

Sustainable Forestry



A Landowner's Manual
Third Edition • 2011

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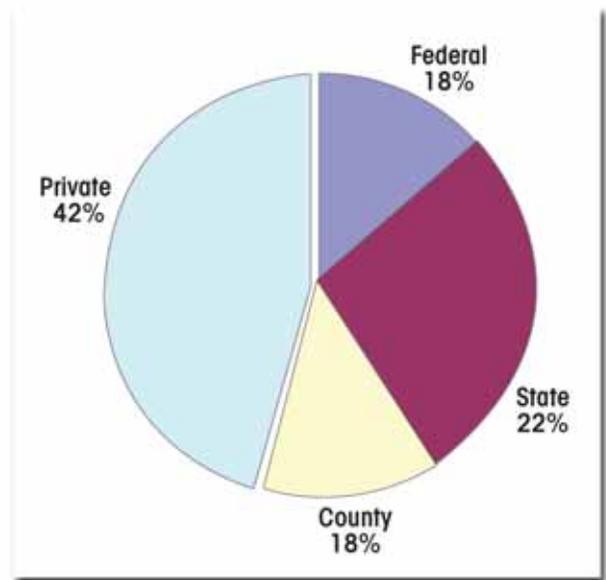
***Bold** and *italicized* words can be found in the Glossary

This document was printed on paper made from Minnesota trees.

Dear Forest Landowner,

The Sustainable Forestry – A Landowner’s Manual, has been published to help you, as a private landowner of Minnesota’s woodlands, manage your woodlands to meet your goals and ensure the future health and viability those forests..

As one of over 200,000 family forest landowners in Minnesota, you play a key role in the management responsibility for nearly 50% of the state’s forested land.



This manual will assist you in understanding forest management terminology and options, as well as provide you with information on the other resources related to the Minnesota’s forests, including its wildlife, plants, and waters.

Establishing goals through management planning, setting up harvest activities, following forest management guidelines, and being aware of rare and endangered plant and animal species are all part of the opportunities and challenges inherent in owning and/or managing the woodlands of Minnesota.

Take time to review the information contained in this manual. 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 to ensure your forestland management and harvesting is a rewarding and worthy experience.

Take time to review the information in this manual. It is provided to you by the Minnesota SFI® Implementation Committee.

The Sustainable Forestry Initiative® Program

The Sustainable Forestry Initiative (SFI) is the largest single forest **certification** standard in the world, and is a globally recognized North American (United States and Canada) standard composed of principles, objectives, performance measures and indicators, supporting sustainable forest management and responsible sourcing. Through its fiber sourcing requirements, the SFI® program stands apart from other forest certification programs by supporting and promoting sustainable forest management practices across all landowner ownerships, including family forest landowners. SFI program participants, certified to the SFI Standard, must demonstrate compliance and adherence to the following 20 objectives:

- Forest Management Planning
- Forest Productivity
- Protection and Maintenance of Water Resources
- Conservation of Biological Diversity including Forests with Exceptional Conservation Value
- Management of Visual Quality and Recreational Benefits
- Protection of Special Sites
- Efficient Use of Forest Resources
- Landowner Outreach
- Use of Qualified Resource and Qualified Logging Professionals
- Adherence to **Best Management Practices**
- Promote Conservation of Biological Diversity, Biodiversity Hotspots and High-Biodiversity Wilderness Areas
- Avoidance of Controversial Sources including Illegal Logging
- Avoidance of Controversial Sources including Fiber Sourced from Areas without Effective Social Laws
- Legal and Regulatory Compliance Forestry
- Research, Science, and Technology to support forestry research, science, and technology, upon which sustainable forest management decisions are based.
- Training and Education.
- Community Involvement in the Practice of Sustainable Forestry Public Land Management Responsibilities



- Communications and Public Reporting
- Management Review and Continual Improvement

The Sustainable Forestry Initiative program guides the forest management activities of its program participants, including forest products companies, and state and county forest lands in Minnesota.

Through the Minnesota SFI Implementation Committee, SFI program participants demonstrate their commitment to sustainable forest management by improving forestry practices on their own forestland, and by promoting sustainable forestry practices with family forest landowners, foresters and professional loggers.

**For more information on the SFI,
visit www.sfiprogram.org**

Owning a Woodland 101: Having a Plan

Your woodland is more than “just trees.”

Trees take a long time to grow; the decisions you make today may have long-term impacts on the forests of tomorrow, as well as the wildlife, the water quality, and the recreation associated with them.

Your decisions regarding your forested land will be influenced by many things, including your family situation, income needs, philosophy about land ownership and the environment. You also have to consider your resources, skills, and time constraints. Then you can sit down with your professional forester to create a flexible plan that you and your heirs can follow to reach your goals for your forest, while safeguarding the environment.

Where do I begin?

A forester can assist you by taking an inventory of your forest resources. The inventory will identify your land's features such as timber, wildlife habitat, water resources, or any special sites that you may want to consider in your management plan.

The management plan will help you achieve your goals. Generating income through timber production need not be in conflict with environmental concerns. By having a flexible plan, it is possible to compatibly link choices such as wildlife food and habitat with timber production.

Ask yourself the following:

1. Do you want to observe wildlife in your forests?
 Yes No
2. Do you want to hunt in your forest?
 Yes No
3. Do you want your forest to produce income?
 Yes No
4. Will you use your forest for recreation?
 Yes No
5. Is the beauty and health of your forest important to you?
 Yes No

The health of your forest may depend on active forest management. It is a misconception that a healthy forest is always an untouched forest. A forest management plan is the road map to successful long-term management of your forest.



It is a misconception that a healthy forest is always an untouched forest.

Elements of a Management Plan

Planning is not a single event, but a series of continuous steps leading to a desired goal. The plan can be as detailed (short-term recommendations) or as general (long-term recommendations) as you desire. The first step is to determine your priorities, set goals and identify the management activities to reach those goals.

A professional forester can assist you in identifying your goals for your forest land. Your goals should be written and revisited periodically.

Statement of Landowner Goals

A well-written plan should begin with a statement of your goals for ownership. Long-term goals are achieved through specific management activities such as **timber stand improvement**, stand **thinning**, timber harvests, **site preparation**, and **regeneration**.

Property Map

Your plan should have a map and/or airphoto showing the location of the property, access, boundaries, timber stands, and other key features.

Protection and Maintenance

Include a description of your activities relative to the following key protection and maintenance requirements:

- Marking and maintaining property lines and corners
- Access such as roads, trails and gates
- Fire protection practices
- Insect and disease inspection, protection, and salvage
- Timetable for review and update of the management plan

Stand Descriptions and Inventory Data

Each stand should be described and correctly marked on the property map and/ or the airphoto. Soil types, number of **acres**, tree species, stand age, **stocking** (trees per acre), range of tree diameters, average tree height, standing timber volume, tree condition and health, and unique water quality or drainage.

Continued on page 4



Well-managed forests generally have several common features:

- *Tree species are suited to local climate, soils, and markets*
- **Crop trees** with adequate room to grow
- *Minimal numbers of damaged, diseased, or insect-infested trees*
- *Protection from fire and grazing*
- *Easy access*
- **Best Management Practices (BMPs)** to prevent erosion and sedimentation to protect water quality
- *Boundaries and corners clearly marked and maintained*
- *A written forest management plan that guides activities*

Forest Management Prescribed Activities

A forest management plan applies your goals to your forest **stands** and then creates a timetable of planned activities.

These activities may include:

- Timber harvests
- **Reforestation** practices: **site preparation**, tree planting, natural regeneration recommendations
- Commercial timber **thinning**
- Pre-commercial thinning
- Weeding and/or **timber stand improvement (TSI)** practices
- Establishing and maintaining wildlife management practices
- Installing and maintaining water quality protection practices (BMPs)
- Enhancing the stand's aesthetics, recreational use, diversity of plants and wildlife species and appeal to wildlife.
- Other: requirements to comply with federal/state regulations such as the **Endangered Species** Act, Clean Water Act, state water quality laws, etc.

Plans vary, depending on who helps you prepare one. But several key points apply to all plans:

- No plan is set in stone and can be modified at any time. The plan you develop is an operating plan which, based on current conditions and facts, will help you in meeting your goals.
- Plans are unique to each owner and forest.
- Plans should be reviewed and updated at least every 5 years or as conditions change or the objectives of the owner(s) change. All owners and heirs, if possible, should be included in developing and modifying a long- or short-term plan to ensure continuity of forest resource management activities.



So, Who Can Help Me With a Management Plan? *Choosing a Professional*

As in any profession, every natural resource professional 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 forestry professionals.

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.

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



A Plan: To Harvest

One objective of many landowners is timber production. Even lands managed primarily for wildlife, recreation, or water protection can produce timber.

There are three primary reasons why you may decide to have your timber harvested.

#1 A harvest may be prescribed in your overall forest management plan to help you achieve your ownership objectives. Timber harvesting is one of the landowner's major management tools. It is useful for accomplishing objectives such as improving the health and vigor of the forest, promoting natural **regeneration**, developing wildlife habitat, controlling **stand** density, releasing an established understory from undesirable overstory trees, altering species composition, establishing planting areas, creating vistas and trails, and developing certain types of recreational activities.

#2 The woodland may be used as a source of income.

#3 Timber may be harvested to salvage its value. Such a salvage harvest is done to reclaim some of the value of trees that have been damaged to such an extent that they will not recover or when the potential for such damage is extremely high. Wind, ice, snowstorms, fire, insects, and disease could cause enough damage to justify a salvage cutting.

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 well-educated timber harvester. To identify logging professionals, check the listings of the Minnesota Logger Education Program (MLEP).

Marketing Your Timber

A professional 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
- how the timber you are not selling will be protected
- responsibility for damages

A professional 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

Forest Management Inc.

Private Forest Harvest Plan

Landowner: Tom Smith

Logger: Dave Kutax Logging Inc.

Loc.: NWNW Sec.37-T71NR2W



Scale: 1/4 Mile

The unit to be harvested is bordered by Twp. Rd X on the north, Twp. Rd Y on the west, and a flagged line on the south and east (designated in yellow on the photo map).

This harvest is part of an overall management plan for Mr. Smith, part of which calls for the creation of a permanent visual buffer along Rd. X, which is a well traveled tourist route to a nearby lake.

The area being harvested consists of over-mature aspen, with some budworm infested balsam fir. A small plantation of jack pine and white spruce exists in the northwest part of the harvest unit, and is not to be entered while harvesting the rest of the area.

Harvest Requirements

- Cutting to be done in summer only when the ground is dry. No rutting of the soil allowed. This will allow the best chance of converting the site to **conifer** (White spruce is to be planted after harvest.).
- Cut all merchantable trees over 4" diameter at breast height. Trees under 4" **DBH** can be left if they are healthy and show no damage from budworm.
- All material cut shall be utilized to a 3" top diameter.
- All merchantable products are to be skidded to a small **landing** adjacent to Twp. Y, where they can be safely processed and loaded onto trucks for delivery to markets.
- Tops and limbs are to be placed in small piles to allow the best chance to plant seedlings without further treatment.
- There is a creek that flows along the south boundary of the harvest area. The ribbons designating this boundary have been placed to allow for **Riparian** Management Zone requirements. The Forest Management Guidelines are incorporated into harvest requirements. The Guidelines should be reviewed by all parties before cutting begins.
- This page shows only the on the ground harvest requirements and is to be given to all operators. Measurement of cut volumes, values of each species, method of payment, insurance requirements, and other contractual elements are found on other contract pages.



Questions to Ask When Choosing a Logger:

Questions to Ask Loggers:

- Are you a member of the Minnesota Logger Education Program? What is your membership number?
- How long have you been in business? How long have current crew members been with you?
- Are you and your employees covered by workers' compensation and liability insurance? What are the dollar limits, and what kinds of accidents are covered? Will you provide me with certificates of workers' compensation and liability insurance coverage?
- What kinds of equipment do you use? How does it match the conditions and requirements of my site?
- Do you handle the entire logging process, or use subcontractors for part of the work? If the latter, how do you ensure that your quality goals are met?
- What types of roads and **skid trails** do you normally construct? What equipment do you use to build them? How will my skid trails, **landings**, and haul roads look when you have completed the logging operation?
- How would you handle a dispute over timber cutting practices? What options do I have if my or my neighbor's property is damaged?
- What **Best Management Practices** or Forest Management Guidelines do you normally implement? Which ones would be needed on my forest?
- Can you supply me with references of previous jobs and to some of the mills you deal with?

Questions for a Logger's References:

- Did the logger fulfill verbal and written obligations for such things as road restoration, fence repair, and cleaning up trash?
- Was the logger willing to listen to your concerns and answer your questions directly?
- Did the logger get the job done efficiently and within the specified time limit? If not, why not? (Be aware that bad weather can cause unavoidable delays.)
- Did the logger take pride in his/her workers and equipment? How about in previous jobs? Was the logger willing to show you any of these?
- Was the logger careful to avoid damaging other trees and land improvements (gates, fences, culverts, etc.)? If there was damage, did he/she make appropriate repairs?
- Did the timber harvester seem concerned about environmental matters, such as wildlife habitat, water quality, and visual concerns?
- Did he or she stop or modify operations appropriately during wet weather?
- Did the logger communicate well with you? Did the logger explain, for example, any necessary changes in the operation? Was he or she flexible in responding to your needs? How were the logger's relations with foresters and neighboring landowners?
- In what shape did the logger leave your skid trails, haul roads, and landings?
- Would you use the logger for future timber harvests or recommend them to your neighbors and friends? Why or why not?

Internet Sites with Timber Sale Contract Examples

Contract Sample One
www.mnsfi.org/contract1.htm

Contract Sample Two
www.mnsfi.org/contract2.htm

Contract Sample Three
www.mnsfi.org/contract3.htm

Minnesota Logger Education Program

The Minnesota Logger Education Program (MLEP) was established in 1995 and provides professional assistance and training to Minnesota's logging community in the areas of sustainable forest management, business management, transportation and safety. MLEP members are required to complete 24 hours of classroom and field training their first year and maintain 12 hours of continuing education units each year thereafter.

Often, the only forest management advice a family forest landowner receives is from a logger. The training and experience MLEP members possess can help facilitate wise and sustainable timber harvest practices. If you are a woodland owner and are considering harvesting some or all of your timber, you should have a forest management plan and contract with an MLEP member logger for your harvesting needs.



Minnesota Master Logger Certification Program

MLEP's Minnesota Master Logger Certification program provides added confidence to customers and the public that the person performing a harvest has the education and experience to do the job correctly. It is an independent, third-party audit of a logging business's harvest, safety and business practices. Logger certification provides formal recognition of those logging businesses who have met the high standard required for certification.

Demand for certified forest resources is increasing. Timber harvested from family forestland by Minnesota Certified Master Loggers can be marketed to mills and other customers as certified wood. To receive a free directory contact MLEP at (218) 722-5442.

Tree Farm

The American Tree Farm System® promotes the growing of renewable forest resources on private lands, while protecting environmental benefits and increasing public understanding of all benefits of sustainable forestry. The American Tree Farm System has over 90,000 family forest owners who manage 26 million **acres** of woodlands in 46 states. Since 1941, Tree Farm has advocated for landowners and recognized them for their commitment to responsible land stewardship.

The American Tree Farm System's green and white sign highlights what the program stands for: Wood, Water, Wildlife, and Recreation. One of the benefits of participating in the Tree Farm program is the availability of information on forest management practices that help you - as a woodland owner, create wildlife habitat, maintain water quality, and engage the younger generations of your family in respect and love for the land.

The Minnesota State Tree Farm committee includes landowners, foresters, government agencies, forest industry and others.



To become a Certified Tree Farmer, contact the Minnesota Tree Farm Committee. Landowners are required to meet the American Forest Foundation's Standards (available at www.mnsfi.org/affstandard.htm). The Standards are a guide for developing a management plan and addressing all the important aspects of managing your forest responsibly. A written forest management plan, specific to your goals and property, is developed for your participation in the American Tree Farm System.

The American Tree Farm System partners with the Sustainable Forestry Initiative® (SFI) to connect responsible family forest owners with SFI certified organizations. Any wood harvested from American Tree Farm System certified lands can be counted as certified materials by SFI certified organizations. SFI and the American Tree Farm System collaborate to provide education on the benefits of practicing sound forestry.

Contact Minnesota Tree Farm at www.mnsfi.org/treefarm.htm; or call (218) 722-5013.

The Act of Good Forestry

Reading about forest management and developing your 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 airphotos, 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 timber harvester who is a member of the Minnesota Logger Education Program.

Voluntary Guidelines - pg 11

Guidelines at Work - pgs 12 & 13

Minnesota is unique in the nation. It has developed forest management guidelines that are voluntary, and yet adopted by nearly all public and private land managers across the state.

Silvicultural Systems - pgs 14 & 15

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

Forest Management for Wildlife pgs 16 - 19

Some type of management can be done in every forest type to improve it for wildlife habitat.

Planning Across Landscapes pg 20

Forest health and productivity is enhanced by shared goals and objective

Using Airphotos pgs 21 & 22

Tax Incentives pg 23

Minnesota's Endangered & Threatened Species pgs 24-29

Minnesota's Invasive Species pgs 30 - 33

*The range of practices used over the life of a forest is called the "silvicultural system."
It is the linking of timber harvesting, **regeneration** and intermediate **stand** management treatments in a logical sequence to meet your goals and objectives.*

Minnesota's Voluntary Site-level Forest Management Guidelines



Regardless of the specific reasons why you own your forest land, 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** (BMP).

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, resource managers and loggers when conducting any forest management activity. When planning your forest management activities, work with your resource manager and logger to determine which combination of Guidelines best fit for 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:

2003 Upper Buford Circle • St. Paul, MN 55108 • 651-603-0109

or

www.mnsfi.org/mfrc.htm

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 and How They Can Help Manage and Sustain Forest Lands

The following photographs represent examples of some of the timber harvesting and 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 inclusion or seasonal pond.



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 the logger, landowner, and resource manager 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:

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**.



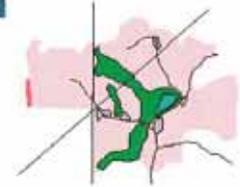
Road alignment:

Reduce visual penetration into clearcuts or **landing** areas with appropriate curves in the road alignment.

Guidelines at work



- A. Harvest design includes irregular edges and visual considerations.
- B. Streamside filter strips maintain water quality
- C. Wetland buffer strips maintain water quality
- D. Individual leave trees for wildlife
- E. Leave trees/islands for wildlife
- F. Undisturbed snowmobile trail
- G. Landings/open areas seeded for wildlife habitat



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, leaving tree clumps, and dispersing the **slash** left on a harvest site.

Water crossings:

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.

Riparian Management Zones (RMZs):

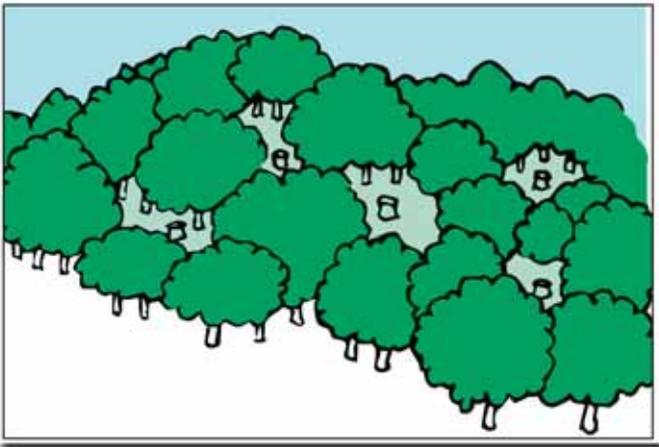
Create or retain at least four 'leave' trees (a leave tree is a live tree retained on a site) per acre within the RMZ. A **Riparian** Management Zone is the vegetated area bordering rivers, lakes, and streams that is considered to require special management considerations. Use sound forest management practices where insect and disease concerns exist.

Forest Management (Silvicultural) Systems

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

Harvesting alters the forest in three principal ways. It changes the understory light environment and climate, it alters understory vegetation, and it disturbs humus and soil on the forest floor. Different harvest methods allow different amounts of sunlight to reach the forest floor and regenerating trees.

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

The selection system can be adapted to encourage the growth of different species. Cutting individual mature trees in the **canopy**, (an adaptation called **single tree selection**), encourages the growth of **shade-tolerant** species, such as maple, beech and hemlock, which are growing in the understory. Cutting groups of trees, (an adaptation called the **“group selection system”**), encourages the growth of shade intolerant species, like poplar, and mid-tolerant species, like oak, basswood, cherry and white pine. The group selection system creates sunny gaps in the canopy where these species can grow.

The results

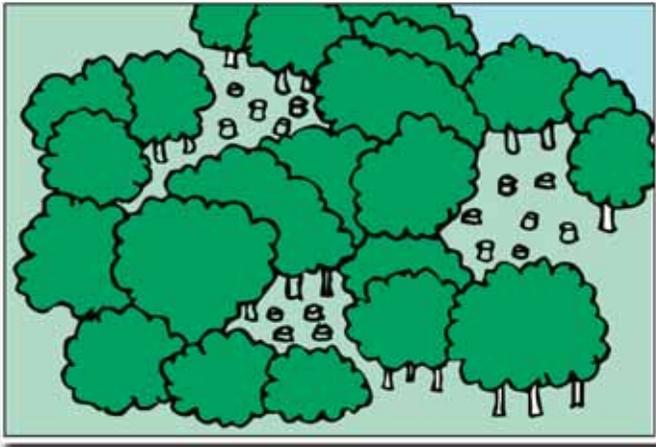
This system maintains a diverse, all-aged forest with a wide range of species of different sizes and ages. These natural-looking forests provide continuous supplies of wood, fuelwood and other forest products, as well as habitat for wildlife and attractive areas for recreation.

SHELTERWOOD SYSTEM

How it works

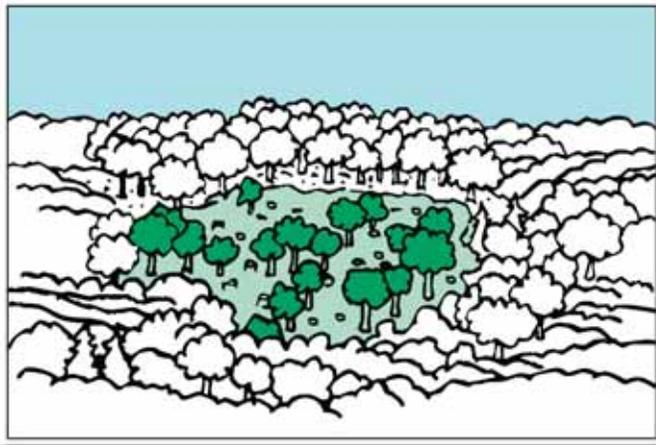
Mature trees are harvested in a series of two or more partial cuts. The cuts stimulate the germination and rapid growth of a new forest in the shelter and the shade of mature trees. The mature trees usually provide seed for regenerating the site, but sometimes **regeneration** is achieved by seeding, 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.

This system can involve two different kinds of harvests:



1. Preparatory cut

The preparatory cut is a thinning operation that gives selected trees room to grow large **crowns**. Trees with large crowns provide more seeds than trees with small crowns. A preparatory cut is only done if there is a shortage of trees with large crowns on the site.



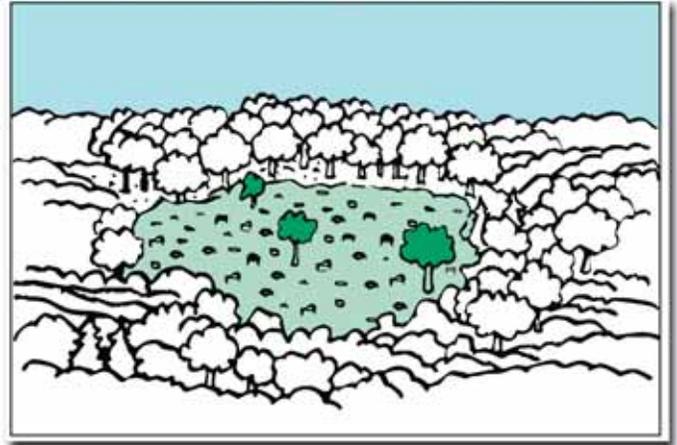
2. Removal cut

The removal cut harvests all the mature trees. It can be done as a single harvest or as a series of partial harvests. The removal cut is conducted after a dense carpet of **saplings** (trees taller than 1.5 metres) is established in the shelter of the mature trees. By giving the saplings full sunlight, the removal cut encourages the rapid growth of a new forest.

The results

The shelterwood system produces an even-aged, fast growing forest. It favors mid-tolerant shade tree species, such as oak, white ash and white pine, which can germinate in shade but later require some sunshine to survive.

CLEARCUT SYSTEM



How it works

All the trees are harvested in one cutting operation. In a modification of the **clearcut** system, called the "seed-tree method," individual trees or groups of trees are left standing to provide seed for **regeneration**. The **seed trees** are large-crowned (capable of producing large quantities of seeds) and able to survive in windy, exposed conditions.

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 results

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.



Photo courtesy: Ruffed Grouse Society

Forest Management Practices for Wildlife

FOREST HARVESTS		
Forest Management Practice	Wildlife Habitat Enhanced	Favored Wildlife
Seedtree & Shelterwood	Removes the majority of mature trees, leaving those needed to produce seed and provide shade for regenerating a new forest. Following the harvest, the site favors grass, herb and shrub growth.	Favors the same wildlife as <i>clearcuts</i> . Provides some habitat for tree-dependent wildlife species such as woodpeckers and forest roosting bats.
Selection Cuts (Group & Individual Trees)	Creates small forest openings intended to regenerate small areas of forest or improve remaining trees. Provides a mixture of grasses, herbs, and shrubs, intermixed within a mature forest. Can provide for a diversity of tree species, age and size.	Benefits bluebirds, hooded warblers, bats, mice, gray and red fox, black bear, deer and other wildlife attracted to forest openings.
Clear Cuts (Group & Individual Trees)	An area of forest in which all mature trees have been harvested. The site remaining is an early successional forest that favors grass, herb and shrub growth. The benefits to wildlife can be influenced by the size, shape, and distribution of clearcuts, and the use of streamside management and other buffer zones.	Benefits forest game species, small mammals, ground-nesting/feeding birds, and other wildlife such as ruffed grouse, doves, yellow warblers, chestnut-sided warblers, rabbits, rodents, reptiles, turkey, kestrel, woodcocks, deer, moose and black bear.

SITE PREPARATION

Forest Management Practice	Wildlife Habitat Enhanced	Favored Wildlife
Windrows	Provides cover and travel corridors for wildlife across newly harvested timber stands . Accumulation of debris and seeds quickly produces herbs and woody plants valuable for wildlife food and cover.	Small mammals, reptiles, amphibians, deer, and many bird species.
Timber Thinnings	Increases sunlight reaching the forest floor, stimulating the growth of grasses, herbs, shrubs and other woody vegetation. Increases vertical habitat diversity.	Benefits a wide array of wildlife and birds, including ground foraging mammals, deer, turkey, chestnut-sided warblers, Eastern wood pewees and scarlet tanagers. Provides open flight space for aerial species such as bats, owls and flying squirrels.

TIMBER & WILDLIFE STAND IMPROVEMENT PRACTICES

Prescribed Burning	Greatly enhances habitat diversity across the landscape by stimulating growth of grasses and herbs valuable to wildlife. Also increases insect abundance, a primary source of food for many wildlife species. May temporarily reduce habitat diversity from the ground to the canopy , or vertical habitat.	Benefits a wide array of wildlife such as small mammals, deer, turkey, and a variety of songbirds.
Salvage Cuts	Creates forest openings that increase overall forest habitat diversity and stimulates the production of native grasses and herbs valuable to wildlife.	Seed, forage, and insects produced in these areas are key wildlife food sources.

Photo by Carl Vogt



ADDITIONAL FOREST HABITAT IMPROVEMENTS FOR WILDLIFE

Forest Management Practice	Wildlife Habitat Enhanced	Favored Wildlife
<p>Forest Openings (logging decks, woods roads, timber harvests, timber <i>salvage cuts</i>, utility rights-of-way, firebreaks)</p>	<p>Increases production of native grasses and herbs valuable to wildlife. Openings can be planted as wildlife food plots.</p>	<p>Seed, forage and insects produced in these areas are key wildlife food sources. Excellent sites for nesting, brood rearing and feeding for a variety of wildlife such as turkey, woodcock, bear and deer. Excellent foraging habitat for bats.</p>
<p>Riparian Management Zones (RMZs)</p>	<p><i>Riparian</i> forests and streambanks are generally moist fertile sites with a predominance of woody plants, <i>conifers</i> or hardwoods, providing mast, cavities and travel corridors for wildlife. RMZs act as buffers that protect water quality in streams for fish and other aquatic life.</p>	<p>Enhances bird diversity by providing feeding and breeding areas for many migratory birds. Width is important and varies for different wildlife species.</p>
<p>Forest Corridors</p>	<p>Often connects forested habitats that are separated. Provides forested buffers through harvested <i>stands</i> which maintain wildlife food and cover. Also serve as wildlife travel corridors.</p>	<p>Benefits terrestrial wildlife like deer, bear, squirrels and other species with limited mobility.</p>
<p>Mast Trees & Shrubs</p>	<p>Retaining a variety of fruit-producing trees and shrubs provide essential food sources for wildlife throughout the year.</p>	<p>Benefits most wildlife.</p>
<p>Snags</p>	<p>Provides both food and cover for insect-feeding and cavity-dwelling wildlife.</p>	<p>Cavity-dwelling and insect-feeding wildlife such as Eastern bluebirds, chickadees, red-headed woodpeckers, loggerhead shrikes, northern flickers, owls, several species of bats, martens, raccoons and squirrels.</p>
<p>Woody Debris</p>	<p>Provides food (fungi and insects) and cover. Returns nutrients to the soil and provides a microhabitat for new plant growth valuable for wildlife.</p>	<p>Variety of wildlife including salamanders, toads, turtles, snakes, mice, shrews, skunks, opossums, chipmunks, Rufous-sided towhees, fox, deer and black bear.</p>
<p>Brush & Rock Piles</p>	<p>When cover is limited, provides shelter for certain wildlife.</p>	<p>Rabbits, small mammals, reptiles, and amphibians.</p>
<p>Leave Strips</p>	<p>Provides buffers between timber harvest sites that maintain wildlife food and cover. Also serves as wildlife travel corridors.</p>	<p>Most wildlife.</p>
<p>Forest Roads</p>	<p>Openings along forest roadsides or entire logging roads can be managed for native grasses and herbs or planted in wildlife food.</p>	<p>Grouse, turkey, rabbits, deer and other wildlife.</p>

Forest Management Practice	Wildlife Habitat Enhanced	Favored Wildlife
Highly-Valued Areas	Inventory and protect existing habitats valuable to wildlife before beginning forestry practices. Examples are bays, bogs, swamps, beaver ponds, other wetlands, coves, cave entrances, cliffs, talus, fruit-producing shrubs and trees, old home-sites, thickets that provide cover, and other unique habitats.	Most wildlife.
Artificial Nesting and Denning Structures	Provides nesting and denning cavities where natural cavities are limited or absent.	Squirrels, raccoons, wood ducks, Eastern bluebirds, bats and other cavity nesting and denning wildlife.

Photo by Scott Sharkey



Planning Across Landscapes

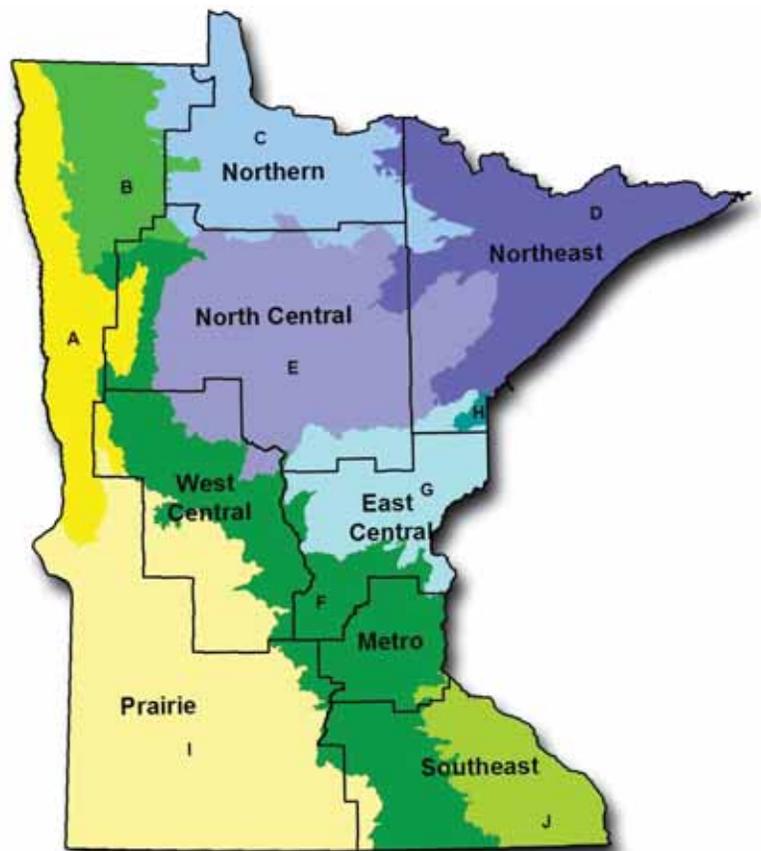
The word 'landscape' evokes images of vast stretches of land, hurrying by us as they are viewed through a car window. The word also evokes images of that yard, right outside our front and back doors, that needs some special attention in the spring of the year.

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 grass-roots 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

Finding Maps and 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 natural resource professional or logger about a possible timber harvest.

This article reviews a few free sources of quality airphotos and mapping tools for your Minnesota property.

Finding a Quality, Current Airphoto:

MN DNR's Airphotos Online (www.mnsfi.org/airphotos.htm) is your source. From this site you can view or save a low- or medium-resolution airphoto of your property. The site allows you to search by place name and will recognize names of towns, lakes, rivers, state parks, or even public land survey (township, range, section) identifiers. Once you find the photo you want, you can view or save the photo to your hard drive. For most purposes though, you may want to order a high-resolution airphoto.

A few tips: To save a low- or medium-resolution photo to your hard drive, right-click anywhere on the photo, then select "Save image as...." On screen, photos are always oriented with north at the top. But once you print the photo out, it's handy to know that the photo number is always printed on the north end of the photo.

Continued on page 22

Airphoto search

Search for airphotos

Place:

Type:

Search Using:

- **Place names**
Enter the name of a city, park, lake, etc.
- **Public Land Survey (PLS)**
Enter a PLS identifier of the form t999r99s99.
- **Coordinate Pairs**
Enter a coordinate pair such as you might obtain from a GPS receiver. Use either latitude and longitude or UTM coordinates.

*Your search options on
DNR's Airphotos Online site.*



Finding Historic Airphotos:

Historic airphotos can also be of great interest, helping you to see how your land has changed over time. DNR also has a similar, but more complex, tool for historic airphotos called Landview (www.mnsfi.org/landview.htm). To use it, visit the link above and look on the left-side menu for "Historic air photos." Check the box(es) corresponding to the years you'd like to see, then zoom in or out to find photos in your area of interest.

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/googlemaps.htm). A sample map, created by a landowner, is at right.

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 natural resource professional 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.

Airphotos 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.



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

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

Tax Incentives

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 forest land. 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

For more information visit
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. Contact information for you local stewardship plan writer can be found by visiting
www.mnsfi.org/stewardship.htm

The Endangered, Threatened and 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. As 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 NPCs 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

Bald Eagle (*Haliaeetus leucocephalus*)

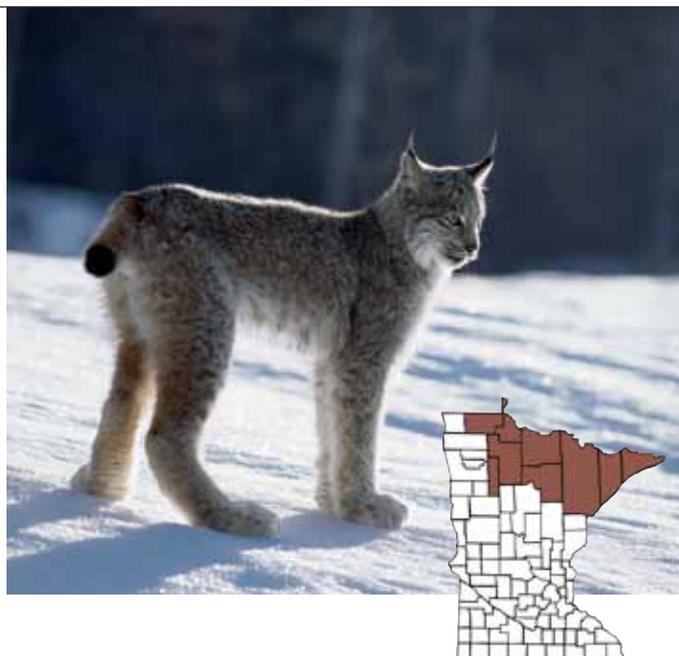
Federal: Protected under Bald & Golden Eagle Protection Act
Minnesota: Special Concern

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 **Minnesota:** Special Concern

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. The U.S. Fish and Wildlife Service is currently working on a proposal that recognizes the recovery of the gray wolf in Minnesota.



Blanding's Turtle (*Emydoidea blandingii*)

Minnesota: Threatened

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

It nests in late May-June, with hatching occurring in September, and over-winters 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*)

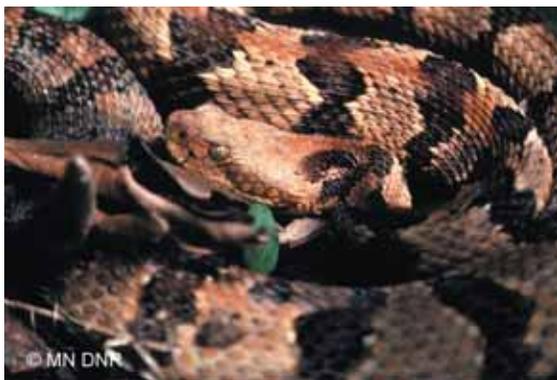
Minnesota: Threatened

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 streambanks 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: Endangered



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 site, 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 two meters 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.



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 lily 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 rarer 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: Not Listed

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. This tree does not have legal status on the federal or state level, but Minnesota is on the western edge of this species' range.



Butternut (*Juglans cinerea*)

Minnesota: Special Concern

The butternut does not have legal status on the federal or state level, but it is considered rare in Minnesota because it is found only in certain locations. 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's are forests with values that are considered to be of outstanding significance or critical importance.

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.

The savanna community most likely to be encountered during forest management activities is

Jack Pine - (Yarrow) Woodland

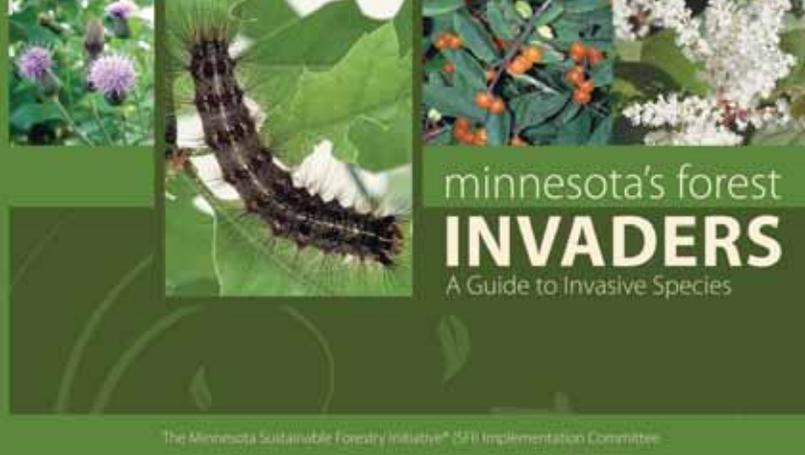
Global rank - G2

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 of this community and detailed information on its distribution, 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

The Minnesota Sustainable Forestry Initiative® (MSFI) Implementation Committee

- 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, a local state forestry office, or county extension agent.

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, local state forestry office, or county extension office.

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 wood-boring beetles (Buprestidae). The adults are small, iridescent green beetles that live outside of trees during the summer months. The larvae are grub or worm-like and live underneath the bark of ash trees. Trees are killed by the tunneling of the larvae under the tree's bark. The tree host suffers extensive damage to its vascular system, depriving its *crowns* 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 transportation 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.

GYPSY MOTH

Where is it from? Where is it af?

The gypsy moth is an invasive forest pest from Europe. It is one of the most damaging tree defoliators in the U.S. Currently gypsy moth populations are low in Minnesota. The Minnesota Department of Agriculture, over the past many years, has made possible the eradication of small infestations of gypsy moth, keeping Minnesota essentially free of gypsy moth.



What does it look like? What does it do?

Gypsy moths have five pairs of blue dots and six pairs of red dots down its back. Gypsy moths move to bark cracks or other hiding places during the day. Aspen and oak top the list of over 500 preferred host species of the moth. Gypsy moth caterpillars feed on leaves of **deciduous trees** and are present in early-mid summer and can completely defoliate a tree. Repeated defoliation can lead to the death of many trees, changing the mix of tree species and affecting dependent wildlife.

How do we stop it?

Managing forests for **stand** diversity is the best means of limiting any insect defoliation. Encourage a mix of tree species, forest types, ages, and sizes. If you see what you suspect are gypsy moth egg masses, report them to the Minnesota Department of Agriculture, a local state forestry office, or county extension agent.

AMUR MAPLE

Where is it from? Where is it af?

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 treatment include cut stump treatment with glyphosate; cut stump or basal bark spray treatment around the stem with triclopyr.

GARLIC MUSTARD

Where is it from? Where is it af?

This European exotic occurs now in 27 midwestern and northeastern states and in Canada. It is on the Minnesota Department of Agriculture's Prohibited Noxious Weeds list 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. It's 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. Flowering stems can be cut at ground level. If there are larger patches, prescribed burning is one tool. Herbicide treatments are 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 being used where garlic mustard is found as the seeds remain viable for several years.

HONEYSUCKLE

Where is it from? Where is it af?

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 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 af?

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. Although the nursery industry quit selling it in the 1930s, it is still found in older neighborhoods throughout Minnesota. Glossy buckthorn (*Frangula alnus*), also from Europe aggressively invades wetlands including acidic bogs, fens and sedge meadows.



What does it look like? What does it do?

Common buckthorn is 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 cover with a tin can or black plastic to prevent re-sprouting or 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.



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.



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 are much smaller. Stems and leaves have short, recurved prickles. It typically grows in disturbed areas such as forest edges, 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 wet-

lands. 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 is spreading throughout Minnesota and is on the Minnesota Department of Agriculture's Secondary Noxious Weeds List. 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.



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. 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. Its brownish seeds with small tuft of bristles, are dispersed by rodents, livestock and commercial hay. Seeds are viable in the soil for 7 years.

How do we stop it?

A number of control methods are employed: Mechanical: Early detection and pulling; mowing as needed so plants cannot go to seed. Prescribed burning: only very hot burns are effective and they may also damage native plants. Chemical: Applying selective herbicide clopyralid during bud growth in early June gives best results, but can also affect native plants of the sunflower and pea family. Biological: Thirteen insects identified and two seedhead flies have shown some effectiveness.

THISTLE

Where is it from? Where is it at?

A number of non-native thistles occur in Minnesota, including bull, Canada, plumeless, and sow. 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. The Canada thistle is on the MDA Prohibited noxious weeds 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 will weaken the roots. Prescribed burning will set thistle back, but also stimulates seed germination. Burning should occur consecutively for three years. Spot application of herbicides during the bud stage can be effective after burning. Biological agents, such as stem weevil, bud weevil, and stem gall fly are commercially available.

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.



What does it look like? What does it do?

Leafy spurge has a smooth stem and stands about 2-3-1/2' 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. It rapidly invades primarily non-cropland disturbed environments, such as roadsides. It is a threat primarily to moist and dry prairies and savannas, quickly displacing native plants. It is most aggressive in dry soil conditions where there is less competition from native plants.

How do we stop it?

It requires aggressive and repeated treatments to remove leafy spurge. Both chemical and biological treatments have been effective. Prescribed burning combined with repeated chemical treatment is effective. Root-boring beetles, four root-mining beetles, shoot-tip gall midges and grazing goats can be 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 savanna and woodland edge environments where it competes with native shrubs. 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 is common throughout the U.S.; in southeastern Minnesota it is found primarily in the southeast in prairies and oak openings.



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 for 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 listed as a noxious weed and a prohibited exotic species in Minnesota. It is illegal to possess, plant, transport, or sell purple loosestrife 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 or county extension agent. There may be assistance available to help in eliminating purple loosestrife.

COMMON TANSY

Where is it from?

Where is it at?

Common tansy was introduced to the U.S. from Europe for medicinal and horticultural purposes. It is still cultivated in gardens and is common along roadsides and abandoned farmyards in northern Minnesota and along the north shore of Lake Superior. South sloping open areas are most vulnerable. Common tansy is on the Minnesota Department of Agriculture's Secondary Noxious Weeds list in Minnesota.



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.

Forestry in the

As we enter the second decade of this 21st Century, new terms, innovative ideas, and special forestry interests emerge. The following terms, concepts, and management ideas are ones you will likely hear as you walk the walk, and talk the talk of private forest management in the woodlands of Minnesota.

You are encouraged to keep updated on these ideas; ask questions about them; and apply them to your woodlands if they are applicable and if they are compatible with your forest management plan's goals and objectives.

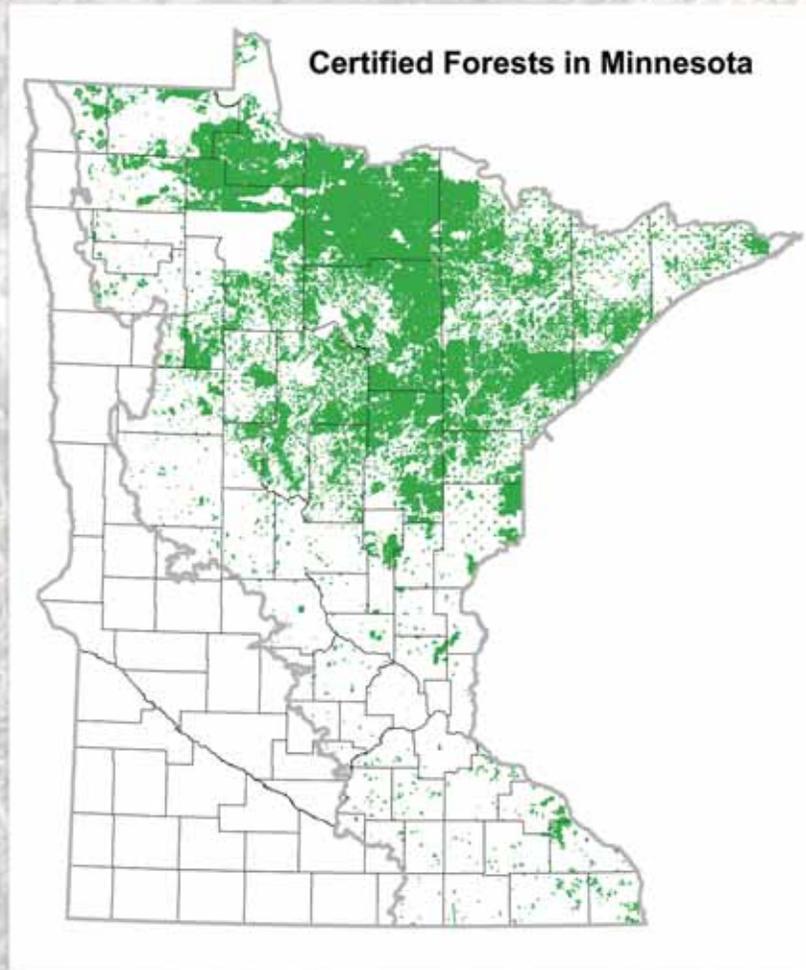
Certification

Forest **certification** is a voluntary process through which forest landowners elect to have their lands and management practices evaluated by a neutral auditor to the standards of a certification system. The two primary objectives of certification are:

1. Ensuring market access for certified wood products
2. Improving forest management

Many of the nation's paper, lumber, and furniture manufacturers, as well as retail companies have endorsed forest certification as a means of assuring customers that the products they are buying come from well-managed forests.

The Sustainable Forestry Initiative® and American Tree Farm System® are among the most common certification systems operating in Minnesota.



21st Century...

Biomass

What is Biomass?

Biomass, as a renewable energy source, refers to living and recently dead biological material that can be used as fuel or for industrial production.

Sources of woody biomass include (but are not limited to): logging residue (non-merchantable tops and limbs left over from a commercial timber harvest along with non-merchantable small-diameter trees and stems, dead standing trees and down logs), primary and secondary mill residue, dedicated energy crops, urban forest clearing material, land clearing material and brushland material.

The Minnesota Forest Resources Council (MFRC) has completed development of its biomass harvesting guidelines for forestlands, brushlands and open lands.



Available Woody Biomass Resources

Active Wood Energy Facilities Listings

www.mnsfi.org/facilities.htm

Biomass Harvesting Guidelines

www.mnsfi.org/bhg.htm

Existing Studies on Woody Biomass Utilization and Availability

www.mnsfi.org/availability.htm

Minnesota Woody Biomass Report

www.mnsfi.org/utilization.htm

Minnesota Woody Biomass Facilities Directory

www.mnsfi.org/directory.htm

For copies of biomass harvest guidelines, as well as copies of the entire Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers and Resource Managers, call or email:

Minnesota Forest Resources Council
651-603-6761
www.mnsfi.org/fmg.htm to download copies.

Glossary

Acre: An area of land containing 43,560 square 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 trafficking in areas of bare soil, maintaining streamside management zones, ensuring rapid revegetation following harvesting, and minimizing soil disturbance.

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.

DBH: The diameter of a tree stem at breast height (4.5 feet) above the ground.

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 (i.e., fire, harvest, insect outbreaks, etc.).

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

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

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.





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.

Sapling: A small tree, often defined as being between 1 and 4 inches diameter at breast height (DBH).

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.

Tolerant species: A species of tree that has the ability to grow in the shade of other trees and in competition with them.



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