a small popup window will show you matches and you can zoom to a place by clicking on a name.

A place search will return up to 1,000 matching results.

Finding Historic Air Photos:

Historic air photos can be of great interest and can help you see how your land has changed over time. Visit the Landview link (www.mnsfi.org/landview.htm) and look on the left-side menu for "Aerial photography" and underneath that listing, "Historic photos." Follow the menu prompts to find the area(s) and year(s) of interest.

A LIST OF RESOURCES:



A sample Google map created by a landowner at an Extension and Minnesota Logger Education Program workshop.

Making a Custom Map of Your Property

The easiest free tool to make a custom map of your property is Google Maps (www.mnsfi.org/google-maps.htm). A sample map, created by a landowner, is above.

Chances are, you've used Google Maps before to get directions or to find a business. But to make your own custom map, you'll first need to create a free Google account. Once you've got an account set up, look for the 'My Maps' link near the upper left corner of the screen and follow the on-screen instructions from that point. You'll be able to add point, line, or polygon features to your map. You can add names, descriptive text, and even photos to each feature.

Google Maps provides interesting opportunities. For instance, in addition to showing your map to a professional forester or logger, you can also share it with certain other individuals—you might ask your children or grandchildren to add their favorite places to your map.

Air photos and maps can both be valuable planning tools and also open up a whole new view of your Minnesota woodland. There are many free sites online to offer quality maps and images of your property. The sites described here are a great place to start.

If you have any trouble using any of the sites mentioned here, you will find step-by-step tutorials for each of them at www.mnsfi.org/sfimaps.htm. You can also post questions at the same link.

Guidelines for Managing Minnesota's Forests:

- Minnesota's forest management guidelines -- mnsfi.org/fmg.htm
- Minnesota's forest management guidelines quick reference field guide -- mnsfi.org/fmgquick.htm

Information on topics ranging from forest management tools to insects and disease, and tips from other private landowners:

- My Land Plan -- mnsfi.org/landplan.htm
- MyMinnesotaWoods -- mnsfi.org/mymnwoods.htm
- Woodland Stewardship -- mnsfi.org/woodlandsteward.htm

People Who Can Assist

- Minnesota Association of Consulting Foresters -- mnsfi.org/macf.htm
- Minnesota Forest Industries -- mnsfi.org/mfi.htm
- Minnesota Logger Education Program -- mnsfi.org/mlep.htm
- Minnesota Department of Natural Resources -- Forestry -- mnsfi.org/dnrforesters.htm
- National Wild Turkey Federation (Minnesota) -- mnsfi.org/nwtfmn.htm
- Minnesota Deer Hunters Association -- mnsfi.org/mdha.htm
- Ruffed Grouse Society (Minnesota) -- mnsfi.org/rgsmn.htm

THE ENDANGERED, THREATENED & SPECIAL CONCERN SPECIES OF MINNESOTA'S FORESTS

Minnesota's private forest landowners are stewards not only of the trees growing in their woodlands, but also of the other plants and animals that live there. To be a good land steward, it's important to be aware of those species and of ecological communities that are designated as "imperiled, critically imperiled, threatened, or endangered," as well as how forest management activities on your lands may affect them. In Minnesota, threatened and **endangered species** are listed by either the Minnesota Department of Natural Resources at the state level or by the U.S. Fish and Wildlife Service at the federal level. Critically imperiled (G1) or imperiled (G2) native plant communities are globally rare or, because of some factor(s), especially vulnerable to extinction. They are designated as imperiled or critically imperiled by NatureServe, a non-governmental organization. Minnesota DNR's Division of Ecological and Water Resources takes the lead in identifying G1 and G2 Native Plant Communities across the landscape.

The Sustainable Forestry Initiative® (SFI) program (www.aboutsfi.org) combines the perpetual growing and harvesting of trees with the long-term protection of wildlife, plants, soil and water quality. To meet the SFI Standard, program participants who procure wood from family forest owners provide outreach opportunities to them on conservation of biodiversity for imperiled species. This guide is aimed at assisting you as a private landowner in your awareness of species of concern in your area.

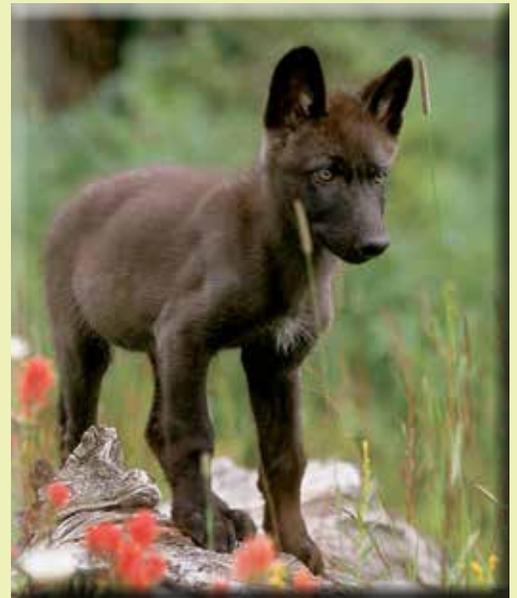
Definitions

A species is considered **endangered** if the species is threatened with extinction throughout all or a significant portion of its range.

A species is considered **threatened** if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

A species is considered a **species of special concern** if, although the species is not endangered or threatened, it is extremely uncommon in Minnesota, or has unique or highly specific habitat requirements and deserves careful monitoring of its status.

G1 and G2 Communities: The global rank (G-rank) of a plant community is a numerical assessment of the rarity and imperilment of the community across its entire range of distribution. The most imperiled plant communities are ranked: G1 – Critically imperiled - (very few remaining acres or very vulnerable to elimination throughout its range) or G2 – Imperiled – (few remaining acres or very vulnerable to elimination throughout its range). State ranks (S-ranks) are similar to global ranks but are based on the extent and condition of the community in Minnesota.



For more information

Minnesota Department of Natural Resources
Rare Species Guide
www.mnsfi.org/rsg.htm

Federally listed species in Minnesota
www.mnsfi.org/federalendangered.htm

US Fish and Wildlife Services
www.mnsfi.org/f&w.htm

NatureServe
www.mnsfi.org/natureserve.htm

Northern Long-eared Bat

(*Myotis septentrionalis*)

Federal: Threatened

The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches but a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*. Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They spend spring, summer, and fall in forests, where they raise their young. All forest management should consider impacts to this species.



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

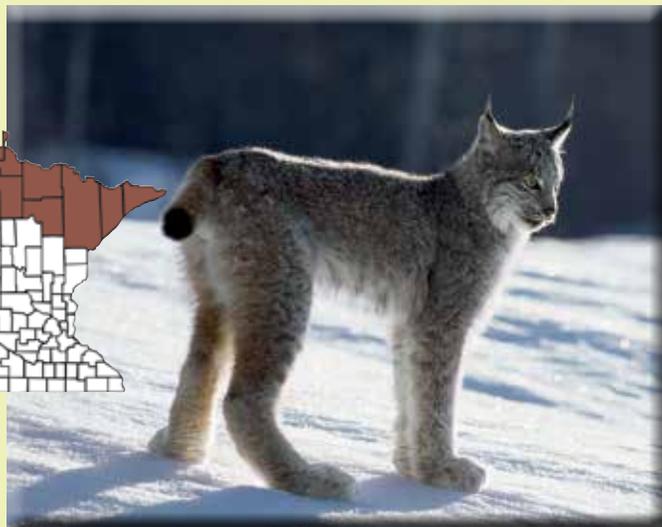
Bald Eagle (*Haliaeetus leucocephalus*)

Federal: Protected under Bald & Golden Eagle Protection Act
Minnesota: Special Concern

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

Bald eagles tend to nest in large white pine, red pine, aspen, or cottonwood trees near lakes and rivers. Their nests are large - six to eight feet across. Eagles lay their eggs in March and most young leave the nest areas by August.

The nesting season (January-August) is considered one of the more sensitive times of the year for this species. Management of forests near an active eagle nest should be discussed with a professional forester or wildlife biologist.



Canada Lynx (*Felis lynx*)

Federal: Threatened

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

Lynx tend to favor the young forest habitats that are preferred by their primary prey, the snowshoe hare. In fact, its populations are known to fluctuate closely with hare abundance. In addition to hares, lynx eat rodents, grouse, and other birds.

Our knowledge and understanding of this cat is increasing as research is conducted in Minnesota. Forest management activities that create habitat for snowshoe hare help support lynx populations.



Gray "Timber" Wolf (*Canis lupus*)

Federal: Threatened

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

Young forests provide high quality deer habitat and thus, quality habitat for the wolf. The wolf population in Minnesota has now reached a level that may allow for downlisting in the future.

Reptiles



Blanding's Turtle (*Emydoidea blandingii*) Minnesota: Threatened

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

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



Timber Rattlesnake (*Crotalus horridus*) Minnesota: Threatened

This long snake, three to four feet in length, is very distinctive with its barred body pattern and a large tan rattle. Although the background color of its body varies from yellow to brown, its tail is always solid black.

The timber rattlesnake is found in the bluff and hill country of southeastern Minnesota. Its ideal habitat includes forested bluffs, south-facing rock outcrops, and bluff prairies, particularly in the Mississippi River Valley.

In the summer, it will be found in forests, prairies, and agricultural lands; it overwinters in communal dens, often in crevices or fissures in limestone bluffs and outcrops.

Do not interfere with the timber rattlesnake when and if you encounter one! In the winter, take care not to disturb areas around known den sites.



Wood Turtle (*Clemmys insculpta*) Minnesota: Threatened

Wood turtles are found in 15 of Minnesota's eastern counties. The wood turtle is mostly aquatic. It prefers small-to medium-sized, fast-moving streams with adjacent **deciduous** and **coniferous** forests. Wood turtles will occupy adjacent alder thickets, and forest and grassland habitat for basking and foraging. Sandy, sparsely vegetated areas that are not prone to flooding and have ample exposure to direct sunlight provide important nesting sites. They nest on sandy bars, cutbanks, or sand/gravel mining areas.

During the summer, this species will forage on land.

Wooded floodplains and uplands adjacent to wood turtle streams supply a variety of foods, including berries, succulent leaves, mushrooms, insects, and earthworms. Wood turtles overwinter in water beneath the ice in bank undercuts and near log jams. They are very long-lived, maturing between the ages of 14 and 18 years.

Maintenance of small clearings and young forests adjacent to wooded streams, particularly near sandy stream-banks with exposed soils, will provide basking and feeding habitat near nesting and hibernation sites.





Ram's-Head Lady's-Slipper (*Cypripedium arietinum* R. Br.)
Minnesota: Threatened

This legendary orchid has always been considered rare in Minnesota. The reasons for its rarity are not entirely known. Recently, however, it has suffered a general decline in Minnesota largely as a result of a loss of its habitat from logging, mining, agricultural activities, water level manipulation, and urban development. Many remaining populations face a critical threat from people who illegally dig up these plants, even in state parks and state scientific and natural areas. This type of poaching is especially tragic because the plants do not survive transplantation from the wild.

This beautiful, rare plant is found in diverse coniferous forest habitats including bogs or lowland forests (dominated by northern white cedar, tamarack, balsam fir, dry pine forests) and upland mixed **deciduous** forests. The ram's-head lady's-slipper prefers shady, lowland sites.



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

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

Grape Ferns and Moonworts (*Botrychium* Sp)
Minnesota: Endangered. Threatened. Special Concern.

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



Glade Mallow (*Napaea dioica* L.)
Minnesota: Threatened

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

Plants



Dwarf Trout Lily (*Erythronium propullans*)

Federal: Endangered **Minnesota:** Endangered

Dwarf trout lily is one of only two or possibly three plant species found only in Minnesota, and is the state's only federally-endangered plant. It occurs only in the southeastern counties, typically on north-facing slopes of maple-basswood forests and floodplains of the Zumbro, Straight, Little Cannon, and Cannon rivers in Rice, Goodhue, and Steele counties. The plants usually occupy the lower part of the slope but may extend nearly to the top of the slope or descend into the level floodplain. This is a deeply shaded habitat in the summer, but the dwarf trout lily completes its life cycle in early spring before the trees leaf out.

Habitat loss is largely the result of incompatible recreation uses and housing development. Loss of the elm **canopy** in floodplain habitat, earthworm infestations, over-use by deer, and proliferation of invasive species such as European buckthorn, reed canary grass, and garlic mustard threaten the species even at protected sites. Soils at the sites where dwarf trout lilies grow are generally quite erodible and caution should be used in mechanical removal of non-native species to assure that seedbeds are not created for other invasive species.



Golden-seal (*Hydrastis canadensis* L.)

Minnesota: Endangered

Golden-seal has always been rare in Minnesota, in part because southeastern Minnesota is at the northwestern periphery of its North American range. It has become even more rare in recent times, however, not only in Minnesota, but across its entire range because of intensive and unsustainable harvest by commercial root diggers.

It is often associated with a rich woodland ground cover of wild ginger, hepatica and blue cohosh. Populations range from just a few scattered individuals to more than 100 at each site.

Golden-seal appears to be intolerant of grazing or **disturbances** that open the forest canopy.



Eastern Hemlock (*Tsuga canadensis*)

Minnesota: Endangered

The twigs and branchlets of this **conifer** are said to "ride with the wind." The flexible branches have flat needles that are about a half inch long and whitened on the underside, giving a delicate silvery and fragile look to its foliage. The needles attach to the twigs of the tree by slender stalks.



Butternut (*Juglans cinerea*)

Minnesota: Endangered

Butternut is similar to walnut, but its wood is much lighter. It has been known as the "white walnut." Butternut grows rapidly on well-drained soils of hillsides and streambanks in mixed hardwood forests.



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

Four-toed Salamander (*Hemidactylium scutatum*)
Northern Goshawk (*Accipiter gentilis*)

Golden-winged Warbler (*Vermivora chrysoptera*)
Red-shouldered Hawk (*Buteo lineatus*)

FORESTS WITH EXCEPTIONAL CONSERVATION VALUE

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

Following are just a few examples of imperiled plant communities according to state and global ranking systems. For a listing of all S1 and S2 listed communities, go to: www.mnsfi.org/nrcs.htm

White Cedar - Yellow Birch Forest

Global rank - G2

State rank - S2

The *canopy* of this rare forest type is dominated by white cedar, typically with yellow birch, heart-leaved birch, or sugar maple as important components. However, some older mesic forests of this type have large yellow birch and canopy co-*dominants* of white birch, white spruce, and balsam fir. This community type is often assigned a forest cover type of Birch, White Spruce, Balsam Fir, or White Cedar. When sugar maple is present, the mesic nature of the forest becomes more apparent and it may be assigned a Northern Hardwood cover type. This type occurs primarily along the North Shore, but probably also occurs on scattered fire-protected sites in the Arrowhead region.¹

White Pine – Sugar Maple - Basswood Forest (Cold Slope)

Global rank - G2

State rank - S1

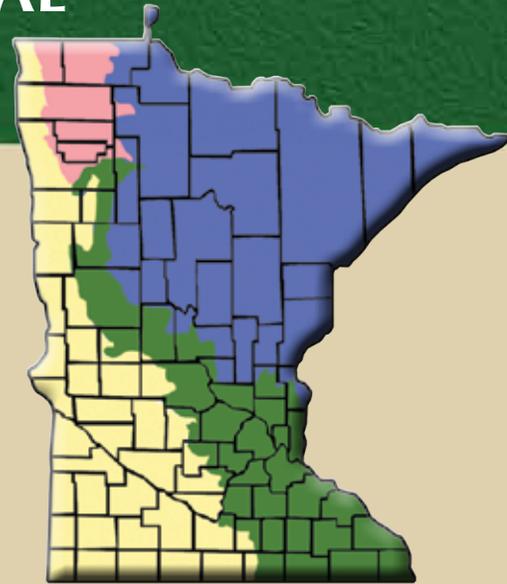
This rare community is restricted to lower and middle portions of north-facing slopes in counties of the Eastern Broadleaf Forest Province near the Mississippi River and Wisconsin border in southeastern Minnesota. It is characterized by the presence of northern species otherwise absent in southeastern Minnesota. The presence of white pine, balsam fir, and yellow birch are good indicators of this type.¹

Tamarack Swamp (Southern) and Rich Tamarack Swamp (East Central)

Global rank - G2 and G3

State ranks - S3

The Tamarack Swamp (Southern) type is found primarily to the south and west of the Laurentian Mixed Forest Province, whereas the Rich Tamarack Swamp (East Central) is limited to the southern portion of the Laurentian Mixed Forest Province. These tamarack swamps usually occur in



isolated basins but can occur as floating mats at the edge of ponds. The rarest examples of these communities have a canopy dominated by tamarack mixed with hardwood species such as red maple, black ash, or yellow birch.¹

Savanna Communities

Global rank - G1 and G2

State rank - S1 and S2

Savanna communities with scattered oaks or pines and a ground layer of prairie species are the most imperiled forested native plant communities in Minnesota. Historically, these communities occurred mostly along the prairie-forest border and were maintained by fire or grazing by bison and elk. Most savannas have been converted to agriculture, and in the absence of fire and the extirpation of these large herbivores, most of the remaining savannas have succeeded to woodland or forest. Today, degraded oak savanna can usually be identified by the presence of scattered large, open-grown oaks surrounded by younger forest grown trees.¹

Jack Pine - (Yarrow) Woodland

Global rank - G2

State rank - S2

This type is dominated by jack pine and is characterized by an understory of prairie species such as big bluestem and hoary puccoon. It is found on sandy sites in the western regions of the Laurentian Mixed Forest in north-central Minnesota and is most likely to be encountered in Crow Wing, southern Cass, and Hubbard counties.¹

¹For help with identification see DNR's "Field Guide to the Native Plant Communities of Minnesota". (www.mnsfi.org/ecs.htm)

MINNESOTA'S FOREST INVADERS

A GUIDE TO INVASIVE SPECIES

EMERALD ASH BORER

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



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

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

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

ASIAN LONGHORNED BEETLE

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



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

How do we stop it? Early detection is critical. Key signs for ALB are: • Presence of adults. • Oval to round pits chewed in the bark of live trees. • Round 3/8" diameter holes are made by emerging adults on trunks and branches; coarse sawdust around the base and in branch unions of heavily infested trees. If you see what you suspect are gypsy moth egg masses, report them to the Minnesota Department of Agriculture or a local state forestry office.

COMMON PINE SHOOT BEETLE

Where is it from? Where is it at? The common pine shoot beetle is an invasive species from Europe and Asia that feeds primarily on pine tree species, *Pinus* spp. The beetle was first noticed in Ohio during 1992. It is currently known to occur in 15 states. In 2003 pine shoot beetle was detected in Ramsey, Dakota and Anoka counties in Minnesota.



What does it look like? What does it do? Adult beetles are cylinder shaped, 1/4 inch long, shiny reddish brown to black. The adults fly to living pine trees where they feed by tunneling through new and one-year-old shoots, killing them. Scotch pine seems to be the preferred host; however, Austrian pine, eastern white pine, red pine, and Jack pine can also serve as hosts. Around the time of the first fall frost, adults tunnel into the thick bark at the base of the tree.

How do we stop it? Minnesota is under a USDA quarantine for pine trees (including Christmas trees) and pine products with the bark attached. Pine/pine products being moved into a no-quarantine area must be inspected and certified free from the beetles. Look for them in dead or dying pine shoots. Pine slash and downed logs should be chipped or burned. When harvesting pine, cut the stumps close to the ground.

SIREX WOOD WASP

Where is it from? Where is it at? The sirex wood wasp's range spans from Europe and northern Africa to Mongolia and southern Russia. It has invaded New Zealand, Australia, South Africa and South America. It recently invaded North America where, as of winter 2006, it was detected in New York, Pennsylvania, and Ontario. It was found in solid wood packing materials.



What does it look like? What does it do? Sirex wood wasps look a lot like native wood wasps. Adult wasps are 1 to 1.5 inches long, lack the narrow 'waist' of other groups of wasps, and have a pointed plate-like projection extending from the tip of the abdomen. Females are metallic blue-black in color with orange legs. Males are

similar to females, but the middle portion of the abdomen is orange and the hind legs are black. Larvae, which tunnel in wood, range from 0.04 to 1 inch long and are creamy white with a dark spine projecting from the abdomen. The wasps feed primarily on pines, including Jack, eastern white, red, Scots, and Austrian pines. It also infrequently attacks spruce, larch, and fir. It prefers stressed trees, but can kill apparently healthy trees.

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

GYPSY MOTH

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



Thielen Cremers, Kimberly, MDA

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

How do we stop it? The gypsy moth on its own has limited spread, however they spread easily by hitchhiking; laying tan colored egg masses on firewood, logs, vehicles, campers, and any outdoor household items. Each egg mass can contain over 1,000 viable caterpillars. To minimize this artificial spread pest quarantines are in place for areas considered generally infested for gypsy moth. General awareness of the pest and areas of establishment will greatly reduce the spread of this insect to new areas. Managing forests for stand diversity is the best means of limiting defoliation once established. Encourage a mix of tree species, forest types, ages and sizes. If you find a

suspect gypsy moth caterpillar or egg mass, report it to the Minnesota Department of Agriculture or a local state forestry office.

AMUR MAPLE

Where is it from?

Where is it at? Amur maple is a native of central and northern China, Manchuria and Japan. It was introduced to North America in the 1860s. It is still frequently sold



commercially as an ornamental and for wildlife and shelterbelt plantings. A prolific seed producer, Amur maple is becoming invasive in the northern U.S. Extensive wild populations have been found in Illinois and Missouri.

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

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

GARLIC MUSTARD

Where is it from? Where is it at?

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



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

How do we stop it? There are both mechanical and chemical means to control garlic mustard. Mechanical: In areas of light infestations you can just pull the plant up and dispose of it on site. Flowering stems can be cut at ground level. If there are larger patches, prescribed burning is one

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tool. Herbicide treatments are also an option: Chemical spot application of 2 percent glyphosate in early spring or late fall when native plants are dormant. Wash your boots and mechanical equipment after working in a garlic mustard infestation since seeds are easily spread and can remain viable for several years.

HONEYSUCKLE

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



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

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

BUCKTHORN

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



What does it look like? What does it do? Common buckthorn is an understory shrub or small tree up to 25' high with a spreading loosely branched **crown**, often with multiple stems at the base. Leaves are egg-shaped, dark,

glossy, and finely toothed. Glossy buckthorn is similar, but typically growing only up to 18 feet with oval-shaped, dark glossy leaves with smooth edges.

How do we stop it? Plants that are two inches in diameter or larger, are best controlled by cutting the stem at the soil surface and then covering with a tin can or black plastic to prevent re-sprouting. Or you can treat the stump immediately after cutting (within 2 hours) with a herbicide containing triclopyr or glyphosate to prevent re-sprouting.

JAPANESE KNOTWEED

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



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

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

MULTIFLORA ROSE

Where is it from? Where is it at? Multiflora rose is a native of Asia, brought to the United States in 1866 as a rootstock for grafting ornamental roses. Later it was promoted for erosion control and wildlife cover. It occurs from northern Texas, Arkansas, Mississippi, Alabama, and Georgia in the south, north to the New England coast, central New York, southern Michigan, Wisconsin, and Minnesota. Multiflora rose is regulated as a Restricted Noxious Weed in Minnesota.



What does it look like? What does it do? Multiflora rose is an erect, arching, **deciduous** shrub that may grow 15 feet high by 15 feet wide, but generally is much smaller. Stems and leaves have short, recurved prickles. It typically

grows in disturbed areas such as forest edges, overgrazed pastures, roadsides, and stream banks. Fragrant clusters of white flowers bloom in May and June. It is distinguished from other wild roses by the feather-like fringed bracket at the base of each leaf.

How do we stop it? Mowing and repeated cutting will slowly set multiflora rose back. This may take two to four years. There are several chemical control options. Most are low volume foliar applications, but basal spray, soil, or cut stem applications options are also available. They are generally shallow rooted and can be mechanically uprooted.

REED CANARY GRASS

Where is it from? Where is it at? This Eurasian species has been planted throughout the U.S. since the 1800s for forage and erosion control. It is still being planted. It is common in wetlands and low lying areas throughout the state.



What does it look like? What does it do? Reed canary grass greens up early in the spring. It can grow up to six feet high on erect, hairless stems. The leaves are 1/4"-1/3" wide, gradually tapering, up to 10" long. Flowers bloom May to mid-June; densely clustered single florets are green to purple changing to beige over time. Reed canary is a major threat to natural wetlands. It out competes most native species. It forms large, single species stands, with which other species cannot compete. If cut during the growing season a second growth spurt occurs in the fall.

How do we stop it? Consecutive annual burns spring or fall can help give the native grasses an advantage. Also, mowing mid-June and October can help to reduce seed and encourage native species. Preliminary research indicates that fall chemical application may be most effective (glyphosate).

SPOTTED KNAPWEED

Where is it from? Where is it at? This native of Europe and Asia has become a serious problem in pastures and the rangeland of the western states. It has spread throughout the northern 1/2 of the state and poses a serious threat to the southern tier counties where it has not become widely established at this point. This plant is regulated as a Prohibited Noxious Weed on the Control List in Minnesota.



What does it look like? What does it do? Spotted knapweed has a thistle-like pink to purple flower at the tip of a wiry stem that is two to three feet high. It blooms from July through September. Spotted knapweed overtakes grasslands reducing forage, wildlife habitat, and species

diversity. It especially threatens dry prairie, oak and pine barrens, dunes, and sandy ridges, and is poisonous to other plants (phytotoxic). Spotted knapweed spreads rapidly in artificial corridors, gravel pits, agricultural field margins, and overgrazed pastures. Spotted knapweed infestations decrease pasture productivity, wildlife habitat and species diversity. Infestations increase soil erosion and consequently decrease water quality. Spotted knapweed reproduces by seed that can be moved by wind and water, on equipment and animals, and with infested hay.

How do we stop it? Small patches of knapweed can be manually removed. Herbicide treatments with the active ingredient aminopyralid can be very effective. Biological control using a combination of seedhead weevils and root weevils is a good method to reduce large, stable infestations. Spring burns can be integrated with biological control for improved management.

THISTLE

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



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

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

LEAFY SPURGE

Where is it from? Where is it at? Leafy spurge is native to Europe and Asia; it now occurs across much of the northern U.S. in the grasslands and savannas of the Great Plains. It is on the Minnesota Department of Agriculture's Prohibited Noxious Weeds list in Minnesota.

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What does it look like? What does it do? Leafy spurge has a smooth stem and stands about 2 to 3-1/2' tall. Its stems, flowers, and leaves emit a white milky sap when broken. Clusters of yellow flowers bloom from May to September. Seed are expelled from a capsule and are viable for years.

Once established, leafy spurge reduces pasture and grassland productivity. It is toxic to cattle. Infestations displace native plants and reduce wildlife habitat.

How do we stop it? Leafy spurge produces a deep and extensive root system allowing it to recover after mowing or spraying. Repeated herbicide applications can be effective on small infestations. Biological control with beetles successfully reduces large, stable infestations. Spring burns can be integrated with biological control for improved management. Targeted grazing with goats and sheep is also effective.

SIBERIAN PEASHRUB



Where is it from? Where is it at? This native to Siberia and Manchuria, invades savanna and woodland edge environment where it competes with native shrubs. It is still sold in nurseries as an ornamental, and for shelterbelt and wildlife plantings.

What does it look like? What does it do? Siberian peashrub is an upright shrub or small tree, up to 18' high. An identifying trait is its bean-like seed pods that are up to two inches long. Its compound leaves have 8-12 pairs of elliptic leaflets. Yellow flowers bloom in May and June. It invades disturbed grasslands as well.

How do we stop it? Prescribed burning can be used to control Siberian peashrub. It will stump sprout but will eventually be weakened. It can also be cut-stump treated with glyphosate and cut-stump or basal bark sprayed around the stem with triclopyr.

WILD PARSNIP



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

What does it look like? What does it do? This perennial may spend one or more years in a rosette stage, bloom under favorable conditions, and then die. Leaves are alternate and made up of 5-15 egg-shaped leaflets along both sides of a common stalk. Flat-

topped broad flower clusters bloom yellow from June to late summer. It invades slowly into disturbed habitats and along edges but once the population builds, it spreads rapidly and can severely modify open dry, moist, and wet-moist habitats. The toxic sap of the plant tissue can cause a rash, blistering, and skin discoloration on people.

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

PURPLE LOOSESTRIFE

Where is it from? Where is it at? Purple loosestrife is a wetland plant from Europe and Asia; it was first introduced into the east coast of North America in the 1800s. There are about 2,000 purple loosestrife infestations recorded in 68 of Minnesota's 87 counties. Of those sites, the majority (70%) are lakes, rivers, or wetlands. It is regulated as a Prohibited Noxious Weed on the Control List in Minnesota.



What does it look like? What does it do? Purple loosestrife grows along marshes or water's edges as a wand up to six feet high of pink-purple flowers with yellow centers. It has opposing downy leaves with smooth edges. It invades marshes and lakeshores, replacing cattails and other wetland plants. It can form dense, impenetrable stands which are unsuitable as cover, food, or nesting sites for a wide range of native wetland animals.

How do we stop it? Small infestations can be pulled up by hand, preferably before the seeds ripen. Aquatic and broadleaf herbicides can be effective in controlling purple loosestrife. Biological control has also proven effective in greatly reducing the abundance of purple loosestrife. Report infestations to your nearest Department of Natural Resources office and inquire about biological control agents for control of this species.

COMMON TANSY

Where is it from? Where is it at? Native to Eurasia, tansy was introduced to North America for medicinal, culinary and insect repellent uses. It escaped cultivation to invade grasslands and is abundant in north central and northeastern Minnesota. It is a prohibited noxious weed on the control list.



What does it look like? What does it do? Common tansy grows in dense patches, 3' tall and up to 5' tall in shaded areas. A single stem branches upward into short stems that form a flat-topped cluster of button-like flower heads. The bright yellow daisy-like flower discs are up to 1/2" wide and bloom from July through October. It crowds out other vegetation; most grazing animals avoid common tansy because it is distasteful, and even toxic to some animals.

How do we stop it? Common tansy can be spot sprayed with selective broadleaf herbicides. Repeated applications may be needed to eliminate infestations. Individual plants may be pulled up but are likely to resprout from the remaining roots.

ORIENTAL BITTERSWEET

Where is it from? Where is it at? Oriental bittersweet is native to China, Korea, and Japan and was introduced to North America in the late 1800s as an ornamental. Most known infestations are in the Stillwater, Red Wing, and Winona areas. It is a prohibited noxious weed on the eradicate list.



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

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

To learn more about terrestrial plant regulations in Minnesota, please visit the MDA's Noxious Weed Program Website:

<http://www.mda.state.mn.us/weedcontrol>

Do your part to protect Minnesota's land by following these five easy steps.



STOP INVASIVE SPECIES IN YOUR TRACKS.

PlayCleanGo.org

Clean your gear before entering and leaving the recreation site.

Remove mud and seeds from clothes, pets, boots, gear and vehicles.

Burn only local or certified firewood.

Use only local or certified weed-free hay.

Stay on designated trails.



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

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

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

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

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

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

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

Conifers: Plants that bear seeds in cones (e.g., pines, firs, spruces, cedars, redwoods, cypresses, junipers, hemlocks, and larches).

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

Crown: The leaves and branches of a tree.

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

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

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

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

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



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

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

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

Nongame (species): Species of birds, mammals, and reptiles which usually have no open season for hunting or trapping.

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

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

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

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

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

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

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

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

Silviculture: The art and science of managing forest vegetation to produce desired future forest conditions.

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

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

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

Snag: Standing dead tree.

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

Stocking: The number of trees per acre.

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

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

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