

Beyond the Suburbs

A Landowner's Guide to
Conservation Management



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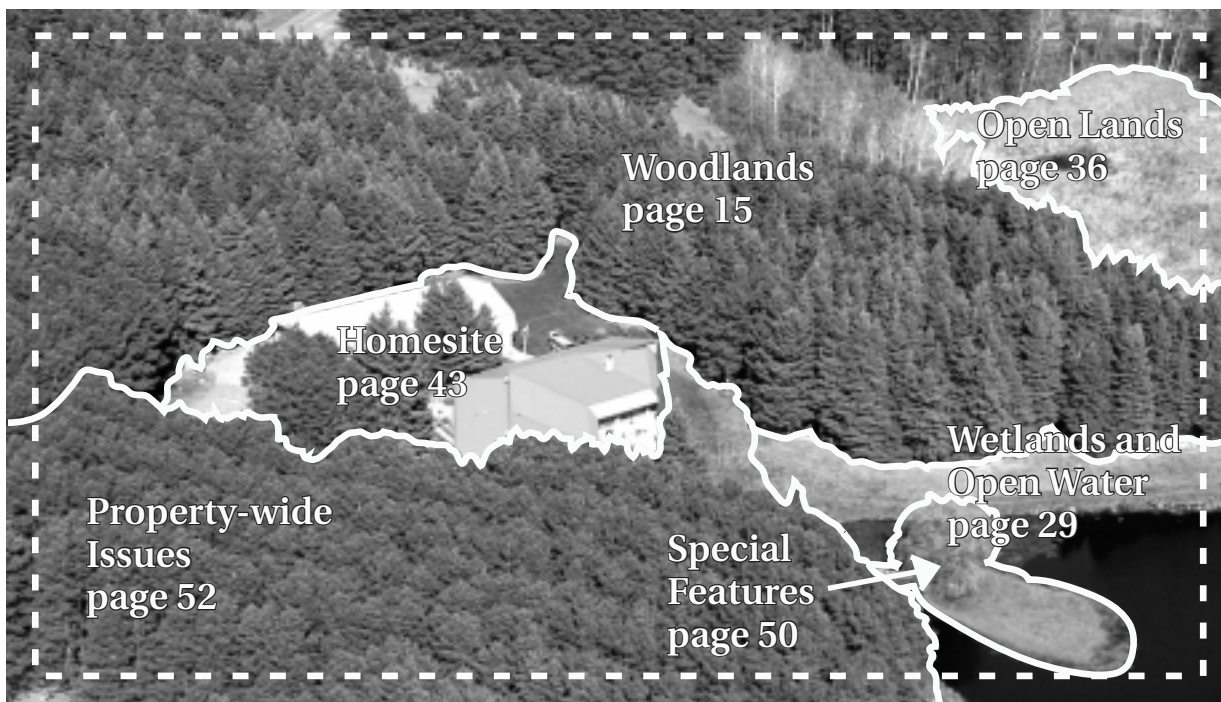
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I. Introduction

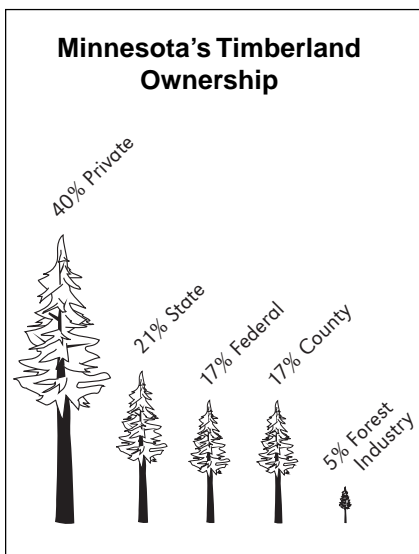
A. What About Minnesota's Private Forest Lands?

It is the 21st Century. With the advent of a “new” millennium, more and more Minnesotans are finding a piece of the land to call their own—be it a large suburban lot, 10-acre hobby farm, or 40 acres of recreational land “up north.”

As one of the private forest landowners in Minnesota who owns 40 percent of the state's woodlands, your forest management activities have a tremendous impact on the quality and productivity of the land. These private lands are critical in providing Minnesotans with beauty, homes for wildlife, sources of recreation, protection of watersheds, and a supply of fiber to forest industries.

A sobering statistic, however, is that the state's once-large parcels of forest and open land are being divided into smaller and smaller blocks. Approximately 800,000 acres of non-industrial private forest (NIPF) land is in parcels of less than 20 acres—and the number of these smaller parcels is quickly growing.

These facts prompted the publishing of this guidebook. Smaller acreages present challenges to effective sustainable management of these lands, including natural preservation, restoration, fire control, pest control, as well as conservation management, education, and outreach. Traditional one-on-one technical assistance to NIPFers is not possible, yet the actions of the NIPFer (or nonaction) can affect the overall resource base. The purpose of this guidebook is to give you—the private landholders of Minnesota—a tool for a better understanding of conservation management.



MN-DNR

B. This Guidebook

1. Why is it Published? Who is it For?

This guidebook is intended to:

- Inspire you as a landowner to apply conservation practices to your land. There are many things you can do with your property! This guidebook is written to help you accomplish your goals without the undesirable effects that could result from decisions made without basic conservation management principles in mind.
- Create a greater understanding of conservation practices and increase your knowledge of resources available to assist in conservation management activities.

2. Expectations

This guidebook is designed to:

- a) Help you connect your land-use activities to an understanding of the benefits and consequences of those activities—to you and the land around you.
- b) Help you establish realistic goals.
- c) Give you management alternatives for a variety of land features.
- d) Guide you in developing a plan of action.
- e) Guide you to additional resources.
- f) Link you to an ever-changing and updated web site.
- g) Answer the most commonly asked questions of landowners like yourself.

3. How to Use This Guidebook

Section II. The Big Picture (pages 4-6), will give you some basics about land management. The guidebook shows you a “biome” map and suggests you find approximately where you are located. You will read about interconnections and the advantage of looking “beyond” the boundaries of your property.

In Section III. Planning (pages 7-13), the guidebook explains how to assess your land and set your goals.

In Section IV. Land Management Options (pages 14-59), an image of possible land features will direct you to management alternatives. There is also a worksheet to help you in making decisions.

Finally, once you have established your goals, look to other resources in the “Yellow Pages” section of the guidebook for additional details on how to accomplish them (pages 60-64). Some of these resources are referenced in the guidebook as “See YP-73.” This refers to the numbered entry in the “Yellow Pages” at the end of the guidebook.

Who is this guidebook for?

Landowner profile:

Who are you?

You live on the edge between city and forest. You want to actively pursue conservation practices.

You are a landowner who has:

- One to 20 acres.
- A house and a garage sitting on what used to be:
 - a pasture.
 - a woodlot.
 - a cornfield.

You want to:

- plant trees;
- dig a pond;
- create wildlife habitat;
- restore wetlands;
- pasture three horses; AND
- have a safe place for your children to play.

You wish you:

- had 400 acres.
- could squeeze everything that you most love from nature out of the one to 20 acres you do have.
- accomplish everything “tomorrow.”

You may be one, or some, or “all” of the people described above. Perhaps you don’t fit any of these categories. However, if you own one to 20 acres and you want to take care of the land—perhaps make it a better place, and maybe even attract some wildlife—this guidebook is for you.

For your information...

The idea of looking beyond one’s own boundaries is part of the definition of a term resource managers use called “connectivity.”

Connectivity is defined as “the extent and means by which various resources connect.” Here are two examples:

- Migratory songbirds need continuous habitat corridors along rivers in order to make their migratory trips from the tropics to the northwoods of Minnesota (and back).
- The red-shouldered hawk, a species of special concern in Minnesota, needs large blocks of forested habitat for nesting and hunting. This hawk cannot survive in a landscape with only small “scraps” of wooded lands scattered here and there. By maintaining woodlands or other forest types that cross your property, you can retain this critical connectivity.

For more information on fragmentation, check out *Natural areas: Protecting a Vital Community Asset, a Source Book for Minnesota Local Governments and Citizens*, by Laurie Allmann. For more information on fragmentation, see YP-66.

II. The Big Picture

A. Interconnections

So, you think you are living “on the edge?” You probably are if you own one to 20 acres of land next to a community, or a lake, or in the country next to a forest or cropland. This is a special area, and an area of concern for resource managers and landowners. Human populations continue to grow and new residential subdivisions and commercial centers continue to develop. Wooded areas and farmlands are being fragmented; wildlife habitat for many species of animals is being lost.

If this “edge” is where you find yourself, and you want to restore, take care of, or recreate the natural world in your back yard—your problems are unique. Your property is but a piece of the puzzle that makes the “big picture” of a landscape. The activities you undertake on your property can benefit, or degrade, your neighbor’s land and their neighbor’s land.

1. Biome

Determine Your Biome!

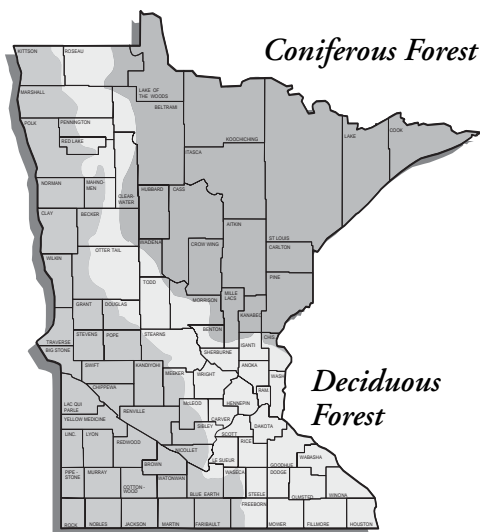
Minnesota is the meeting ground for three of North America’s eight major ecological regions (also known as “biomes”). Climate and geography largely define them. They are:

- deciduous forest biome in the middle of the state;
- prairie/grassland biome along the western border; and
- coniferous forest biome in the north.

Minnesota is fortunate to be such a meeting place of vegetation types. When combined with the state’s wealth of rivers and lakes a wide range of habitat conditions are available. And that means a tremendous variety of plants and animals!

Knowing approximately which biome your land is in may give you a start to understanding your land’s soils, plants, wildlife, and the land’s capabilities. As you look at goals and management alternatives, keep in mind which biome you live in. Some goals may not be possible because of your biome. For example, a pine windbreak won’t grow well in a prairie/grassland biome because of temperatures and rainfall characteristics. Similarly, plants suited to the deciduous forest biome may have a tough time in the coniferous forest biome. (The growing season isn’t long enough. See YP-1.)

Minnesota Biomes



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Prairie/Grassland

2. Neighborhood Yards; Neighborhood Landscapes

As you think about what you want on your own land, keep in mind that fences don't necessarily make good neighbors. Take a "landscape" kind of view; look beyond the boundaries of your land to your neighbor's land (and beyond that neighbor's land to his or her neighbor's land).

We may not be able to save the entire world (or even one butterfly species) on one acre or 20. For most of us, the property we own may be too small in itself to sustain more than a few individuals of any specific wildlife population. But you can increase the positive effects of your land management activities by looking across boundary lines into your neighborhood and surrounding community by taking a look at the "bigger picture."

You ARE unique (and so is your property). Fragmented areas (e.g., one- to 20-acre lots) have their own unique problems AND opportunities. Think of connected natural areas and open space as natural infrastructure. Usually we think of infrastructure as systems of transportation, communication, and power supply—systems we depend on for our daily lives. If one node, like a power station, is damaged, the power supply for an entire region can be affected.

Natural areas work the same way. Every living thing, including humans, depends on the systems of clean air and water, productive soils, and intact ecosystems. Natural areas are part of a larger system and must remain connected.

Anything you can do to retain, restore, reconnect, or recreate native landscape components on your property will be meaningful. It will be even more meaningful if those activities can extend beyond the boundaries of your own land.

3. Systems

Your land is part of a "system," or "ecosystem," with parts that interact. Living things (plants and animals) interact with each other and with their nonliving environment (water, soil, and topography). Each action, whether by human or nature, affects the system and interactions within it. On a large scale, like the blow-down of a forest that occurred in the Boundary Waters Canoe Area Wilderness in 1999, forest dynamics can be changed from those of an old forest to a young regenerating forest. A large-scale fire could further affect those dynamics.

What happens to one part of the ecosystem, even on a small scale like your property, can have a noticeable affect. For example, if you create a small landscaping pool, you will attract birds, frogs, and the insects they eat. Filling in such a pool could result in less wildlife visiting your property.

"Looking across the fence"

Are there regional or local recreational opportunities you can tie into such as trails? waterways?

Think about your neighborhood:

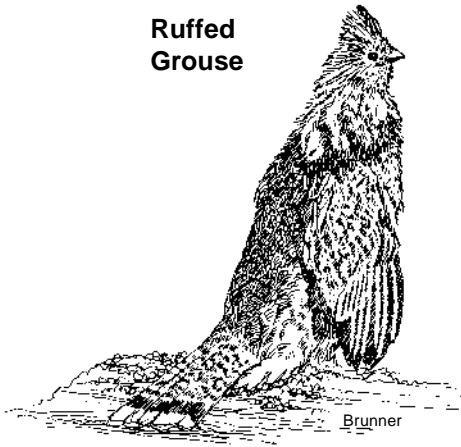
- Are there special natural features on your land that your neighbors do not have (a wetland with a variety of native wildflowers?)
- Do you have natural features in common with your neighbor (wooded areas that span several properties?)
- Does your neighbor have a key natural feature (like a lake or stream) that neighbors may want to rally around to protect or enhance?

Thinking at a "neighborhood level" can help you achieve your own goals (and your neighbors') by taking advantage of the amenities and features of one another's properties. "Neighboring" provides opportunities to protect and enhance larger blocks and corridors of woodlands than any single landowner can accomplish on his or her own.



WI-U, WI-DNR

Ruffed Grouse



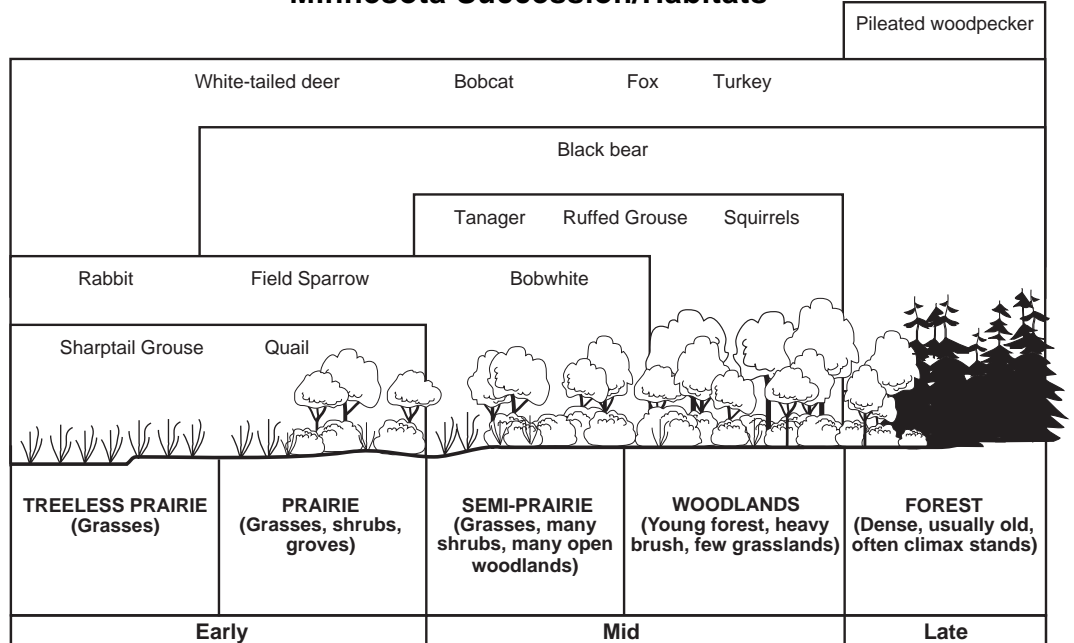
B. Ecosystems Are NOT Static!

Change is constant on the land. Nature does not stand still. It may be your intent to keep the woods as they are, but this is not nature's way. Without direct intervention, succession will continue, and insects and disease will take their toll, possibly altering the composition of the forest. Oaks may give way to maples; birch may give way to balsam fir.

This change is called "succession." Nature has a basic progression of plant and animal communities. Cleared land will grow grasses and forbs, which give way to shrubs and pioneer trees like aspen and jack pine. Eventually these pioneers give way to other trees like maple and red pine. However, both nature and people's activities can interrupt this progression. Windstorms, fire, and flooding can set back the progression closer to a situation like cleared land. Similarly, people can change and alter progression with such activities as logging and fire. So, whether you do something—or nothing—your land will change over time.

The types of animals found on a particular piece of land depends largely on the stage of succession that land is in. Quail and grouse feed on seeds of annual and perennial weeds and grasses occurring in young stands of timber where sunlight reaches the forest floor. This is early successional habitat. Pileated woodpeckers depend on dead and rotting trees found in mature forests. This is late successional habitat. Still, other wildlife, like squirrels and tanagers, prefer midsuccessional habitat.

Minnesota Succession/Habitats



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III. Planning

A management plan is a working guide to good land stewardship. It allows a landowner to maximize the wildlife, timber, recreation, aesthetic values, and other benefits of owning land. A good plan helps a landowner combine the natural and physical characteristics of the land with his/her interests and objectives—and helps to produce healthy, vital, enjoyable, and productive land for future generations.

A management plan includes:

- List of your goals for your property.
- Map of your property.
- Inventory of your property (description of important features and vegetation types).
- List of management options for your property (from list of potential options based on your property inventory).
- Schedule of activities (what you plan to do, when).

Want wildlife?

Provide: food, water, shelter, and space.

Assessment questions

- Is there a large diversity of vegetation on the property?
- Do you have accessible year-round water sources? (Does your neighbor's land have a source of water?) Ponds, swamps, and birdbaths are great sources.
- Are there dead trees, brush piles, or rock piles across the landscape?
- Is year-round food provided with diverse plantings of grasses, shrubs, and trees?

Plan

- Decide which native wildlife you would like to manage for and learn as much as possible about its requirements.
- Determine habitat enhancement needs on your property.
- Design short- and long-term plans for habitat improvements.
- Select plants that provide shelter and food.
- Plant a variety of plant types; intersperse them, creating a mixed stand.
- Plant to create protected nesting areas.
- Plant in locations that form corridors or connections between different, larger habitat plantings.
- Promote and plant woodland, grassland, riparian, and wetland habitats.

Want natural beauty?

Beauty is in the eye of the beholder.

Assessment questions

- Think of your yard as more than “space” around your home. It's an extension of your home.
- Imagine the acres around your home as a series of outdoor “rooms”:
 - Fences, hedges, and shrubs create walls of the rooms.
 - Lawns, ground covers, and decks form the floor.
 - Trees, arbors, and the sky are the ceiling.
 - Think “native.” Are the plants and animals that inhabit your land, natural to Minnesota?

Plan

- Consider how your site is to be used (entertainment? play? public or private?)
- How much time do you have available to take care of your land?
- What kinds of trees, shrubs, flowers, and grasses are “beautiful” or pleasing to you? Consider colors and what they will be at different times of the year.
- Use plants to create spaces within your yard. Rather than planting individual trees and shrubs, arrange groups of plants to define room boundaries.
- Remember, lawns with panoramic views can be very attractive, but they have undesirable features, too. Through their maintenance and the use of fertilizer and pesticides, their care can negatively affect streams and lakes. Large lawns can change runoff patterns and volume of runoff. Large lawns are not necessarily “bad”; but care should be taken in their planning and upkeep.

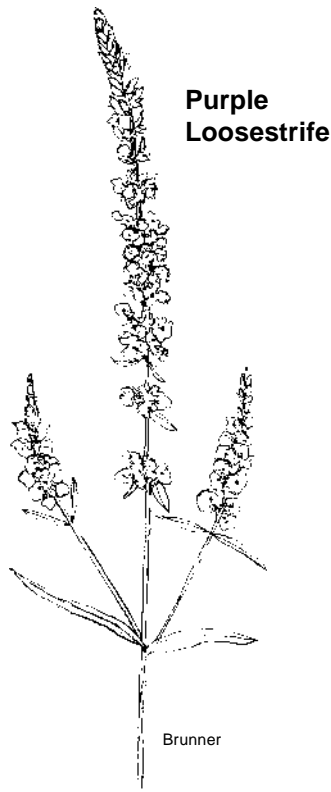
Invasive species of greatest concern

Although there are millions of plants not native to Minnesota, there are a few that land managers are most concerned about because of their invasive qualities.

They are:

In woodlands: European buckthorn—a shrub species that dominates the understory, crowding out a variety of native shrubs and spring wildflowers. It is easily identified in the fall as the last to drop its leaves. For more information on buckthorn identification and control, see YP-62.

In wetlands: Purple loosestrife—a pretty purple-flowered plant that dominates a wetland, choking out all other plants and filling in open water. For more information on purple loosestrife identification and control, see YP-63.



A. Goal Setting

1. General Considerations

Understanding how a natural area “works” is the first step in managing that land. Doing something with this understanding is the second. Land is found in a range of conditions. But there are some guidelines that will typically apply in nearly every instance—from one acre to 20 or more.

Encourage Native Species

Native plants have evolved for thousands of years with the local soil and climate. Although the appearance of your land and the landscape around it have changed over time, you can help create quality natural areas for the future by encouraging, planting, and maintaining native plants.

Native plants provide essential elements of food, shelter, and space for wildlife and fish. They also act as efficient sponges, soaking up rain and snowmelt runoff and maximizing groundwater recharge.

When considering plants to add to your property, not only is it important to choose plant species native to your part of Minnesota, but also plant seeds that come from your area. For example, the native range of red oak stretches from northern Minnesota to central Louisiana. However, seed from red oak in Louisiana comes from trees adapted to much milder winters that would not survive our harsh Minnesota winters. For more information on native plants, see YP-33.

Discourage Invasive Species

Is it a wildflower or a weed? Sometimes it depends on your point of view. One definition of a weed is “a plant growing where it’s not wanted.”

Many plants not native to Minnesota add beauty and variety to our landscape. But did you know they can cause harm to the landscape, too?

For example, ox-eye daisies are not native to North America. They arrived in the 17th century from England, where they were thought to be a charm against lightning. However, they are so numerous now that it is assumed they have always grown here. In fact, in disturbed or over-grazed areas ox-eye daisies can become so numerous they crowd out other species of plants. Other species have become highly invasive and destructive. Many natural controls, such as disease and insects that normally kept these species “in check” in their homeland, do not exist or are not as effective here. Lack of natural controls gives a non-native species an advantage, making it easier for them to become invasive and take over the habitat of native species.

Minimize Runoff

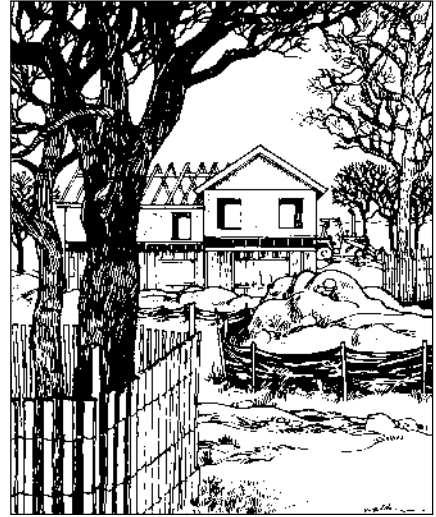
Roofs, driveways, sidewalks, and patios are impervious surfaces that do not allow rain to soak (or infiltrate) into the ground. Instead, storm water goes directly into lakes, creeks, and rivers or ends up there via a storm-sewer system. Unfortunately, this water picks up pollutants, like fertilizers, herbicides, and oil residues, as it washes over impervious surfaces and your lawn. Directing storm water to vegetated areas will help filter pollutants from the water.



Avoid Construction Damage

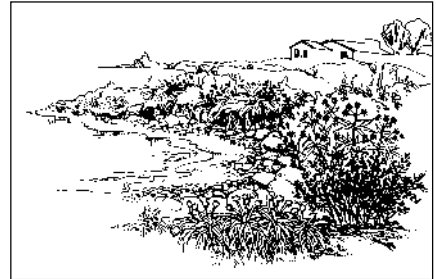
It takes many years to replace trees and vegetation lost to construction damage. It takes courage (and planning!) to save trees from a bulldozer, natural areas from being compacted, and waterways from being rerouted.

On a plat of your property, show the location of trees, plants, and other natural features that are important to you. Consider them in deciding the location of buildings, driveways, walks, and patios. Sometimes changing the angle of a building or road can preserve essential natural areas of your property.



Remember Your Neighbor

Look beyond neighborhood fences and township and county lines. Natural areas rarely have precise boundaries. The wildlife, plants, and waterways interact with, and are affected by, the characteristics and land use of adjacent properties. The land beyond your yard may be host to other natural communities and land features not found within your boundaries. Take advantage of this “extended” back yard and work with neighbors to accomplish mutual resource management goals.



WI-U, WI-DNR

2. Specific Goals

| | |
|--|---|
| <p>(Step 1) Write down the reasons you purchased the land. Perhaps it may be to serve as a homesite, investment, get-away retreat, or source of firewood. Perhaps it’s for recreation. Writing down your goals will help you focus on just what is important to you.</p> | <p>(Step 3) Check your goals against your reasons for purchasing the land. Do they complement one another? You may want to revise one list or the other.</p> |
| <p>(Step 2) Write down what you want from your land in the future. Consider these your “overall goals.” They might include increased wildlife, improved fishing, cross-country ski trails, income opportunity, or others. Spend just minimal time on this; your goals will probably be revised after you assess your land.</p> | <p>(Step 4) Now, take a look at your land to see which of your goals are possible to achieve, taking into consideration the soils, waters, topography, and other features of your land.</p> |

A topographic map may be useful to help you appreciate the slope of your land. Slope and aspect, as well as soil and drainage, can affect plant communities. A topographic map can help you determine slope, aspect, and drainage. A few dollars spent for a compass and “topo” map can lead to hours of enjoyment and learning. For sources of topographic maps, see YP-5.

A single parcel of land may contain several different soils. A soil survey provides detailed information on soil type, expected productivity, and limitations for various uses. To obtain a soil survey, see YP-3.

B. Assessing/Inventory

1. In General

The natural characteristics of your land can either constrain or enhance your opportunities to use that land in the ways you desire. For instance:

Soils

Soil is much more than just “dirt.” Soil is alive! It teems with germinating seeds, the roots of plants, and a great variety of tiny organisms. It provides nutrients for plant growth and anchors those same plants. Soil surveys are available that show you the types of soil on your land. Keep in mind, however, that the property you own may have been altered through development and construction and therefore the soils may have been altered.

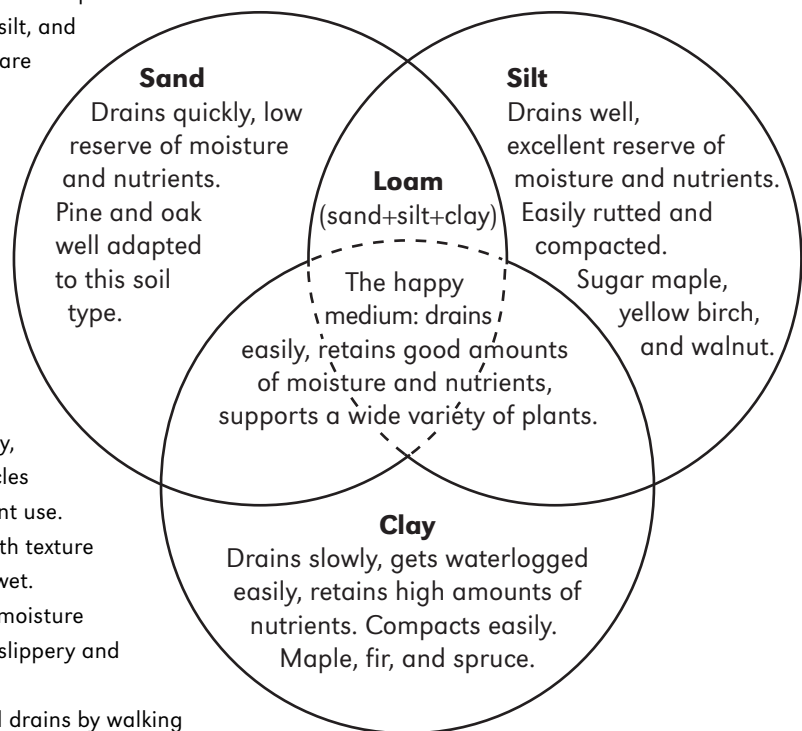
It may be helpful to get your soil tested for nutrient deficiencies. For information on obtaining a soil test, see YP-4.

Soil texture refers to the size of particles that make up the soil. Particles are classified by size as sand, silt, and clay. Clay particles are very small. Silt particles are moderate in size. Sand particles are relatively large. Loam refers to a mixture of these categories.

Different soils have different proportions of each particle size

- Sands have large pore spaces between soil particles. Water drains through them quickly; thus they tend to be drier. Sand feels gritty and doesn’t stick to your hands.
- Clay soils have a large water-holding capacity, but water adheres so tightly to the soil particles that much of the water is unavailable for plant use. Clay soils don’t drain well. They have a smooth texture which sticks to itself (and your hands) when wet.
- Silt soils have the most favorable texture for moisture absorption and drainage. Wet silty soils feel slippery and smooth.

You can get a good idea of how well your soil drains by walking around after a long, soaking rain. Watch for areas of standing water, which indicate areas that don’t drain quickly. Conversely, look for areas that dry out quickly.



Vegetation

Everything is connected in some way to everything else. If you carefully observe a piece of land and the creatures inhabiting it, you will reach that conclusion: things are related. These relationships help us predict the type of plants that will grow on a parcel by knowing the soils and the climate. The type of soil can often be predicted by looking at the plants that grow there naturally. For example, jack pine and oak grow on sandy soils. Only a few tree species, and often-dense shrubs, grow on these poor and droughty soils. Dense stands of hardwood trees with a thick understory indicate rich soils with some clay or silt. White cedar or black spruce indicate wet soils, while tamarack and white pine often indicate “sour,” or acidic soil.

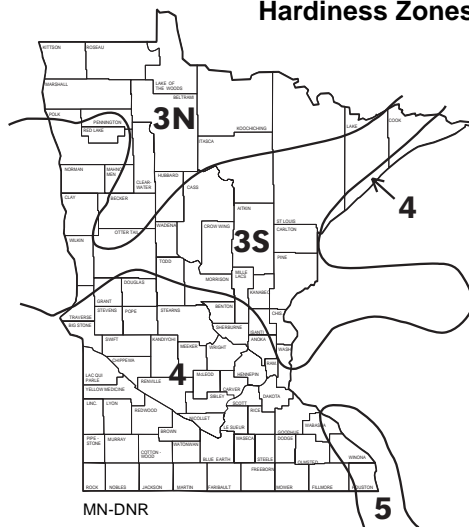
Climate

The length of the frost-free growing season, cold temperature extremes, amount of precipitation, and the duration of droughts are some of the elements of climate that influence your land—what plants will grow and survive, and what animals will live and reproduce there. If you have located your biome on page 4, you will have the basis for determining your climate considerations.

If you live in the prairie biome, you will be very limited in the tree species you can grow. Similarly, those in the coniferous forest biome will have plant survival limitations. When choosing plants for establishing on your property you will also want to consult the USDA plant hardiness zone map to determine which plants will grow in your area. Most plant nurseries and even many seed packets will have a copy of this map.

For a good perspective on Minnesota’s native vegetation prior to European settlement, see YP-2.

Minnesota Plant Hardiness Zones





Aerial photo



Aerial photo and overlay



Overlay



Quad map

MN-DNR

2. Making a Map From a Photo

- Secure an aerial photo of your property and a USGS quad map. To obtain aerial photos, see YP-6. For USGS quad maps, see YP-7.
- At the kitchen table overlay your photo with tracing paper or write-on plastic (matex). Mark your lot with a light or dotted line, noting how your property connects to adjacent properties. Outline/delineate and number the main cover-type stands on your working map, marking the boundaries where the shades of color and texture on the photo change.

3. Inventory

Materials needed:

- Map and photo of your land
- Compass
- Stand inventory sheets—one for each forest type or stand plus two more
- Pencil and clipboard
- 50-foot tape measure
- Plant identification books (many good ones are available at your local library)
- Diameter tape

a) Take your map on a “walk” of your property with a clipboard. See if your outline correctly includes areas (stands) that are similar (e.g., big hardwood trees or open grasslands). Mark on the overlay what the delineated areas are:

- Open: Grasslands, pasture, crops, brush/shrubs?
- Forests: Deciduous or evergreen? Young or old? Plantation (trees in rows)? What are the predominant tree species? Are there fruit trees? Wet forest (bog, bottomland, seasonally wet forest area)?
- Wetlands: Permanent water, emergent vegetation, or wet area (seasonably dry wetland)? Water: Lake? Deep? Shallow? Stream: Seasonally dry (intermittent)? Wet (flowing year around)?
- Homesite (sketch in and label gardens, buildings, trees, driveways, etc.)
- Mark unique features such as roads, trails, bird nests, animal dens, beaver dams, fences, buildings, utilities, steep slopes, particularly large trees, large fallen trees on the ground, seeps, small wet holes, scenic vistas, mast-producing (acorns, fruits, large seeds) species, and other details you notice.

b) At each stand, take notes of its characteristics. Use a copy of the inventory sheet in this guidebook's appendix for each stand. What plants are present? What is the height and diameter of trees? What are the predominant tree species and ground cover, etc? Make notes on what type of management activity you may want to do in the area. Stop at two or three different places in the cover type to see if your findings are consistent. Record any variations. Divide stands into smaller types if you find great differences in species or size during your woods walk. Reevaluate your goals after making your land assessment.

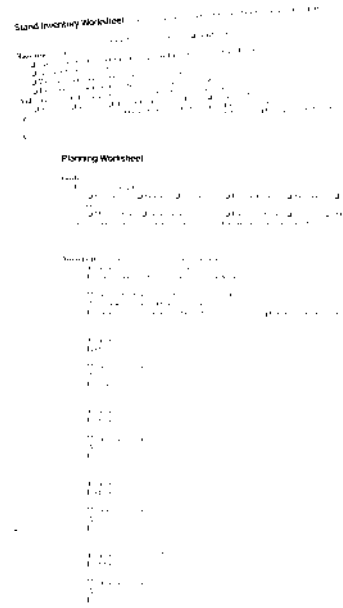
In forested stands, taking some basic measurements can give you information on “quantity” and “quality” of your woodland. (For basic measurements to take, see page 17.) For more information on measurements, see YP-8.

c) In stands that are adjacent to your property line, take a look “over the fence” and assess the type of stand on your neighbor’s land. Is it the same as yours? What is different? Fill out a stand sheet as needed.

C. Develop a Plan Based on Goals and Resources.

Now that you have an inventory of your property, what do you do with it?

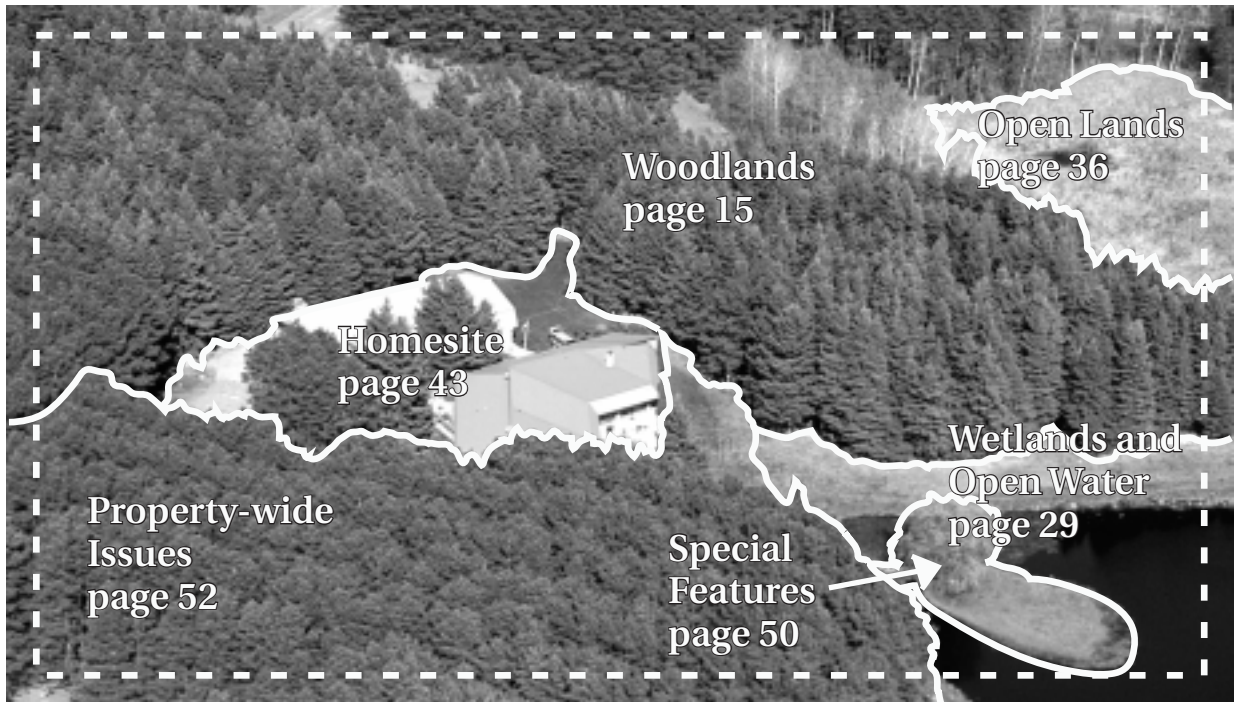
1. Back at the kitchen table, prepare a description of each stand (those delineated areas on your map).
2. Refer to the guide on page 14 to find management options for each stand; write those on the stand description sheet.
3. What are your financial and time limitations? Write those on the stand description sheets.
4. Now that you have a basis for making some management decisions on your property, look out over the next five to 10 years and ask yourself: Which projects do you want to do next year? The year after? Think in “small chunks of time,” like planting only a part of a field the first year.
5. Make a schedule of events for your land. For each event make a list of resources you need (information, plants, professional advice, other materials).
6. Take action! Do the first thing you have scheduled; revise your plan as needed along the way.

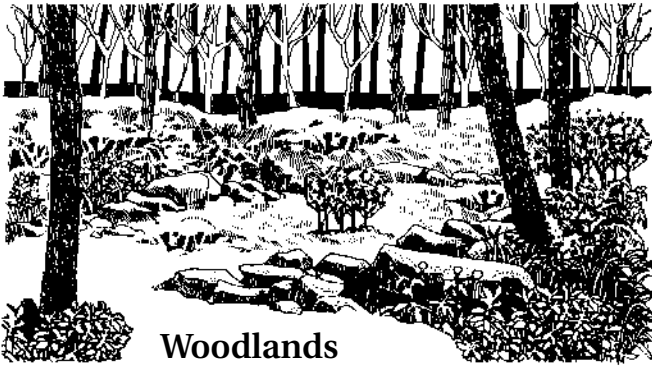


Measure tree diameter at breast height

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IV. Land Management Options





Woodlands

A. Introduction

Woodlands are areas or stands that are predominantly forested. There are many types of forests: young, old, wet, dry, deciduous, or coniferous. Whether you own one acre or 20, the way in which you manage your land will have lasting impacts. This section focuses on several common forest types, how to establish and enhance those types, and some woodland improvement practices.

To make good decisions about which trees to plant, which to encourage in natural reproduction, which to thin and which to harvest, you must be able to identify the species. Learning to know your trees can be one of the most rewarding aspects of woodlot ownership. (And sharing that knowledge with children, grandchildren, and visitors is another step toward ensuring the sustainability of those woodlands!) See YP-12.

B. Management Options

There are many options to managing your forest. Your choices depend on your goals, the current health and vitality of your forest, the tree species occurring there, and how much energy, time, and finances you want to spend.

Some of your forest management options include:

1) *Regeneration*

Forest regeneration can take on many faces. It may be the act of planting an open field, an old pasture, or a previously harvested area with desirable tree species. It may be designing a timber harvest scheme so that certain trees are harvested at specific times of the season to promote a future desired forest condition. It could mean changing a complete existing forest cover type to another type that meets your goals. In any regard, there is a plan and a procedure to be followed if regeneration is to be successful.

Planting in old fields can be difficult. The first obstacle is controlling weeds and grass that compete vigorously for the same water and nutrients the young tree seedlings also need for successful growth. Also, these areas are often exposed to drying winds and intense summer sunlight, causing dehydration and death. In Canada, forest managers have been planting “nurse crop” species in addition to the desired trees in old field plantings. They have been using red pine and the faster-growing hardwoods—like ash and soft maple—in the species mix and planting the trees more densely. The purpose of doing this is that the nurse trees grow fast and, with the

Forest management options often depend on the type of stand that you have on your property.

Uneven-aged stands

“Uneven-aged” stands have at least three distinct age classes (all trees within an age class originate from a single event such as a planting or fire). Trees in uneven-aged stands vary widely in size. Species that thrive in full or partial shade are best suited to these stands. A term used by foresters for these species is “shade tolerant.” Uneven-aged management is complex and its management is suited to larger forests, particularly where a landowner wants frequent timber harvests and income.

Even-aged stands

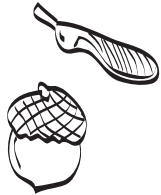
When trees are all approximately the same age, the stand is “even-aged.” Usually trees in even-aged stands are about the same size. Managing even-aged stands focuses on managing trees that need a lot of sunlight in their early years. A term used to describe trees that need sunlight are “shade intolerant.” Typically, clearcutting or other techniques that allow lots of sunlight to reach the forest floor regenerate these stands.

Woodland Management Options

- 1) *Regeneration*
- 2) *Harvest*
- 3) *Timber Stand Improvement*
- 4) *Reserve*



Stump Sprouts



Seeds



Root Suckers



Layering



Container-grown Seedling



Bareroot Seedling

MIN-DNR

crop trees, will help shade the site to more quickly create a “forest” condition. During the initial thinnings, the nurse trees are removed and used for pulp (used in the process of making paper).

A forest can be established or regenerated by either “artificial” means (planting trees) or by “natural” methods (relying on seeds, sprouts, and/or naturally occurring seedlings).

Natural regeneration

Root suckers. Some hardwoods, like aspen and black locust, regenerate from root suckers. A tree growing from a root sucker is genetically identical to the parent tree and is called a “clone.” Suckers usually develop after a parent tree has been cut down.

Stump sprouts. Other hardwoods like oak, basswood, birch, and maple sprout from stumps as well as grow from seeds. Young stumps that are cut close to the ground in late fall or winter when there are food reserves stored in the trees’ roots, sprout best.

Layering. When a buried branch takes root and develops into a new tree. For example, lower limbs of black spruce, balsam fir, and northern white cedar sometimes touch the ground, become covered with organic matter, and develop into trees.

Artificial regeneration

One of the most important “tools” you have for creating the type of forest you want is artificial regeneration. This means establishing a stand of trees by planting young trees (seedlings) or direct seeding.

Direct seeding is often used to establish jack pine and black spruce, as well as some hardwoods including black walnut. It is relatively inexpensive but not as reliable as planting seedlings.

Planting seedlings

You may plant either bareroot or container-grown trees. Bareroot trees are the most common. They may be designated as 1-0, 2-0, or 2-1 stock. The first number refers to the number of years they were grown in the original nursery seedbed; the second number is the number of years they were then grown in a transplant bed. Use large healthy planting stock. Bareroot seedling transplants are expensive but are hardy and may save money in the long run.

Container-grown seedlings are usually grown in a greenhouse in containers. Sometimes these containers are biodegradable and may be planted in the ground with the seedling. These are very useful for planting on dry sites or for planting late in the growing season.

What did you say? (definitions)

Understocked:

Stocking is the density of trees in an area, defined by the number of trees per acre. Stocking relates to the number of trees a piece of land can support in a healthy and vigorous condition. To determine stocking, stake the end of a 50-foot tape at a random spot in your forest. Pull the tape out 37 feet 3 inches. This is the radius of a $\frac{1}{10}$ -acre circle. Count all the trees in this circle and multiply the result by 10. This is the stocking in trees per acre of this area. Generally, if the trees are large (over 3 inches in diameter) and the stocking is less than 50 trees per acre, it is understocked enough to consider regeneration. Similarly, if the trees are small (under 3-inch diameter) and the stocking is less than 100 trees per acre, it is understocked.

Overstocked:

Overstocking is generally only a concern for larger trees (over 3-inch diameter). Foresters determine overstocking by checking the basal area of trees. Basal area is the square feet of tree stem area in cross-section per acre.

An easy way to estimate basal area is to stand in one place and extend your arm with thumb up. Site on your thumb as you rotate a complete circle. All trees that appear wider than your thumb are counted. This count, times 10, is the basal area. If the basal area is greater than 500, your stand may be considered overstocked. For determining a more accurate basal area, see YP-8.

Fallowing:

To plow or till land without seeding or planting, usually to eradicate or reduce weeds.

Site preparation weed control

Seedlings are used most for forestry tree planting. If you care for them properly before and after planting, they will survive and grow well. Compare site preparation for tree planting to preparing a garden site:

- Create space for planting.
- Reduce weed competition.
- Reduce the habitat for mice, voles, and gopher that might damage newly planted seedlings.

Tilling, pulling or using herbicides are common methods of site preparation. Mechanical methods include using bulldozers with brush rakes and summer tilling and fallowing. Because fire usually only results in top kill of weeds, herbicides should be used in combination with fire and mechanical site preparation methods to further increase tree survival and growth. Weed control may be needed after planting. By controlling the weeds you increase the soil moisture and light available to newly planted trees.

After planting, keep these points in mind:

- Trees survive and grow best when there is little competition from other plants.
- Grass and tall brush is severe competition and may kill newly planted seedlings.
- The method of removing competing vegetation is less important than getting the job done. The grass must be pulled or killed. Mowing the grass does not reduce competition for moisture and nutrients. However, cutting or disking brush during the height of the growing season may be effective in reducing it.

Whether underplanting your forest stand or planting a pasture or an old field, you need to consider site, soils, and existing vegetation before you plant trees. Refer to a forestry consultant or other knowledgeable professional for advice on the best species to plant.

Effects of regeneration:

Tree planting can be costly and time consuming, as can the maintenance required to grow a healthy forest. As the trees mature, wildlife species that visit your forest will change. Deer and grouse frequenting young stands will give way to porcupine and woodpeckers finding habitat in older stands.

Trees along a stream will help shade and cool the water, improving habitat for trout and other fish. Trees, especially evergreens, planted to the north and west of buildings can block winter winds, reducing energy costs. These same trees planted too close to buildings can increase the risk of losing those buildings in a wildfire. For more information on tree planting, see YP-18.

What did you say? (definitions)

Hardwoods:

Trees that lose all their leaves each fall. Some "hardwoods" actually have softer wood than softwoods, but generally their wood is harder (e.g., oak, hickory).

Softwoods:

Trees that typically have needle-like or scale-like leaves (e.g., pine, cedar) and bear their seeds in cones. Often called "evergreens." The tamarack is one softwood that actually loses all its needles in the fall.

Direct seeding:

When seed is applied to the soil without tilling. Seeds are spread either by broadcasting from an aircraft, by ground-based spreaders, by hand, or by the use of a mechanical seed drill.

Undesirable tree species:

Non-native trees are generally considered undesirable. (Trees that are native to your part of Minnesota will grow best with the least negative impact on the ecosystem.) There are some native trees that may be undesirable because of their characteristics, such as boxelder.

2) Harvesting and Marketing Your Trees

Harvesting

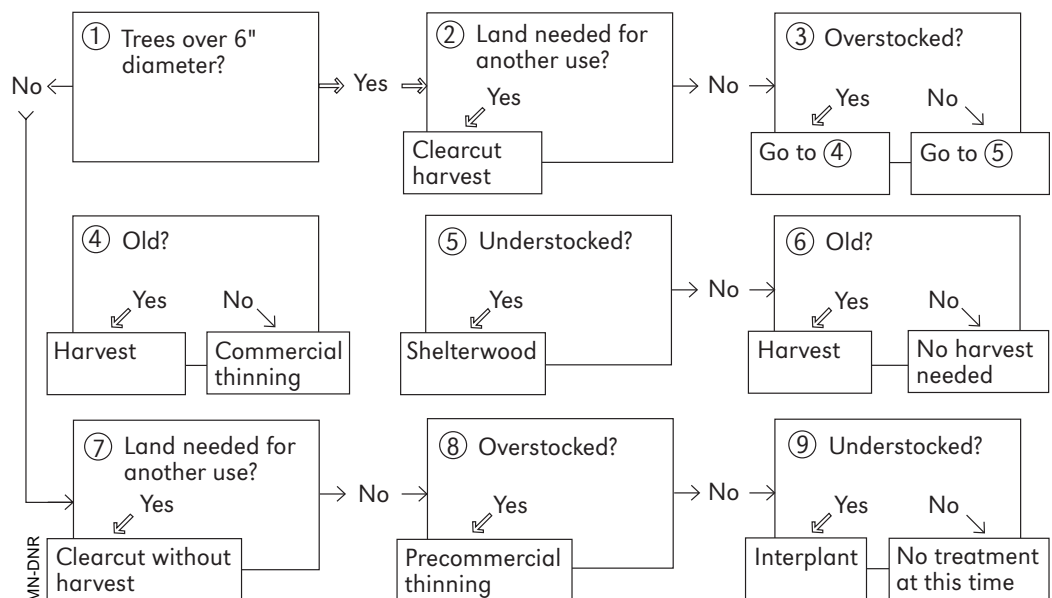
Harvesting trees is often a once-in-a-lifetime choice. Keep in mind that a harvest of your trees should not be planned without considering how the forest will be regenerated. Harvests are usually conducted for one or more of the following reasons:

1. To make money.
2. Change the species composition of the forest.
3. Convert from forest land to another land use.
4. Improve the health and vigor of a forest.
5. Develop wildlife habitat.
6. Create vistas.
7. Clear trails.

If you plan a harvest, think about the following:

- how the trees will be cut.
- how the harvested trees will be moved from the forest to a landing where they can be processed and loaded on trucks.
- how the trees will be transported from your property.
- how the forest will respond.

Forest Management "Decision Process" Chart



If you get nothing else from this section, please take this advice:

Seek professional assistance!

A professional forester has the knowledge and experience to sort out confusing price quotes based on various units of measure such as cords, pounds, tons, board feet, and cubic feet. He/she can also tailor your harvest to reduce the cost of regenerating new trees while meeting your specific management goals. Managing the details of a timber sale alone can be well worth the cost of hiring a professional forester. Studies have shown that those who sell timber using a forester's help get up to 50 percent more for their trees. For more information on this, see YP-16 and YP-31.

Making a timber sale

Since it takes 30 to 60 years to grow trees to harvestable ages, mistakes in selling those trees can be costly. It only takes a few mistakes at the time of sale to lose much of the value of a forest harvest.

The basic steps in a timber sale are:

Select the trees to harvest. The type and amount of harvesting depends on your objectives. A light thinning will stimulate the growth of the residual trees, or a more vigorous harvest like a clearcut will regenerate a new stand. For assistance on selecting trees to harvest, see YP-16.

Determine the worth of the timber. Timber is an unusual commodity—it has no pre-established price. Price depends on what the buyer and seller agree to. It is influenced by tree species (some wood is more valuable than other wood); tree size (large diameter trees have more usable volume); tree quality (trees with fewer defects have higher quality); volume of the sale; distance to market (the closer the market to the wood lot, the less the hauling costs); accessibility of the site; difficulty of logging (steep terrain and soil moisture conditions affect equipment); market conditions; log inventory at the mill; your personal restrictions on harvesting and skidding techniques (restrictions that protect the site and leaving residual trees tend to increase logging costs).

Decide how to sell the timber and how to select a buyer. You can either harvest your own timber and sell the logs, or you can sell the stumpage—the standing trees—and allow the buyer to harvest and haul the logs away.

Advertise. A professional forester can provide you with a list of timber buyers. If you are unable to obtain a list, advertise in a local newspaper, requesting that interested buyers contact you for a description of the sale. Newspaper advertisements can be particularly useful for locating firewood cutters.

Develop a written contract with a buyer. A contract does not have to be complicated, but it should provide each party with legal assurances that the other party will abide by the terms of the sale. It should indicate what you and the buyer have agreed to with respect to the sale. Don't try to sell your timber without first consulting a professional forester. He/she will have many tips to getting the most money for your timber, while harvesting efficiently and with the least damage to your land. Ask a professional forester for a sample contract by which to tailor your own.

Reforestation techniques through harvesting

Site preparation, planting, clearcutting, natural regeneration, uneven-aged management, direct seeding—seem confusing? Often, no single technique is “best”; your forest management goals can likely be achieved using several different reforestation and management techniques. Your forest site, your goals, the species composition of your forest, and local markets dictate reforestation techniques that are biologically and economically feasible.

It is best to choose a reforestation technique before you conduct a harvest. The harvest not only removes products from the forest, but is also the beginning of reforestation. Foresters use different harvest methods to create conditions favorable to regenerate new stands of trees. Many of our conifer and hardwood stands regenerate to a single age class of trees and are considered even-aged. Even-aged reforestation involves removal of the mature overstory of trees, allowing a new generation of trees to be established. Uneven-aged systems maintain and regenerate stands with many age classes, generally composed of mature trees, pole-sized younger trees, and seedlings.



Group Selection



Single Tree Selection

Uneven-aged methods

Managing and regenerating forests in an uneven-aged condition requires removal of some trees of all sizes either singularly or in small groups. Two selection harvest systems are used to remove merchantable trees to create openings for regeneration and to release saplings and pole-sized trees. They are group selection and single tree selection.

Group selection. Trees are removed in small group openings. The width of a group opening may be up to twice the height of the mature trees. Small openings provide sites suitable for some species of fir, spruce, and maple that can regenerate in partial shade (shade tolerant). Larger openings that allow more light to reach the forest floor are needed to regenerate species requiring more light such as pine and oaks.

Single tree selection. Individual trees of all size classes are removed more or less uniformly throughout the entire stand. Very small openings in the overstory allow a little sunlight to reach the forest floor. Generally, this system allows regeneration of only the most shade-tolerant species like balsam fir and sugar maple.

Even-aged methods

Several reforestation systems and harvesting methods can be used to create even-aged stands. They are clearcutting, seed tree, and shelterwood.

Clearcutting. Removal, in a single cutting, of all overstory trees in a stand to develop a new stand in a shade-free environment. Reforestation occurs by natural seeding, direct seeding, planting, or sprouting. Harvest cutting may be done in groups or patches, or in strips. Within

clearcuts, certain trees or groups of trees may be left for wildlife, and buffer strips are maintained to protect streams, wetlands, and special areas.

Planting or direct seeding are the most commonly used methods of reforestation when using clearcuts, but clearcuts can be designed to regenerate by natural seeding. Red and white oak, jack pine, white birch, and aspen are regenerated using clearcutting

Seed-tree method. Leave mature trees, usually six to 15 per acre, from the existing stand to provide seed for regenerating a new stand of trees. The seed trees are typically removed after regeneration is established, but can be retained for wildlife or aesthetics. Planting is sometimes used to supplement natural seeding. White and red pine and several species of oak may be regenerated using the seed tree harvesting method.

Shelterwood. In this method, even-aged stands regenerate beneath the shade provided by mature trees from the previous stand. A typical sequence of treatments can include three distinct types of cuttings: 1) an optional preparatory cut that enhances conditions for seed production; 2) an establishment cut that also prepares the seed bed and provides seed for the new stand; and 3) a removal cut that releases established seedlings and saplings from competition with the overstory.

Cutting may be done to leave seed-producing trees uniformly throughout the stand, in groups or strips. As with seed-tree harvests, shelterwoods are sometimes planted to supplement natural seeding. Oak, pine, and sugar maple are examples of tree species that may be regenerated using the shelterwood harvesting method.

Effects of harvesting

Harvesting can have positive and negative effects. Whether the effects of harvesting are positive or not can also be determined by your goals. If you want more deer and grouse, harvesting will improve their habitat, but may discourage other wildlife. Harvesting can have negative effects if done incorrectly. Removal of trees on steep slopes and near streams can increase erosion and negatively affect fish populations. Removing trees to the north and west of buildings will remove their protection quality, increasing home-heating costs.

Removing these same trees, especially evergreens, may actually decrease the fire hazard to your home. Harvesting can remove an insect or disease hazard that could affect adjacent trees. Look at the land adjacent to your proposed harvest. What effects do you think your harvesting actions will make on these lands?



Clearcutting



Seed-tree



Shelterwood

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Best Management Practices

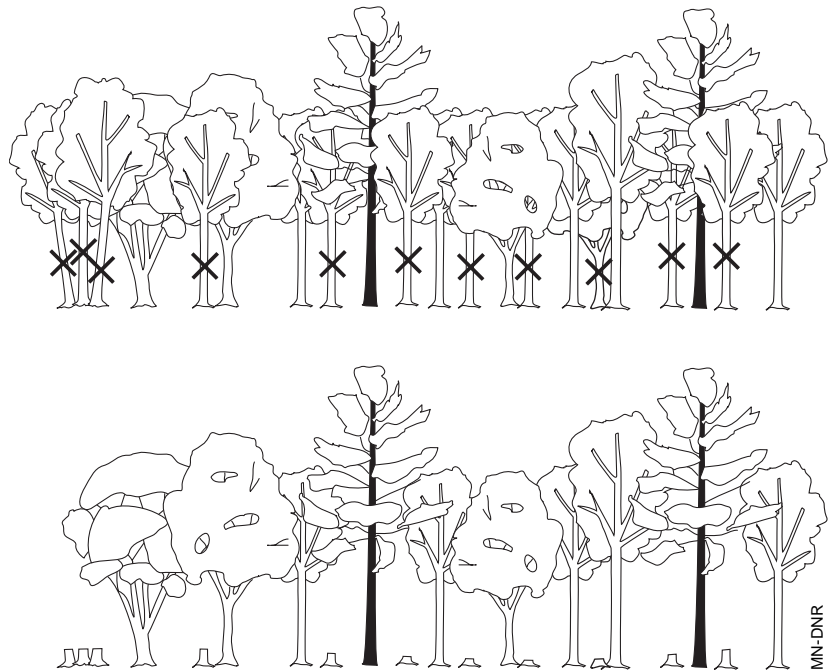
“BMPs” have become the buzz words in natural resource management of this millennium. Most are not rules or regulations, but rather “good sense” ways of preventing or minimizing the impact of management activities on lakes, streams, ground water, and wetlands. Keep in mind some of these common, good-sense suggestions as you manage your forest:

- Preharvest planning: Protect water quality and control erosion and sedimentation by planning in advance for efficient forest harvesting, site preparation, and road systems.
- Timber harvesting: Preserve roads, reduce maintenance costs, and protect water and soil quality by conducting harvesting and hauling activities in accordance with a preharvest plan. Keep roads and landings away from steep slopes.
- Site preparation and forest regeneration: Protect water quality and improve soil quality and productivity by selecting site preparation and regeneration methods that reduce soil exposure, displacement, and compaction.
- Revegetation: Reduce erosion and sedimentation by rapid revegetation of areas disturbed by harvesting operations or road construction.
- Forest chemical management: Minimize the use and maximize the benefits of chemicals through skilled and appropriate management and application. Don’t mix chemicals close to water bodies.
- Wetland forests: Forests located near wetlands are unique environments. Protect these areas by limiting your activities in these areas.

For more information on BMPs, talk with a professional forester, or see YP-14, 15, 46, 47, and 49.

3) *Timber Stand Improvement*

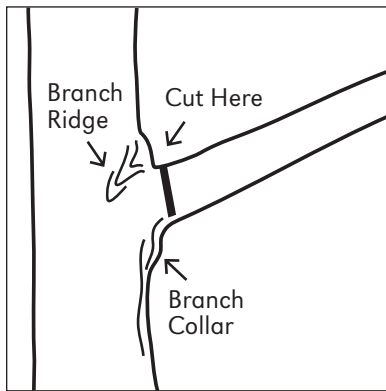
Young forests can benefit from various activities that come under the heading “TSI” or timber stand improvement. These activities improve the quality or value, and health of your trees.



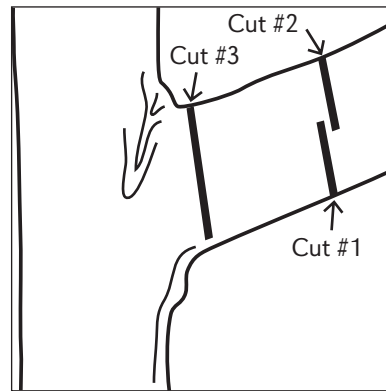
Thinning—cutting trees in a young forest with the goal of reducing the density of trees and concentrating growth on the remaining trees. Although thinning is usually done with the goal of improving the growth of the remaining trees, thinning is an important source of products like firewood, posts, and poles.

Thinning has traditionally been done in pine plantations when the basal area exceeds 400. Recent studies have shown that other species of trees may also benefit from thinning. Thinning is a harvesting method that removes the weak, damaged, and undesirable species of trees. It allows the remaining trees more room to grow, resulting in greater diameter growth. Consult a professional forester if you determine your basal area to be over 400. (For more detail on determining basal area, see page 17.)

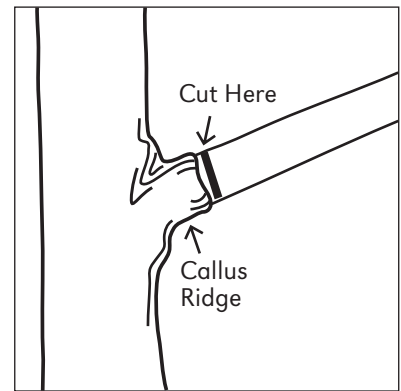
Standard Limb



Large Limb



Dead Limb



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Pruning—removing live or dead branches from the lower 17 feet of the standing trees. This produces higher quality, knot-free wood. Forest landowners use pruning to grow valuable lumber trees. Pruning should be considered if you have trees over 10 inches in diameter, there are no forks or noticeable bends in the tree trunk for 17 feet from the ground, and if one of your goals is eventual income from timber harvest. Pruning is only necessary on the trees in the stand that will be harvested (125 trees per acre or one every 20 feet). Pruning should also be done near buildings for fire safety (see page 45).

Pruning causes wounds. But if done properly, pruning maximizes a tree's natural defenses and beauty. Done poorly, pruning can reduce tree vigor, growth and value. A tree is better left alone, than poorly pruned. For proper pruning techniques, see YP-21.

Pruning is best done during the tree's dormant season to help prevent disease from invading the wounds resulting from the pruning activity. Do not wound oak trees during April, May, or June or the oak wilt fungus could become established and kill the tree; oak wilt could then move through your entire stand of trees. The dormant season is also a nicer time to be doing this woods work—it is cooler, visibility is better, and there are fewer insect pests to annoy you!

Tree paints and wound dressings do not promote healing of a pruned area. Use them only when an emergency (e.g., storm damage) requires that your trees be pruned in May or June.

Effects of TSI

If done correctly, TSI is beneficial to your trees. It improves the quality and health of your trees. If done incorrectly, TSI can damage your trees and even cause considerable mortality in neighboring forest areas. The negative effects of correctly implemented TSI on adjacent lands are very minimal in most cases.

For detailed information on woodland management, timber stand improvement, and characteristics of different tree species, see YP-16.

Improved forest health—consider:

a. Stand composition

What do you mean?

Mixed forests with a variety of species are less susceptible to pest outbreaks than single species stands. As tree diversity increases, the diversity of all associated organisms also increases, leading to a more complex and stable environment. Many pests are host specific. If you have a variety of plant species, a pest may attack a few plants but not all of them.

Improve the diversity of your woodland by either planting or harvesting for regeneration.

b. Stand vigor

What do you mean?

Stand vigor is related to the density of the stand. When trees are crowded, they compete for light, water, and nutrients. This competition results in lower growth rates for all trees, which, in turn, can lead to unhealthy and suppressed trees that are more likely to be attacked by pests.

What can I do?

- Remove low vigor trees that are more susceptible to insect problems.
- Clean up fresh windfall areas and fire-damaged areas promptly.
- Leave old snags for cavity-nesting birds. (Tree-killing insects are rarely found in old and dead trees and the birds attracted by snags will help control insect pests.)
- Do not create wounds by damaging other trees when you are working in the forest.
- Do not leave piles of wood in, or around pine stands for any extended length of time in the spring and summer. Bark beetle populations build up in woodpiles and invade the live trees.

4) Reserve

Sometimes management calls for you to “do nothing” on a piece of your land. This means “hands off” forestry. Unmanaged forests, or “wilderness,”—whether as vast as Yellowstone’s back country or as small as a corner of your land—provides the opportunity for certain kinds of recreational and inspirational experiences that are part of a well-balanced use of the land and natural resources.

Be aware that even “wild areas” in our modern world require management. For example, without management, undesirable non-native species may move into your woodland and become invasive. If you wish to protect a wetland in your forest, fencing may be required. Even domestic dogs and cats can wreak havoc on areas protected as wild sanctuaries.

Nature does not stand still. It may be your intent to keep the woods as they are, but this is not nature’s way. Without direct intervention, succession will continue, and insects and disease will take their toll, possibly altering the composition of the forest. White birch may give way to maples; a vigorous pine stand may become dense and not reach its full potential in height and diameter. If you accept this, you can sit back and observe and enjoy the changes that occur. You must also be aware that your inactivity can affect your neighbor’s woods. Insects and diseases that build up easily in unmanaged forest land may invade and damage neighboring trees.

Frequently Asked Questions

Following are some of the more frequently asked questions about woodland ownership and management.

1. My trees are not looking very good (leaves are yellow, leaves are falling off). Do they have a disease or insect infestation?

There are many reasons why a tree might get sick. Usually it is because something about the site has predisposed it to problems. Check to make sure the growing conditions match the needs for that particular species of tree. Then check for disturbances, such as a change in available water or growing space that might be interfering with normal growth and defense.

Next, determine the pattern of symptoms. In general, symptoms that begin near the top or outside of a tree are related to environmental conditions (for example heat, drought, salt, cold, etc.). Symptoms that begin near the bottom or toward the center of the tree are related to the roots and/or soil conditions (for example root rot, nutrient deficiencies, soil disturbances, etc.).

An excellent diagnostic tool can be found on the web. See YP-19, or contact your local forester (YP-I or YP-J).

In your backyard woods, wildland critters abound. And, the greatest numbers of them are in the form of insects and microorganisms. Amazingly, these native insects and pathogens are key components to most of the essential ecological processes that take place in a wildland, including nutrient recycling, decomposition, plant succession, natural control agents, and creation of wildlife habitat.

When you see caterpillars eating leaves or mushrooms sprouting around the base of a tree, your first question should NOT be, “What can I spray?” It should be, “What is it?”

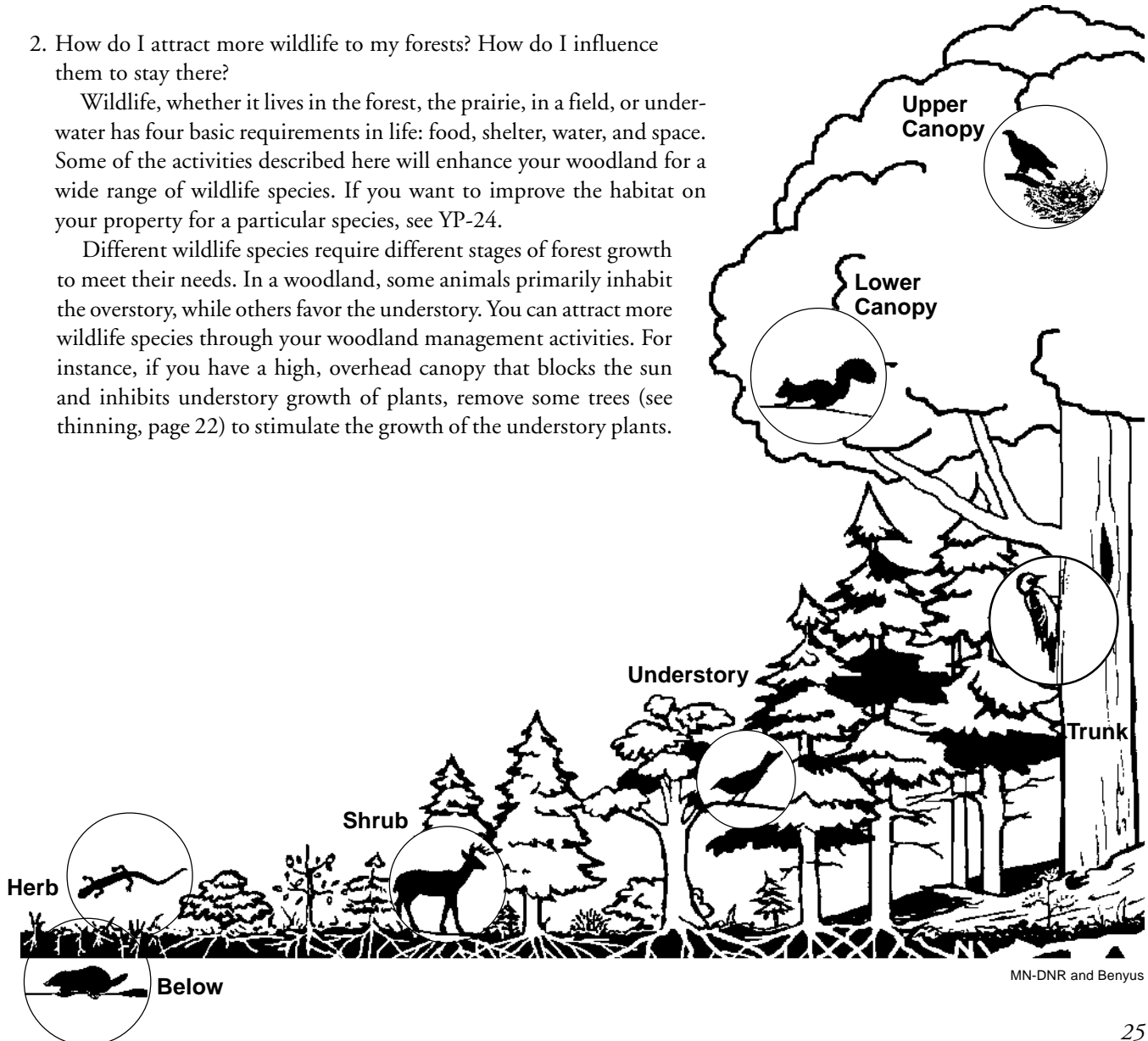
2. How do I attract more wildlife to my forests? How do I influence them to stay there?

Wildlife, whether it lives in the forest, the prairie, in a field, or underwater has four basic requirements in life: food, shelter, water, and space. Some of the activities described here will enhance your woodland for a wide range of wildlife species. If you want to improve the habitat on your property for a particular species, see YP-24.

Different wildlife species require different stages of forest growth to meet their needs. In a woodland, some animals primarily inhabit the overstory, while others favor the understory. You can attract more wildlife species through your woodland management activities. For instance, if you have a high, overhead canopy that blocks the sun and inhibits understory growth of plants, remove some trees (see thinning, page 22) to stimulate the growth of the understory plants.

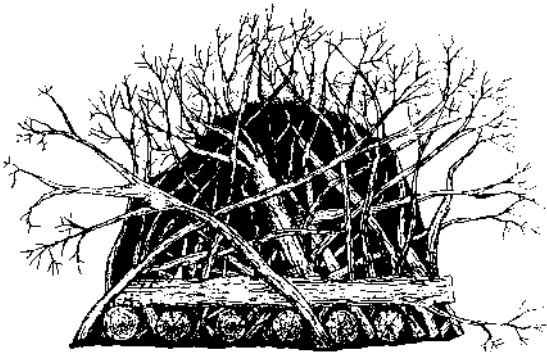
Oak wilt

Oak wilt is a native fungus that invades oak trees and causes sudden wilting of the foliage and tree death. It is especially common on red oak, northern pin oak, and black oak. The disease is spread to new locations by sap-feeding insects that are attracted to wounds on oak trees. Oak wilt can also be spread by contact among root systems of adjacent trees. A good way to prevent oak wilt is to restrict any cutting or pruning of oak trees from April through June when the insect can transmit the disease. Contact your local forester (YP-I or YP-J) for ways to stop the spread of oak wilt.



MN-DNR and Benyus

Brush Pile



MN-DNR

Do not bore holes in oak trees from April through June. The oak wilt fungus could become established and kill the tree as well as surrounding oaks.

Brush piles provide shelter and nesting sites for various mammals. They are most effective when they are placed along the edges of woodlands and fields. Brush piles should be at least 5 feet high and 12 to 15 feet in diameter. Continue to “replenish” the brush pile with branches and twigs you collect as you manage your property. Brush piles are also popular among reptiles and amphibians if they are located on the edge of a pond or lake, with part of the brush submerged.

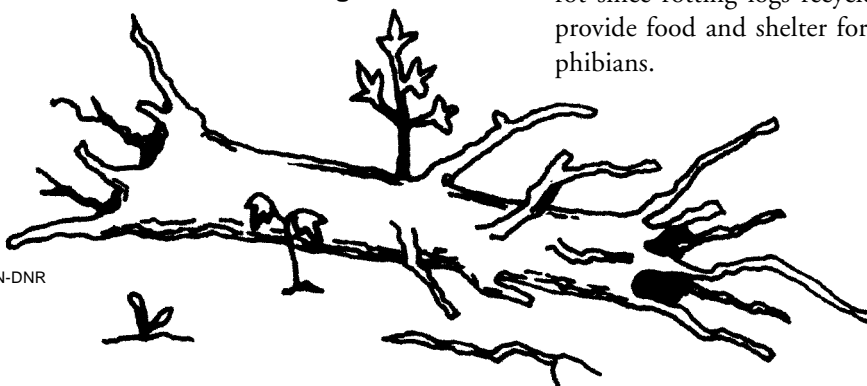
Tree cavities provide homes for squirrels, raccoons, and several bird species. While such “den trees” often have decay (making them not very valuable for timber purposes), they don’t take up much growing space in your forest and they attract wildlife. You can encourage cavity formation in trees by selecting a limb at least 3 inches in diameter and pruning it off about 6 inches from the trunk of the tree. Over time, the limb will decay and a cavity may form there. Elm, ash, and basswood are especially prone to forming natural cavities. You can also bore a hole at least 2 inches in diameter to the center of a living tree. Drill the hole just under a limb. The hole will enlarge as the wood decays and will provide a cavity.

Woodpeckers may hollow out dead standing trees, called snags, for nesting sites. Snags also harbor insects beneath their bark and in their soft, dead wood that can be captured by birds. Snags can be left in hardwood stands for wildlife. But do not leave snags in conifer stands since freshly killed conifers may serve as breeding sites for bark beetles that can infest and kill nearby trees. Do not make den trees out of good-quality trees or leave den trees near buildings. Boring holes in trees will destroy their wood quality and weaken them to the point they may fall on nearby buildings.

Trees with relatively hard wood like oak, maple, basswood, ash, and elm, are most useful as wildlife snags. Aspen snags are good if the trees are at least 12 inches in diameter.

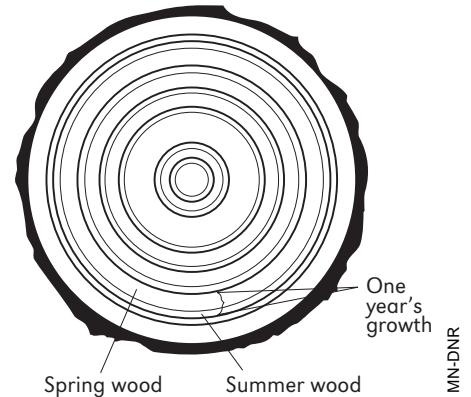
A snag is still valuable to wildlife when it falls over! Leave the snag to rot since rotting logs recycle nutrients into the soil and continue to provide food and shelter for birds, small mammals, reptiles, and amphibians.

Fallen Snag



MN-DNR

Count the Rings



3. How old are my trees?

Growth rates among trees are a function of their species and growing conditions. Size and age may not be correlated if the growing conditions are less than ideal. If it is necessary to determine the age, an increment borer allows ring sampling with minimal wounding. An increment borer can be obtained from several forestry tool vendors. For a listing of two such vendors, see YP-23.

After telling you all of this, however, we will also admit that increment borers can be costly! Another method of determining age is to count the rings on a tree. Somewhere in your woodland there will be a fallen tree or a tree you have cut down. Also, you can roughly determine age by saying young, vigorous trees have 10 rings per inch of tree diameter.

4. Do I need to water my newly planted seedlings?

Even more important than watering newly planted seedlings is controlling competition from other plants, especially during times of drought.

Generally trees require 1 inch of rain or water every week during the growing season (May-October), even more if they have been recently planted. A long, slow, soaking is more effective than a quick, heavy watering. The slow soak encourages deeper root development and wastes less water to runoff. During times of drought, it is important to water your trees; however this may not be feasible in a forest situation. Watering a forest stand of large trees is not necessary because trees have become adapted to rainfall extremes and have well-established root systems.

5. What is the condition of my forest? What can I do to “improve” it?

To determine the condition of your forest, you need to assess the species and age distribution of your trees, tree quality, signs of disturbance, and indicators of tree health. The level of assessment needed depends on your management objectives and the size of your tract of land.

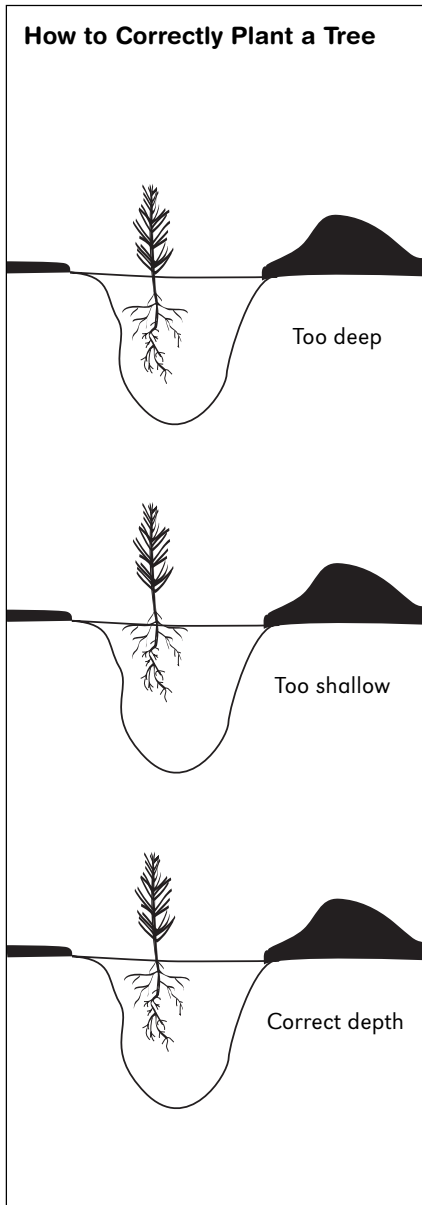
Foresters generally measure each tree on a number of sample “plots” and note the growing conditions of each sample tree. You can acquire a general feel for forest health by identifying and measuring 20 to 30 trees scattered across the site and noting the general condition of the trees. Look at the quality of the main branches: Is the crown thick with branches and full leaves? Are you noticing the same problem on several trees of the same species?

Tree defects and wounds can be caused by a disturbance or they may simply be a function of stand age (old-growth stands naturally have more defects). A good wildlife stand may not be a good stand for timber. Conversely, tree defects are good for wildlife, but could present a risk in high people-use areas.

A note about deer...

It can be thrilling to see white-tailed deer in your back yard. They are beautiful and graceful creatures, a symbol of wilderness living in harmony with human development. If you are thinking about managing your landscape to attract deer, consider the consequences carefully. Your neighbor may have a very different view of deer in the neighborhood.

Deer are notorious for munching on anything green. They can wipe out a vegetable garden in summer or your newly planted tree seedlings in winter. Perhaps most seriously, white-tailed deer are contributing to a conservation crisis in Minnesota’s Big Woods ecosystem. In many places, spring wildflowers once abundant in our deciduous forests can no longer be seen. Ecologists fear that foraging by deer may lead to local extinction of these plants, a treasured part of our Minnesota heritage. For more information on the impact of deer on the Big Woods ecosystem, see YP-73.



MN-DNR

6. If I have only a few different species of trees on my property, how can I develop some diversity in my forest?

The answer to this question depends on the kind of trees you have and the soils they are growing on. If stocking levels are low (where a lot of sunlight is reaching the ground), you may be able to do an underplanting of a shade-tolerant species such as maple, cedar, or balsam fir. If your trees are old, you may want to do some harvesting (see pages 20-21). If your stocking levels are high, you may need to do a thinning before you can consider adding trees. In this case, small patch cutting (shelterwood) in combination with thinning and followed by tree planting may be the best route to take.

7. How can I tell if a tree is a “hazard”?

While trees increase the value of the property, poor-quality trees can become hazard trees. Signs to look for are significant wounds, cracks, or bulges on the trunk or main branches; severely leaning trees; cavities, conks, mushrooms, or “punky” wood that indicate decay; and topped trees or trees with numerous large sucker sprouts or poorly attached branches. Trees with these symptoms near high-use areas, such as the house or driveway, should be removed and/or pruned to correct the problem. Also, dense evergreens, or evergreen stands with ladder fuels (shrubs and small trees that create a solid wall of foliage from the ground to the treetops), can be a severe fire hazard, especially within 30 feet of buildings.

Wetlands and Open Water



A. Introduction

For most of us, the terms bog, swamp, marsh, slough, and wetland mean about the same thing—cattails, quiet waters, waterlilies, frogs, and waterfowl. This is a correct picture for some wetlands, but not for all. Some wetlands have visible surface water only a few weeks each year. Some are farmed or mowed for hay, and some are maintained as lawns.

All wetlands share these characteristics:

- They have soils that developed in wet conditions.
- They are wet either above-the-ground or wet within 12 inches of the ground surface during all or part of the growing season.
- They have vegetation adapted to wet soil conditions.

According to the Wetland Conservation Act of 1991, it is illegal to fill or drain a wetland without first seeking advice, and potentially a permit, from a local unit of government and the U.S. Army Corps of Engineers, see YP-P.

B. Management Options

Wetlands provide some challenges for management because they are so fragile. Options include:

1) Creation of a Wetland

This is a complex science; successful outcomes are not assured. As with many dynamic ecosystems, it isn't enough to simply make an area wet and then leave it alone. Should you, as a landowner, try to create a wetland? The answer to this depends on your land, the watershed surrounding it, and several other factors that will be unique to your local area. The best thing to do if you are considering creating a wetland is to contact your local watershed district office. If you don't have one, or don't know if one exists, see YP-G.



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2) *Mitigation*

This is the strategy by which a wetland destroyed by a project (highway, dam construction, development project, mining, etc.) is replaced with a comparable human-made wetland in the same region. Mitigation has received increased attention ever since “no net loss of wetlands” became government policy. Wetland creation isn’t a modern phenomenon. Groups like the U.S. Fish and Wildlife Service (YP-R) and Ducks Unlimited (YP-80) have been in the business of wetland habitat creation for half a century or more.

3) *Restoration*

This a fancy term for undoing what we have already done. In the best of cases, restoration may mean little more than plugging drainage pipes and allowing the normal hydrologic regime to reestablish itself. At the other extreme, wetlands that have long been buried beneath parking lots and roadways are essentially irretrievable. Restoration can be very complicated, but there are often local experts willing to help. For information on potential restoration, contact your local watershed district office (see YP-G).

4) *Enhancement*

This means adding things to a wetland like plants, birdhouses, and trails. In pristine settings, wetlands do perfectly well on their own without any “help” from people. The difficult part of altering a wetland is that it may start a chain reaction that ultimately results in more harm than good accomplished. Too often, enhancement is for the benefit of human beings rather than the ecosystem.

A first step when considering whether an enhancement is the right management option, is studying your wetland for signs that it’s needed. Look for a lack of plant diversity, signs (or lack of) wildlife, evidence of erosion or sediment (cloudiness) in the water. These clues will point to the most beneficial enhancement steps. Be sure to obtain permission from affected neighboring landowners and/or government agencies (see YP-C) before starting work.

With this advice in mind, consider the following:

Vegetation plantings

Vegetation has a stabilizing effect on wetland soils and improves water retention and pollution filtering. Vegetation is used by wildlife for food, shelter, or building materials. However, if your wetland already has a dense plant growth, it is not a good idea to add more. Don’t force vegetation on parts of a wetland that are natural clearings.

Study the site for signs of erosion and other damage caused by vegetation loss. Select native plants that appear naturally in that wetland. Garden centers and plant books are good sources of information.

Creating buffer zones

Wetlands tend to merge into their surroundings very gradually so it's beneficial whenever possible to enlarge the buffer areas around them. Keep lawns and structures away from the edge of a wetland. If lawns or cultivated areas are already there, consider letting a border area return to its natural state. It may be necessary to plant appropriate native species in reclaimed buffer zones. These buffers or filter strips benefit not only the wetland by filtering lawn chemicals and eroding soil before entering a wetland or lake, they can also benefit people. For example, geese can be a nuisance on lakeshore lots. Planting a buffer of native plants along the shore can deter geese from coming onto your lawn.

Exclude or limit domesticated animals and pets

Horses, cattle, and free-roaming dogs and cats are foreign species in a delicate wildlife matrix. Spring is a particularly vulnerable time for wetland species. If you cannot totally exclude pets from your wetland area, put bells on the collars of cats and dogs, and take steps like wrapping sheet metal around tree trunks to keep cats from reaching birds. Controlling wildlife may also be important. Unchecked populations of geese, carp, and other species are capable of decimating a wetland.

Restrict off-road vehicles

It may seem fun to do a "swamp run" with an all-terrain vehicle (ATV), but the uprooting of plants and displacement of fragile soils can have lasting effects to water flow, plant composition, and aesthetics. Keep vehicles out of wetlands.

Wildlife habitat additions

Birdhouses, nesting boxes and platforms, and feeding stations will attract birds to a wetland. Local birding organizations can offer advice about species-specific structures. Tree stumps, dead snags, and small brush piles offer shelter, perching sites, and homes for birds and other animals.

One of your best resources for a list of native wetland plant species is *Lakescaping for Wildlife* (YP-40).

It may also be appropriate to remove exotic or noxious vegetation. Your county extension office (YP-H) will have information on these plants, as well as recommendations for removal. Herbicides should be used with great caution, especially near water.

An excellent lakeshore plant identification reference is *Wetland Plants and Plant Communities of Minnesota and Wisconsin*. (YP-41). *The Shoreland Landscaping Series* (YP-48) shows you how to achieve a natural landscape through re-vegetation. The series includes *Natural Shoreland Landscaping*, *Choosing Plants for Shoreland Revegetation*, *Wave Break Structures for Lakeshore Revegetation*, *Planting Shoreland Vegetation*, and *Resources for Shoreland Landscaping*. For a comprehensive guidebook to restoring buffers, see YP-45.

Trails and boardwalks

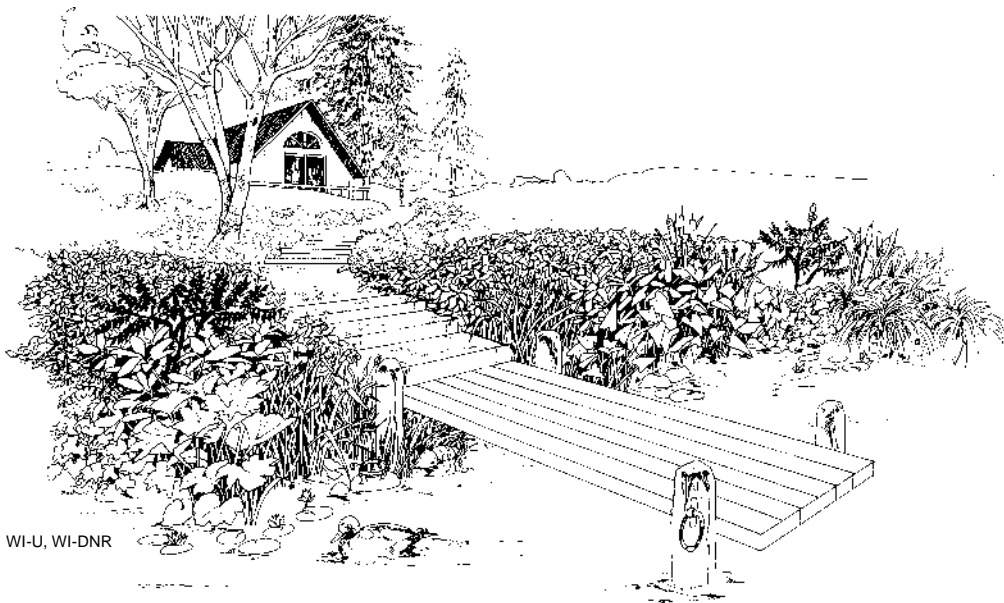
Access corridors encourage human enjoyment while restricting traffic to specific strips of a wetland. A trail around the periphery of a wetland will be less disruptive than one that goes through its center. Boardwalks not only provide a “closer look,” but also can help reduce the disruptive effects of human traffic on vegetation (and they are necessary where water makes trail walking difficult). During the breeding and nesting seasons, it is wise to limit or close off access to your trails.

Blinds

Simple blinds built either in a tree or on the ground can allow people to “disappear” from view of birds and other wildlife while quietly observing wetland residents.

Effects of wetland management

Removing exotic plants and planting native plants in and around wetlands and open water will improve the water quality. Algae blooms will be reduced and problem animals like geese will be deterred. Building boardwalks and trails can enhance your recreational experience, but if not created correctly, they can degrade your wetland. Not building boardwalks can also lead to degradation. For example, reed canary grass can invade a high-quality wetland in footprints left by a single hiker. Wetlands provide habitat for a wide variety of animals; some are enjoyable like meadowlarks and red-winged blackbirds, while others can be a nuisance, like mosquitoes.



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Frequently Asked Questions

1. How can I attract wildlife to my wetlands and open waters?

- True wetland or riparian habitats are very difficult to create where the natural components do not exist. But “enhancement” of existing areas can be rewarding.
- Where wetland habitats exist, protect them from draining and pollution. Manage for natural wetland plants and prevent their destruction.
- If a creek or stream transects your property, allow at least 50 feet on each side for a riparian habitat strip. Plant trees and shrubs that provide food, shelter, and erosion control. Many tree species are adapted to riparian locations. Shrubs such as black chokeberry, native spirea, or red-osier dogwood add structure to these areas, as well as provide important wildlife benefits.
- Establish large shallow areas around ponds with cattails and wetland grasses.
- Do not “mow to the edge” of water bodies. Native grasses and wildflowers attract wildlife and require little maintenance (thus leaving time to enjoy your waterside area).

2. How do I ensure the quality of the water on my property?

To ensure water quality, you need to have sound land-management practices adjacent to water resources. The key is reducing runoff by creating buffer strips and modifying yard-care practices.

Roofs, driveways, sidewalks, and patios are impervious surfaces that do not allow rain to soak (or infiltrate) into the ground. Instead, much of the stormwater is directed into the storm sewer system where it is carried away, potentially to affect other water systems. Unfortunately, this water picks up pollutants like fertilizers, herbicides, and oil residues as it washes over impervious surfaces and your lawn. Directing stormwater to pervious retention areas will help filter pollutants from the water and recharge groundwater.

To do this, create small vegetated depressions away from the house to capture and infiltrate stormwater.

Plant shrubs and trees. As compared to shallow-rooted turf grasses, the deep roots of trees and shrubs increase infiltration and filtering of runoff. Additionally, tall canopies of trees slow raindrops, allowing more time for infiltration. Plant ground covers in shady areas where grass will not grow. Ground covers prevent soil erosion and slow the movement of runoff, allowing for increased infiltration. Direct water from down spouts away from paved areas to grass drainage easements where the stormwater can infiltrate.



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Quiet please!!!

Wetlands are usually used and occupied by frogs, toads, salamanders, and aquatic insects. Keep in mind, some of these critters have “voices.” The ducklike quaking of the wood frogs, the sleigh-bell choruses of spring peepers, and the baritone of the bullfrog may come with aquatic territory. For some folks this is music, for others it is a nuisance. Think about your likes and dislikes when undertaking a wildlife habitat improvement project!

Creating and maintaining buffer strips of native vegetation (trees, shrubs and ground cover) around the edges of water will filter runoff of pesticides and soil before it is able to enter the water. A fifty-foot wide buffer strip around water is a good guideline.

Another key component to water quality is modifying your yard-care practices. Reduce the use of fertilizer on your lawn and garden. Often only one application of fertilizer each year is necessary to create a green lawn. Use only fertilizers that have no phosphorus content (the middle number of the fertilizer bag should be 0). Instead of using weed and feed products or broadcast pesticides, spot treat the problem areas. Both these practices will reduce the amount of chemicals available to be washed into nearby water. When mowing, direct grass clippings back onto the lawn and away from surfaces such as the sidewalk and driveway. Grass clippings and leaves that enter the storm sewer add unwanted nutrients to ponds, rivers, and creeks running through the area.

3. How do I get to the other side of the wetland/stream?

Many trails do eventually cross a drainage ditch or stream! Before initiating any project, it is a good idea to contact your local Department of Natural Resources (DNR) hydrologist to determine if your trail crosses a protected water body or wetland. State jurisdiction over the use of protected waters and wetlands generally begins at a point known as the “ordinary high-water mark.” Permits from the Army Corps of Engineers (YP-P) and/or your local DNR (YP-C) may be required before constructing any crossing, including fords.

Natural crossings (fords) often can be used to traverse slow-moving streams less than 24 inches deep. You should give preference to locations with gently sloping, stable banks and gravel or sand bottoms. A crossing made of flat stones placed at convenient intervals can be safe, environmentally sound, and aesthetically pleasing. Stones should be large enough for the surface to remain dry with one-third to one-half of their height embedded in the streambed. Gravel or natural rock may be used to improve the streambed for crossing with horses or vehicles.

Streambanks may be graded to permit passage into and out of the ford and to keep water from running down the trail. Finished banks should be no steeper than 5:1 and must be seeded or mulched to reduce erosion.

Culverts can be used to cross deep streams or ditches. Install culverts that are wide enough to handle the greatest expected flow of water. This will prevent the washing out of the trail. Align culverts with the channel to reduce erosion on the banks and to prevent debris from accumulating. Your local Soil and Water Conservation District office (YP-G) can advise you on size, location, design, and installation of culverts.

If you are thinking of putting a bridge across your stream, keep in mind that a simple log bridge may be functional for stream crossings less than 10 feet wide. Wider streams will require permanent bridge designs. Usually professional design assistance and regulatory permits will be required for placing bridges of this magnitude. Bridge designs will vary depending on the length and height of the crossing, the type and amount of trail use, and the size of maintenance equipment you have to provide upkeep of the bridge.

Always locate bridges above the ordinary high-water mark. You can anchor small bridges or cable them to large trees at one end so they can swing away during flooding. Install handrails on bridges higher than two feet above the water, or that cross deep or fast-moving water.

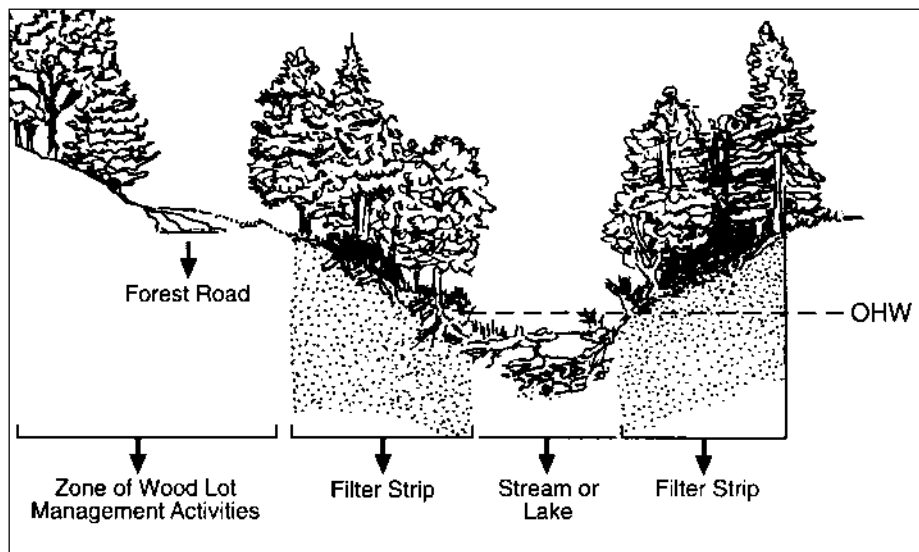
For more information on working around water, see YP-C or YP-44.

In Minnesota, any project constructed below the ordinary high-water mark that alters the course, current, or cross-section of protected waters or wetlands is subject to the regulatory jurisdiction of the DNR.

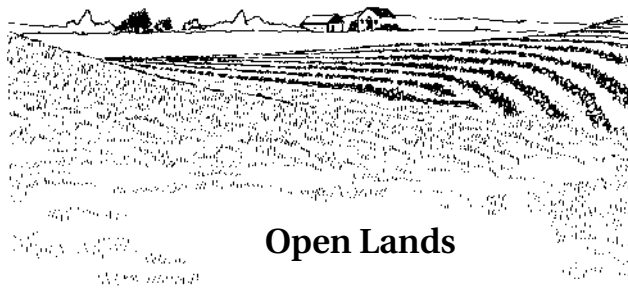
4. How do I create a pond?

A DNR public waters work permit is not required if the pond is not excavated below the ordinary high-water (OHW) level of a public waters or public waters wetland. A landowner should contact a DNR wildlife manager (YP-D) for information on how to construct a wildlife pond that is attractive to wildlife. The DNR does not pay individuals for constructing wildlife ponds on their private property. Local units of government may also have requirements for excavations.

Ordinary High-water Level



MN-U, Duluth



Open Lands

A wonderful guidebook with detailed information, planning charts, and sample prairie designs is *Going Native—A Prairie Restoration Handbook for Minnesota Landowners* (YP-51).

Open Land Management Options

- 1) *Prairie*
- 2) *Pasture*
- 3) *Crops*
- 4) *Trees*

Introduction and Management Options

Open lands are areas that have very few trees and shrubs. Either bare ground, grasses, or crop residue typically dominate the areas. These lands provide many options for land management including:

1) *Prairie*

Prairies are nice places! An established prairie, like a healthy forest, absorbs rainfall, reduces erosion and runoff, and improves water quality. A mature prairie doesn't need herbicides or pesticides, thrives without use of fertilizers, and stays beautiful even in years of low rainfall. They are long-lived. They offer a connection to Minnesota's natural legacy. Prairie vegetation typically takes three to five years to establish and it is well suited to Minnesota's climate and growing conditions.

Is there a "downside" to establishing and maintaining a prairie? Although prairie plants are fabulous at holding soil and out-competing weeds, and can evolve into beautiful blooming fields, they can be expensive to establish and maintain. Natural prairies were maintained for centuries by frequent fires that killed encroaching trees and shrubs and stimulated the germination of the seeds from prairie plants.

However, as important as it is to prairie management, fire can be a dangerous management tool in the hands of the inexperienced. It is recommended that prairie maintenance by fire only be undertaken by professionals. This maintenance can be costly. Mowing can be an alternative to burning if cuttings are removed from the area.

How do I establish a prairie?

Compared to a lawn, a prairie takes less money and time to maintain in the long run. But there is a substantial initial investment of time and money. One way to establish a prairie is to hire a contractor to plant a wider diversity of species right way. But this is not the only way to create a prairie. You can:

- Start small (in as little as 1,000 square feet) and expand as finances permit. You can use seed from this first section to plant other areas later. Keep in mind that a bigger prairie will harbor more diversity and be less susceptible to weed invasion, but don't let that keep you from planting a smaller one.
- Start with fewer species. Plant a few of the common or more easily grown grasses over the entire site at first, and add more species as time and money allow.

The following are a few generalities on planting a prairie

Seed:

- If you can, try to buy seed that originated no more than 100 miles from your site. Good seed suppliers will guarantee the origin and viability of their seed.
- Be aware of mixes that don't include the Latin or scientific name. Common names can vary or be similar for different species. For example, the white petalled ox-eye daisy (*Chrysanthemum leucanthemum*) is a troublesome exotic agricultural pest, while the common ox-eye (*Heliopsis helianthoides*) is a native yellow daisy.
- It's best to buy from a native plant nursery that grows its own seeds. Ask where your suppliers get their seeds. A commercial "wildflower" seed mixture may contain non-native species.

Seeding rates:

- Figure out how many square feet or acres you will be planting. This is where a carefully drawn map is helpful. An acre is 43,560 square feet. If you know your site is an eighth of an acre, that site will be 5,445 square feet.
- In general, a seeding rate of 10 pounds of "Pure Live Seed" (PLS) per acre or eight ounces per 1,000 square feet will provide enough prairie plants to dominate a site.

Pasqueflower



Site preparation:

This step is critical. The two goals to accomplish here are:

1. removing competing plants and
2. developing a smooth, firm seedbed that will increase germination rate of your seeds.

If you are working with a prairie planting over 10 acres, the most effective site preparation is a combination of herbicide treatment and mechanical cultivation.

- Mow the site to get rid of last year's growth and encourage new plant growth. After two to three weeks, when weeds are 10 to 12 inches high, apply a 2 percent to 4 percent solution of glyphosate (follow container directions).
- If you choose not to use a herbicide, you can cultivate only, but you must do so every two to three weeks to a depth of four to five inches during the entire growing season to kill perennial weeds. The following spring, till the soil one inch deep after the first good rain and plant!
- A "no-till" method plants seeds directly into dead sod. It is a good choice for establishing prairie species around existing trees. Apply glyphosate as above, but do not cultivate the seedbed. Use a "no-till" seed drill. Check with a local farm implement dealer or agricultural cooperative about renting a seed drill.
- The final step in site preparation is to break the soil into smaller chunks. On areas larger than an acre, use a double-disk or field cultivator. On sites less than a quarter acre, use a rototiller. Rake and pack by hand to create a smooth firm seedbed. It is important to pack the soil so the seed will not be planted too deeply to germinate.

Planting considerations:

- You may plant spring or fall. The best time is late May to mid-July.
- Planting methods come in two styles:
 1. Drill—A native seed drill is adapted to accommodate different shapes and sizes of seeds. There are different sizes available for pulling behind a tractor or an ATV. Drills can be rented but keep in mind that usually everyone wants one at the same time!
 2. Broadcast—Just as its name implies, broadcasting simply means spreading the seed by hand on the soil surface. This is followed by lightly packing the seedbed.
- Watering. While most prairie plants are drought resistant, prairie seedlings are susceptible to drought. Research your area's average rainfall. Plant when you're most likely to get sufficient rain, generally before July 15 in most parts of Minnesota.

Maintenance

A prairie is “low maintenance,” but that doesn’t mean “no maintenance!” Caring for your prairie, particularly during the first three to five years, is important. Admittedly, the first few years you may see mostly bare ground, dandelions, and mare’s tails. Not quite the lush field of bluestem you imagined. Have patience! Your prairie plants are putting most of their energy into root growth during the first few years.

Maintain a friendly environment for prairie plants by mowing, controlling weeds and woody plants, and burning if possible.

Burn or Mow?

Prescribed burning is one of the best methods of maintaining a prairie. It encourages vigorous plants; warms the soil, thus extending the growing season; and controls trees and woody shrubs. Burning can be dangerous, however, and can be against local ordinances. There are companies that specialize in burning prairies. We advise you to turn to them. See YP 55 for a list of contractors.

Mowing and then raking the cut material to prevent the development of thatch is a good way to maintain a prairie. Mow and rake on the same schedule you would burn. Since mowing doesn’t work as well as fire to control non-native weeds (e.g., brome and quack grass), pay special attention to removing weeds.

- Choose plants that are right for your land. Narrow the field of potential selections by getting a catalogue of prairie grasses and flowers from a nursery. Several nurseries in the Twin Cities and throughout the state specialize in native plants. See YP-54 for a list of nurseries.
- Write it down! You might remember, but you probably won’t (i.e., When were you supposed to cultivate your site? Which seeds did you order? Where and when did you plant the seeds?).

How often do I burn or mow my prairie?

There is no magical number of years between burns. The best indicator to the need for treatment is the presence of invading weeds, trees and brush. This is usually every three to four years. In dry areas, prairies may take as long as 10 years to accumulate enough plant litter to burn.

Food plots for wildlife can generally be paid for in part through participation in United States Department of Agriculture cropland set-aside programs (known as CRP—Conservation Reserve Programs). Check with a DNR area wildlife manager (YP-D) for details. Pheasants Forever (YP-81) is an organization that can also provide seed for food plots.

2) Pasture

Many small landowners own open land in order to pasture horses or other livestock. This may be a viable option for you, provided there is enough acreage of pasture for the animals, and the area is properly fenced to contain them to the open land.

There are many sources of information on pasturing animals. Visit your Soil and Water Conservation District office (YP-G) or University of Minnesota Extension Service office (YP-H) for information on improving your land for pasture. A minimum of one acre of land is required to pasture each 1,000-pound animal for a year. If your land does not meet this requirement, you should not consider pasturing except for a short time span. Pasturing beyond this limit can result in serious degradation of the land.

It is important to contain livestock to designated pasture land. Livestock can seriously degrade a forest through compaction of the soil, chewing or rubbing bark off trees, and introducing the seeds of invasive plants (through livestock manure). Livestock can endanger water quality through bank erosion and introduction of manure into the water.

3) Crops

Planting crops on open land provides income and can attract wildlife (which wildlife depends on which crops you plant). Contact your Soil and Water Conservation District office (YP-G) or County Extension office (YP-H) for advice on the best crop to plant on your land. This advice usually can only be given after a soil test (YP-4).

Leaving one- to two-acre foodplots of corn, grain sorghum, sorghum-sudangrass, buckwheat, soybeans, or sunflowers after harvest can provide valuable winter food for deer and other wildlife.

Are food plots important?

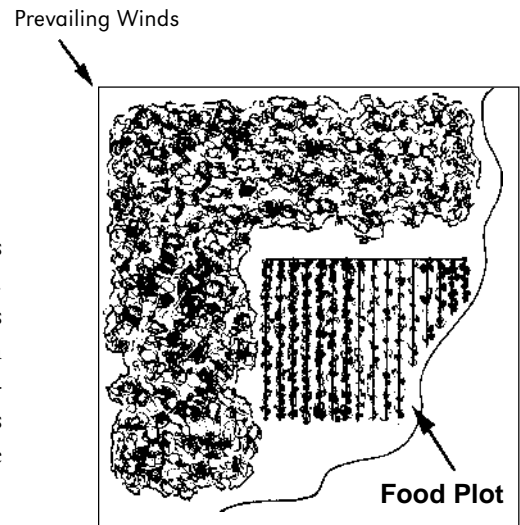
Food plots can serve as an excellent way to enhance the survival of wildlife that is on your property in the wintertime. They can include corn, grain sorghum, sorghum-sudangrass, buckwheat, soybeans, sunflowers, or any combination of these crops. Even rutabagas can be planted as a food plot for deer!

A typical food plot is up to 10 acres in size. It should be sheltered on the north and west by natural features that will prevent drifting winter snows from covering the grain. Farm shelterbelts, wooded creek bottoms, or wetlands can help shelter a food plot.

Excellent food plots can be created by planting corn in one direction (i.e., in rows running east-west) and by planting cane sorghum in the same food plot at a right angle to the corn (i.e., in rows north-south). If a corn food plot is not entirely eaten in its first winter, it can be left standing a

second year. The herbaceous vegetation that grows up in the rows provides wonderful pheasant food and shelter, and abundant seeds for other wildlife.

What is the “downside” to food plots? Although food plots from crops can be beneficial to wildlife, many of the fertilizers and pesticides used in agriculture can be detrimental to water quality. Consider this when looking at growing crops on land located near open water. Agricultural pesticides can also limit options for future planting and kill adjacent trees if they are not applied correctly.



4) Trees

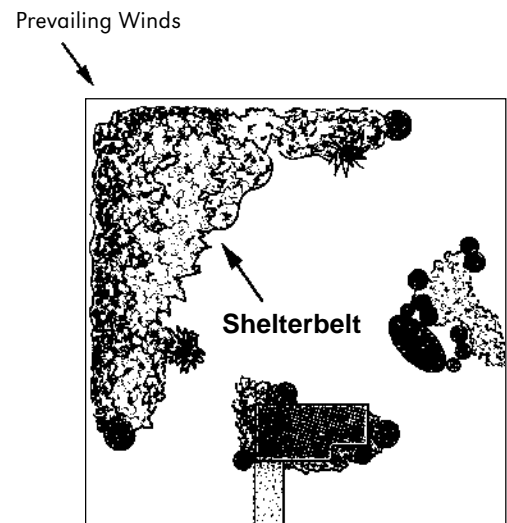
Another option to managing open land is to plant trees. You can plant all or part of the open land to trees, depending on your goals. If you are looking at reconnecting scattered parcels of woodlands, improving wildlife habitats, improving aesthetics, or gaining income from tree products, you might want to plant trees.

When planting trees, consider:

1. Which trees to plant.

The trees you plant will become major elements in the overall landscape of your property. Look around your area to see what are the naturally occurring trees in neighboring forests with similar topography and soil conditions as found on your planting site. Consider the following when choosing a tree:

- Will the species tolerate the local winter weather and other conditions associated with the site where they will be planted? Give consideration to planting suitable tree species on appropriate sites. It's best to plant native tree species (Minnesota has over 50 native species!). The conditions of the planting site are as important as the tree. Soil type and drainage, availability of water and sunlight, exposure to drying winds, and other factors are considerations. By attempting to match the requirements of the tree to the planting site, you can increase the survivability, performance, and longevity of your selections.
- In addition to the references we suggest, a professional forester can give you advice on which tree species will do well in different locations based on climate, soil, slope, and exposure. Hardy, locally grown native trees can be purchased from Minnesota-based nurseries. Planting a mixture of tree species provides greater structural and species diversity (better bird habitat!) as well as reducing the potential for insect and disease problems.
- Does the species have the characteristics to provide the benefits you desire (income? shade? wildlife value? beauty?) that you want on your property?



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How do I design and establish a windbreak?

A windbreak is planted on the side of your property into the prevailing winds (usually to the north and west of buildings or other areas you want protected). For more information on windbreaks, look at the publication *Field Windbreaks* (YP-29).

See YP-16 and 22 for some excellent descriptions of different tree species and their environmental requirements.

2. How to prepare the site for tree planting

Open land provides a relatively easy place to plant trees. However, trees do not compete well with established plants. Tall, thick ground cover and shrubs can prevent your newly planted trees from surviving. If there is grass, get rid of it. Mechanical disking or application of an appropriate herbicide can be used to prepare the site for tree planting. See YP-16 or YP-H for appropriate methods.

3. How many trees to plant

As a general rule, tree spacing density will vary depending on your goals. If your goal is to reestablish a forest, then you need to plant from 436 (10' x 10' spacing) to 900 (6' x 8' spacing) trees per acre. The goal in these plantings is to quickly occupy the site with trees and eliminate the grass sod.

If your goal is to block the wind by planting a windbreak or shelterbelt, you can plant as few as 300 (10' x 15' spacing) trees and shrubs per acre. For wildlife food and cover plantings, you may plant 450 (10' x 10') trees and shrubs per acre.

4. Where to get the trees

The Minnesota Department of Natural Resources forest nurseries (YP-E) sell trees for conservation planting in minimum quantities of 500. Many private nurseries and local Soil and Water Conservation District offices (YP-G) also sell seedlings for conservation planting.

5. Who will plant the trees

Contact your local DNR forester (YP-J) or Soil and Water Conservation District office (YP-G) for names of planting contractors in your area. You may also be able to rent equipment and plant the trees yourself. There is a wonderful sense of pride in being able to say, "I planted those trees myself!"

6. How to plant and maintain the trees

Unlike planting a tree in your yard, planting a field of trees requires different methods of planting and maintenance. You cannot expect to dig a hole and water each of 500 or 1,000 trees in a field. Planting can be done by machine or by hand. When you order trees, planting instructions will come with them, or see YP-E.

What are the consequences of planting trees? Tree planting is a lot of work. New plantations should be monitored frequently to identify potential problems due to insects, diseases, and pests. Gophers are a nuisance in open field plantings and must be controlled. Deer and rabbits may browse new plantings heavily. A good rule of thumb is to plant enough trees to create a forest and some extra to feed the wildlife!



Homesite

A. Introduction

Building sites are an important part of your property. Not only because they are the places where you live and spend much of your time, but because what you do on this part of your property may have a significant impact on the remainder of the land.

B. Management Options

You have options you may consider before you build or do any additions or expansions to your current home that will help you preserve the surrounding areas.

1) Minimize Soil Disturbance

This is especially important near any trees or other vegetation you care to preserve. Something as seemingly harmless as scraping away the under-story of a woodland or adding a few inches of fill around a tree to smooth out some rough spots to seed grass can cause the early demise of the large trees you wanted to save. As a general rule, you should not disturb the soil (or add any soil) around a tree within the drip line (the area under the crown). If you remember that a tree's roots often extend away from a tree as far as it is tall and the majority of a tree's roots are in the top eight inches of soil, you can gain an appreciation for the potential to do harm to the trees.

Exposed or disturbed soil greatly increases the potential for runoff or erosion. A single heavy rain after a disturbance can cause severe erosion problems. Do not excavate any larger of an area than is necessary to complete a building project. Your trees will thank you!

Did you know that 80 percent to 90 percent of soil compaction is caused on the first pass? In other words, if you drive your car over your lawn once, it has done much the same damage as driving over the same area several hundred times? When you consider that the majority of a tree's roots is in the upper portion of the soil, you could be killing your trees. This is particularly important for shallow rooted species like birch and maple.

2) *Minimize Impervious Surfaces*

In natural areas, like woodlands and prairies, the soil is loose, allowing raindrops to infiltrate (be absorbed) into the soil. This replaces the moisture used by the plants on the site. It is not until the soil is saturated that runoff occurs. In building sites, there are undoubtedly surfaces that will not allow water to infiltrate. Your house or garage roof, your driveway, and your patio all create an area where water will no longer be able to enter the ground. In these areas, you must direct the water to another area that can handle it. If you create too many impervious surfaces, you may not be able to direct the water to an area to handle it.

Excess water may lead to erosion problems or, if the water is directed to areas with vegetation that does not like a lot of water, you may harm your plants.

3) *Fertilizers, Pesticides, and Their Use*

Once you have made a decision to plant a tree or hedge, establish a lawn, or plant a garden, you will want to care for it. You will often notice “weeds” or “insects” that may seem to be a problem, either aesthetically or physically to what you have planted. There are many different pesticides on the market to treat just about every problem, and their use is not necessarily a bad thing. When using pesticides, however, you should consider what product you will use and where you will use it. Often, misapplied chemicals may have unwanted results.

For example, when spraying for dandelions, you want to make sure to use enough chemicals to kill the weeds. However, if you apply too much, you may kill some of the broadleaf plants you want to keep, namely your trees. If you remember your trees’ roots are in the upper portions of the soil you can see how this might happen. A good technique for applying pesticides is using a spot application directly on the weed instead of a broadcast application across the entire lawn. This reduces the amount of pesticide you need to use, reduces the risk of affecting other plants, and puts fewer chemicals into the environment.

Finally, the overapplication of both fertilizers and pesticides can cause pollution. Fertilizer application beyond what the vegetation can use, and what the soil can hold, will move from the site. A heavy rain may wash the chemicals into ground water or onto another area. If the area of application is near a water source or storm sewer, the chemicals may be washed directly into the water and cause problems where you would not expect them.



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4) Invasive Landscaping Plants

When selecting new plants for around your homesite, you should avoid plants that have the potential to take over your adjacent land. There are several species available from local nurseries that can move into nearby lands and displace native plants. These species should be avoided and native plants given preference. For example, Norway maples look beautiful, but they are prolific seeders and will, over a period of years, seed into your nearby woods and displace native species. Other plants to avoid include Ginnala maple, Siberian elm, buckthorn, Tartarian honeysuckle, and varieties of switchgrass.

As a general rule, if you stick to plants native to your area, you will not have a problem. When considering non-native species, you may wish to consider sterile varieties of landscape plants or those where our climate will prevent the unwanted spread into local woods

5) Fire Safety

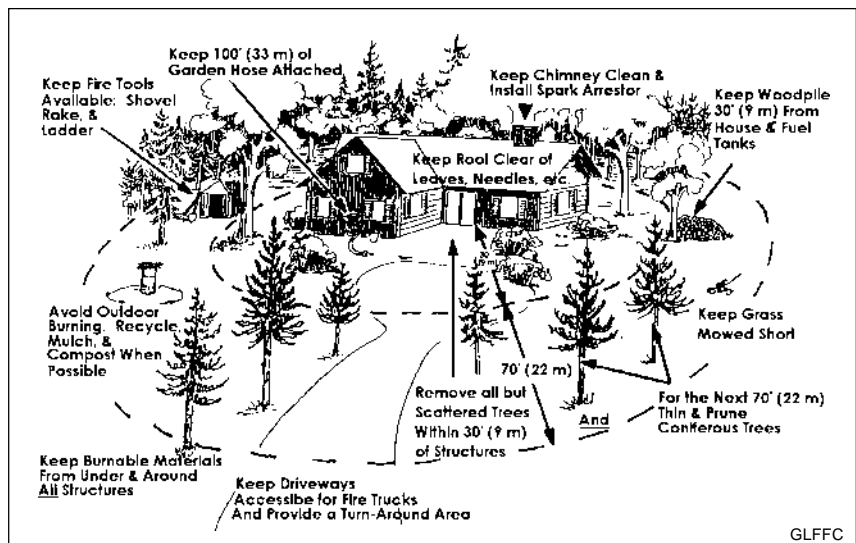
Reducing the risk of fire is a legitimate and “smart” land-management activity.

Reduce the risks

On property with buildings, you need to consider protecting those buildings from fire. As more and more people move onto rural lands, the fire departments of these areas are less able to protect all those rural structures. You can create “survivable space” that will allow your buildings to survive a wildland fire. The key to creating survivable space is reducing the fuel for a wildfire. Fuel on a homesite can include tall dead grass, small evergreen trees, firewood or lumber piles, brush, debris, and even the buildings themselves.

The fewer opportunities you give a firebrand to land near your buildings and ignite a fire, the better your buildings will survive. A rule of thumb is to maintain a green lawn at least 30 feet around any building. Remove any woodpiles and other flammable materials in this perimeter. Prune conifer trees up to at least 10 feet from the ground to limit the fire from starting the lower branches on fire. Keep your lawn mowed, raked, and green.

Most small landowners need to be concerned about the safety of their property from wildfire. Assess your risk by using the Forest Home Fire Risk Form (YP-56).



Quiz:

1. Are evergreen trees and shrubs removed at least 30 feet from buildings?
2. Is the grass mowed short and kept watered for 100 feet around buildings?
3. Is your driveway wide enough for large firefighting equipment?
4. Do you have an exterior water supply?
5. Are your shingles fire-resistant?
6. Are firewood and other flammable materials piled at least 30 feet from buildings?
7. Does your chimney have a spark arrestor?
8. Do you know the local burning laws?
9. Do you know how to report a wildfire?
10. Are basic firefighting tools kept handy (100 feet of hose, ladder, shovels, and extinguishers)?

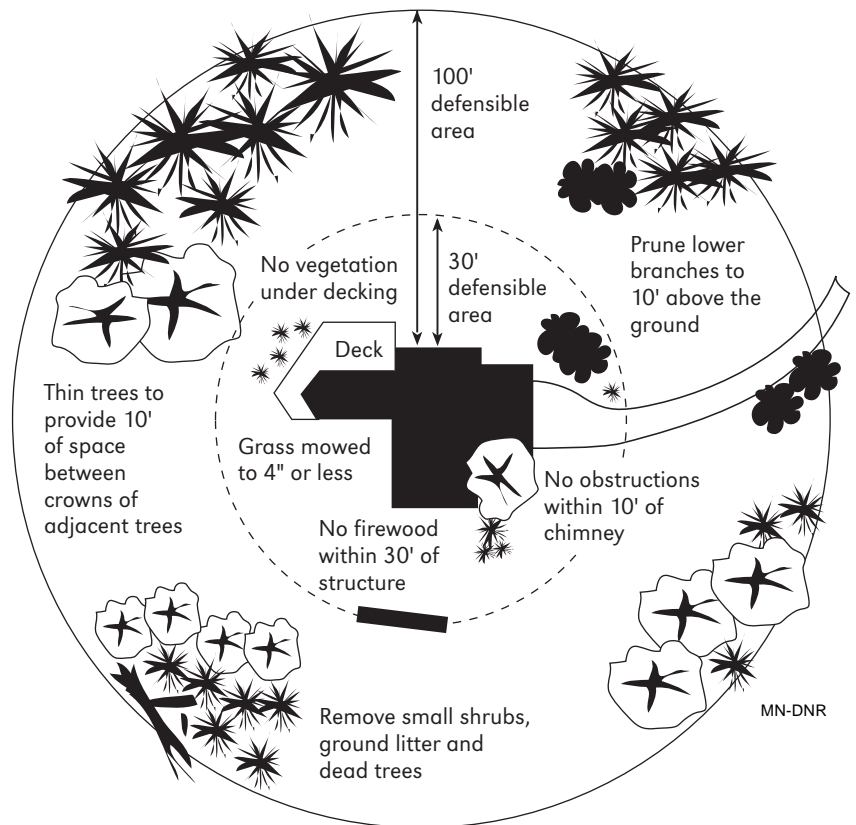
A “no” answer to any of the above questions represents an unsafe condition.

Your choice in building materials will affect the susceptibility of your home and property to the threat of wildfire. If your home is close to a marsh, conifer plantation, or tall grass field, avoid using combustible material for siding and roofing wherever possible. Be sure you keep your home well-maintained. Check your roof to be sure it is in good condition and free of dead leaves.

Cooperation between owners of neighboring parcels of land is another key to wildfire prevention. Wildfire is bigger than any one property. If both you and your neighbors manage vegetative fuels, fire risk can decrease. A fire-safe property might include flower and vegetable gardens, shrub borders, concrete and brick patios, and colorful gravel and landscape boulders that create an attractive setting while reducing fire risk. Ponds, streets, utility corridors, and mowed areas serve as fuel breaks.

Flammable plants are generally plants with needles or fine, lacy leaves. The leaves have an odor when crushed and the sap is gummy, resinous, and has a strong odor. Also, avoid plants with loose, papery bark. Examples include pines, spruces, fir, cedar, juniper, paper birch, and shagbark hickory.

Use less flammable plants around your homesite. These plants are, in general, those that have broad leaves that are supple and moist. Their sap is waterlike without an odor. Examples of native Minnesota plants providing many aesthetic and wildlife benefits include: dogwood, viburnum, oak, maple, elm, cherry, plum, ferns, poplar, and ironwood.



Frequently Asked Questions

1. What can I do to attract more wildlife near my home?

A mowed lawn provides minimal habitat; use turf only where it is needed. Of course, people usually like to see at least some lawn in their front yards. In areas where turf is not necessary, such as the corner of your yard or sides of the house, plant a variety of perennials (those plants that come back every year), shrubs, and trees. Consult a native plant nursery for species appropriate to your site.

- Think “vertical;” think in “groupings.” A mass of shrubs is often more visually striking than a single tree or shrub and is more appealing to songbirds if you are trying to attract them to your feeder. Vertical layering of perennials, shrubs, and trees creates a variety of habitats, thus attracting a variety of wildlife species.
- Get together with your neighbors and plant groups of trees and shrubs adjacent to each other at your property line. The combined groups will provide more habitat and privacy than unconnected individual efforts.
- Choose native plants that provide food and shelter for wildlife as well as colorful flowers and foliage for your enjoyment. Birdbaths are attractive to many birds in the summer, even if there is a lake, pond, or stream nearby.

2. How do I keep unwanted wildlife (like bears and squirrels) out of my bird feeders—and deer from eating the trees I planted?

So, you have “too much” of a “good thing?” Nuisance wildlife can be just that—a real nuisance. Just as it is important to learn the habitat needs of wildlife species you WANT to have on your property, learn the habitat needs of those creatures you do NOT want. You may be able to reduce nuisance populations of certain wildlife species by removing one or more of their habitat requirements.

In general, techniques to reduce “problem” wildlife include repellents, removing habitat, and fencing. The specifics of these techniques are as varied as the species of animal.

There are several bird feeders on the market that will keep squirrels at bay, but bears and raccoons can be more tenacious. Suspending feeders 10 feet above the ground at least eight feet away from poles, trees, or other structures may be effective. Taking feeders inside at night, especially in the spring when bears and raccoons are hungry from a winter of hibernation, may be your best tactic. Keeping deer away can be as simple as applying budcaps or repellent sprays, or as expensive as special fencing. For more information contact the DNR Information Center (YP-A) and/or University of Minnesota Extension Service (YP-N) for brochures on your problem animal.



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Black Bear

Brunner

Many good references to backyard tree care can be found at the DNR Information Center (YP-A) or on the web (YP-59).

See YP-19 for a good reference to some common insect and disease problems of trees. Inspect your trees often for signs of disease and/or insect problems. If you see evidence of either, contact your local city forester (YP-I), DNR forester (YP-J), or county extension agent (YP-H) for assistance in identifying the damaging agent and eliminating it.

3. How do I get grass to grow in the woodlands beside my home?

There may be several reasons grass is not growing in your woodland. It could be covered with a great diversity of forbs and shrubs that are beneficial to wildlife. In this case, why try to grow grass? You'll just have to mow it! The woods could be invaded by dense brush like buckthorn. Removing this tenacious exotic can be a daunting task. Look at page 54 for more information on controlling buckthorn. If there is very little ground cover, the woods may be too dense to support growth on the ground. A thinning may be necessary. Check page 22 for more on thinning.

4. Do I need, and how do I obtain, a burning permit to burn my trash?

You should not (and in most cases it is against the law to) burn trash. A burning permit is required in most counties to have a running grass fire or to burn a brush pile. If the ground has a contiguous 3-inch snow cover, you may burn vegetative materials only (tree branches, brush, crop residue, etc.) without a burning permit. Once the snow is gone, you need a burning permit. Some communities may be more restrictive on open burning. Contact your city or DNR Forester for a permit.

5. How do I prune my trees?

Pruning trees improves the quality of a tree and its beauty—a particularly important attribute when trees are located near your home where you look at them often. Pruning can be done when trees are as small as 4 to 8 inches in diameter at breast height (DBH), as well as during the life of the trees. But never remove more than one third of the live crown or branches. Any dead or damaged limbs, and crossing or rubbing branches should be pruned at planting time. Pruning should be done when trees are dormant, never when leaves are forming in spring or when they are falling in autumn. Oak trees should never be pruned between April 15 and July 1 to prevent spread of oak wilt. Pruning paint is not recommended for pruning cuts. For a diagram on correct pruning techniques, turn to page 23 in the “Woodland Section” of this guidebook, or see YP-21.

6. How do I care for the trees I planted around my home?

“Urban trees,” those trees growing in community parks and boulevards and around your home need attention—even after they have been planted. One of the most important activities is to ensure your trees have enough water right after planting. Check and care for them at least weekly during the first growing season.

Soil and weather conditions will dictate how often and how much water to apply. Examine the soil moisture 4 to 8 inches deep to determine the need for water. If the soil feels dry or just slightly damp, watering is needed. When you water, take into account the soil type and drainage.

Well-drained, sandy soil will need more water more often than a clay soil that can hold too much water. The best method? A slow trickle from the garden hose for several hours or until the soil is thoroughly soaked.

For established trees, place a hose in three or four locations that are even with the reach of the branches (drip line), moving the hose when the soil is thoroughly soaked. Avoid short, frequent waterings as this promotes the development of a shallow root system, which is vulnerable to environmental stress (drought).

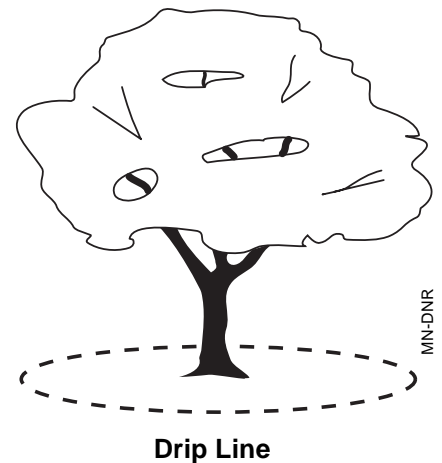
Protect trees from damage caused by lawn mowers, weed whips, pesticide use, and construction projects. To protect trees from lawn mowers and weed whips, mulch around the base of the trees with three to five inches of wood chips out to the drip line. This eliminates weeds and the need to trim or mow near trees. It also helps retain moisture during dry conditions. Avoid using broadleaf herbicides in the dripline area around trees, also keep equipment and construction materials out of this area.

Trees also need “winter protection,” which begins in the fall. Adequate moisture is needed to withstand the drying winds of winter. Therefore, trees should be thoroughly watered in late fall, just prior to the freezing of the soil. Trees need to go dormant; don’t encourage late growth by watering too heavily or applying nitrogen fertilization in early fall.

In the fall, wrap young and thin-barked trees with commercial tree wrap from the bottom up to the first major branch. This is to help prevent sunscald caused by the heating effect of the winter sun in cold weather. It causes sunken, dried, or cracked bark and usually occurs on the south or southwest side of the tree. Be sure to remove the wrap in the spring.

The combined effects of wind and sun cause winter browning of evergreens. Trees lose water from the needles while roots are in frozen soil. Place a screen of burlap or similar material on the south, west, and windward sides of the evergreen to protect it from wind and sun. Water evergreens well throughout the growing season, lightly in September, and then thoroughly again before the soil freezes. (Even better, select species that tolerate Minnesota winters.)

Animal damage during the winter months can be severe. To protect a tree from mice, place a cylinder of one-fourth-inch mesh hardware cloth or plastic drainpipe around the trunk. The cylinder should extend high enough to prevent feeding at snow level and should be firmly anchored in the soil without disturbing the tree roots. Protection from rabbits may be more difficult if they can reach higher than the hardware cloth extends. If you have many trees and shrubs to protect, application of a commercial repellent may be more practical. The repellent can be sprayed or painted on the trunks and branches. The effectiveness and duration of the repellent will depend on the severity of the winter and the availability of other food.



Watering rule of thumb:
Trees need at least one
inch of water each week
from either rainfall or your
sprinkler

Special Features



A. Introduction

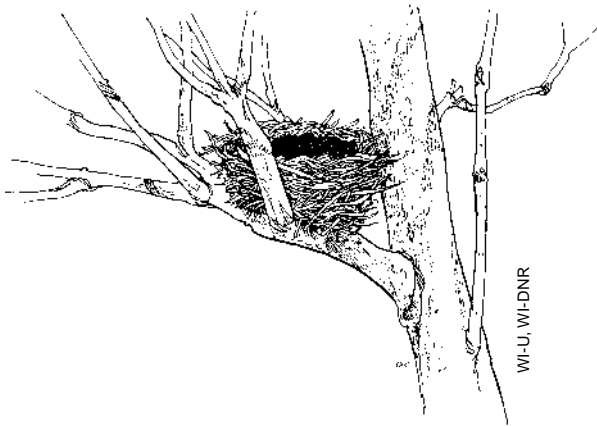
During the inventory of your property, you should have noted any special features. These “features” may be a beaver dam, an animal den or eagle’s nest, a seep or spring, or anything else that is unique to your property. In this section we will describe the significance and management of the following special features:

1) *Bird Nests*

Significant bird nests are eagle and osprey nests. If there are these types of nests, especially an eagle nest, on your property or on your neighbor’s property, you have a very significant feature! Watch the nest during spring and summer to see if it is occupied. If so, management on the rest of your property may need to be altered. Eagles lay eggs in March. Parents take turns incubating the eggs that hatch in about 35 days. The young eagles begin to fly at three months of age (late June or early July). Four weeks or so after they have learned to fly the young eagles leave the nest for good. Human disturbance near the nest site may cause eagles to abandon their nests or leave the young vulnerable to severe weather and predators. Therefore, it is necessary to protect nesting areas during the breeding season. The key is to not disturb the nest or the area around it for one-quarter mile. If you have an eagle nest near or on your property, contact your local DNR Wildlife Office (YP-D) for advice on management.

2) *Animal Dens*

If you find the den of a bear, fox, or other animal on your property, you have an exciting viewing opportunity. Watching fox pups play around a den in the evening can be a memorable experience. Red fox mate about mid-winter and the female bears from four to 10 pups in early spring. They often den up in woodchuck or badger holes. Dens are usually found in dense woods. The den, however, is little more than a nursery because fox

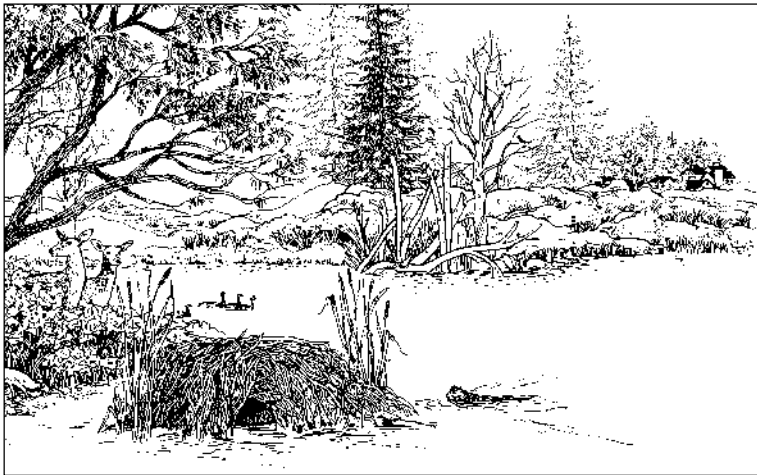


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prefer to sleep in the open, even during winter. The key to management around dens is to avoid disturbing them during the winter (bears) and early spring (fox) when their residents are either hibernating or nursing young.

3) *Beaver Dams*

Beaver dams on your property can be a blessing or a curse. The dams create wonderful ponds that provide habitat for a variety of animals from ducks to deer. The dams can also flood forests, roads, and other valuable property. If your beaver dam is not creating flooding problems, you have another great opportunity to enjoy wildlife. If the dam is creating unwanted flooding, there are several control options. For information, call the DNR Information Center (YP-A) and request the publication, *Controlling Beaver Damage*.



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4) *Springs and Seeps*

Springs and seeps are areas, usually on a hillside or base of a hill, where water flows out of the ground. The key to management around springs and seeps is to keep equipment away from these areas and maintain a vegetative cover around and up the slope. These areas generally have very different plants than the surrounding areas. Take some time to notice the different plants. Protecting these areas will retain water quality and provide a feature that attracts wildlife.

5) *Steep Slopes*

Steep slopes and cutbanks are fragile. It takes very little to start erosion that scars the land and degrades water quality. The key to management around these areas is the same as springs and steep slopes, protection. Planting native shrubs should stabilize cutbanks that have begun eroding.



Property-wide Issues

A. Introduction

To avoid repetition throughout this guidebook, we have placed management options and frequently asked questions common to many or all of the types in this section. If you have not found your answer elsewhere in this guidebook, this is the place to look!

1) *Trails and Roads*

Creating and maintaining trails and roads can benefit your entire property. They provide access for recreation and management activities, can serve as fuel breaks that prevent the spread of wildfire, and can enhance wildlife habitat. The key to creating trails and roads is siting. Locate your trails and roads so they provide necessary access, but be aware of the potential for erosion. Trails and roads built on a side hill, along waterways or across low areas can cause severe erosion. Avoid these areas if possible. Run your trails perpendicular to waterways. Seed trails to clover or other ground cover immediately after construction to reduce erosion and attract wildlife. Advanced techniques are necessary for building roads and trails on hills. An excellent resource is *Recreation Trail Design and Construction* (YP-72).

2) *Utility Lines and Easements*

Utility easements may transect your property. Management and maintenance of these are the responsibility of the utility company. Your main concern should be safety in management activities adjacent to these easements. Harvesting trees adjacent to powerlines can be risky. Contact your utility company if you plan to harvest trees, dig, or significantly alter the landscape adjacent to a utility easement.

Frequently Asked Questions

1. How can I attract wildlife?

Whether you want wildlife in your back yard or in your fields, forests, or wetlands, wild animals have four basic needs for survival: food, water, shelter, and space. If you keep those needs in mind as you plan for wildlife, you will have a good chance for success in obtaining both furred and feathered “residents” and “visitors.” In the following section, we talk a little about each of these components. You are encouraged to read further. Look for excellent wildlife references in the Yellow Pages at the back of this guidebook.

Food: Every species has its own unique food requirements, and they change as an animal matures and from one season to another. As you plant, favor fruits and berries, grain and seeds, nectar sources, nuts and acorns, browse plants (woody twigs and buds), forage plants (grasses and legumes), and aquatic plants.

Many insects and other invertebrates are attracted to trees and shrubs and they, themselves, provide a food source for wildlife.

Water: The importance of water cannot be overemphasized. Springs, beaver ponds, marshes, creeks, swamps, lakes, and rivers are vital components of the environment. If water is not available in any form on your property, this is a good time to take into account the water that may exist on adjoining lands. It may serve to provide that missing component of habitat that is needed to attract wildlife to your area. You may also want to create artificial water sources such as birdbaths and landscaping pools.

Shelter: Shelter is necessary to protect wildlife from weather and for use in hiding from predators. It is particularly important while animals are nesting and raising their young, and when animals are at rest. Shelter comes in many forms—trees, shrubs, grasses, flowers, or structures like rock piles, brush piles, cutbanks, hollow trees, birdhouses, burrows, bridges, and even abandoned buildings.

Space: Every animal species has its own unique pattern of space or “territory.” By learning how much space is defended by a particular species, you can know how much wildlife can be expected to occur on your land. A ruffed grouse, for example, needs about 10 acres. Bluebirds need about five acres per pair. In contrast, wood ducks and purple martins do not defend territories around their nests; thus many pairs can nest within a limited area.

How to attract birds to your yard

These are examples of plants you can grow to attract birds and other species. Be sure to check with your nursery on what grows best in your area.

Shrubs for birds

- common juniper
- highbush cranberry
- red-osier dogwood
- serviceberry
- sumacs
- viburnums
- wax myrtle

Trees for birds and other wildlife

- American beech
- American holly
- apple
- balsam fir
- cottonwood
- crabapple
- flowering dogwood
- hawthorns
- hickories
- oaks
- red mullberry

Vines for birds

- American bittersweet
- native honeysuckle
- strawberry
- Virginia creeper



WI-U, WI-DNR

Don't forget your neighbor! If you don't have all the "pieces," look beyond the boundaries of your land. Does your neighbor have a pond or other type of water resource that will provide this necessity for the wildlife you want to visit your property? Perhaps your neighbor's land can provide the "shelter" that your land doesn't. Each animal species needs a certain amount of space ("home range") where it can find the food, water, and shelter needed for survival. Depending on the size of your property, you may be able to provide all the habitat needs for a particular wildlife species if it has a small home range. To attract wildlife that roam over large areas, consider the habitat on surrounding properties and then provide the component of habitat on your land missing on your neighbor's.

2. How can I get rid of "problem plants" like prickly ash, poison ivy, brambles, thistles, spotted knapweed, and buckthorn?

"Problem plants" can occur on your homesite and in your woods and fields. Controlling problem plants usually requires a combination of cutting, pulling and herbicides. Generally, pulling small plants and cutting larger plants in late May to early July, when active growth occurs, is the first step in effective control. Following this with a second cutting in August along with a herbicide treatment completes an effective control program. Herbicides such as Glyphosate sprayed on leaves and Garlon⁴ sprayed on cut stumps seem to be most effective. Most herbicides are not recommended for use around kids and pets, and it is not recommended that they be allowed in the area of application for several days. Many herbicides are designed for specific plants. Use care as some herbicides will affect all plant material that they contact—whether it is desirable or not. You should always read the herbicide label to see if the plants you want to control are listed as target species and that the plants you want to keep are not.

For more detailed control measures for many of the common nuisance plants, call the DNR Information Center (YP-A) or (YP-64). For more information on herbicides, contact your local county Extension Office (YP-H) or the Minnesota Department of Agriculture (YP-M).

3. Can I use my property for income?

Small acreages have fewer opportunities for generating income than larger tracts of land, but there still are options. You may not have enough land for a commercial timber sale, but cutting of individual trees for firewood or specialty products like artist conks, crafter's birch branches, decorative cones and a host of others may be possible. For more information, see YP-17.

4. How does a rural sewage treatment system affect my property?

Areas not served by a municipal sewage-treatment system rely on individual sewage-treatment systems (ISTS) for treatment and disposal of sewage generated on the lot. Poorly constructed or maintained sewage systems can pollute nearby waters and even your private well. ISTS should be installed and inspected by a qualified ISTS installer.

The life of an ISTS, at normal loading and with good maintenance, should be 25 years or longer. For most systems, this means checking (every three years for most systems) the depth of accumulated solids in the septic tank.

If the amount of accumulated solids is too great, the solids must be removed through the manhole by a licensed ISTS pumper. Excessive water use in the dwelling should be avoided, as should excessive organic

loads (garbage disposals). No toxic or hazardous substances should be discharged into the system. For more information, see YP-57.

5. How can I develop a view while preserving the natural feel of my property?

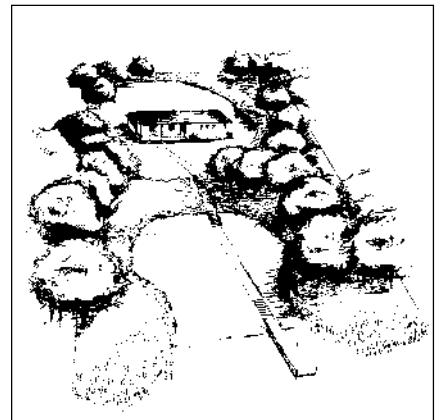
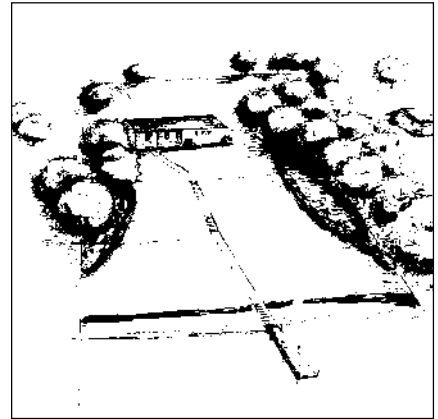
People often re-create the landscape at their cabin that they leave behind at their permanent residence. In some cases, mowing the large lawn is one of the prime weekend activities. In some cases the lot has been cleared to create a panoramic view. Occasionally the forest is completely cleared. Habitat connections that provide cover for animals are lost. Privacy is often sacrificed and seasonal interest and change within the yard is limited.

When a mowed lawn is the standard landscape treatment, few wild-life species are able to make this site their home because of the lack of food and cover. Water quality declines as debris and fertilizers wash into the lakes and streams. Also, steep slopes often occur on streambanks and encircle Midwestern lakes. When cleared, these slopes are susceptible to erosion without the protection of canopy trees and understory plants. Slopes are also dangerous to mow and are too steep to be used for most recreational activities.

By reducing lawn size you reduce landscape maintenance needs and allow more leisure time. Habitat can also be preserved or restored without sacrificing the owners' needs. By selective trimming of branches and brush, "framed" views can be created, easy access to the lake maintained, and outdoor play space left ample without destroying the habitat value of the property.

A greater diversity of plants will provide food and shelter for a great variety of wildlife species. Adding trees, shrubs, wildflowers, and grasses builds the vertical structure of habitat, which increases a lot's usefulness for wildlife. This vegetation also helps to prevent soil erosion by breaking the energy of raindrops hitting the ground and by holding soil in extensive root systems. Emergent vegetation planted in the water absorbs wave energy, thereby reducing beach erosion. Water clarity is not compromised by soil washing from the lot.

When natural vegetation has been destroyed, re-create the buffer zone and replant forest to create a vegetative connection between water and upland forest. This cover is essential for many wildlife species. By restoring the forest and water's edge vegetation, erosion is greatly reduced, and a great variety of wildlife will visit the property. Distinct areas of lawn will provide space for favorite activities and allow a selected view. All of this facilitates a harmonious existence with the natural environment and its inhabitants.



MN-DNR

6. What can I do to involve my neighbors in resource management?

The first step is to get to know your neighbor. Discuss your property, the goals you have, and the activities you plan to undertake. Give them a copy of this guidebook. Discuss the features that you've seen on their property that complement your activities. Building an interest in resource management takes time, but if you show them the benefits, they may be willing to become involved.



WI-U, WI-DNR

Stand Inventory Worksheet (Complete one sheet for each stand or different area on your property.) **Side 1**

_____ Stand number or letter (mark this on your map) Neighbor's property

Basic type (check one):

- Open (grassland, bare soil, pasture, crops, predominantly brush or shrubs—few or no trees)
- Woodland (predominantly trees)
- Wetland (open water, wet soil or periodically wet area)
- Developed (property with buildings on it or utility right of way)

Soil—dig a small hole about a foot deep. Is the soil at the bottom of the hole:

- Wet Sand Clay (sticky and hard to dig) Loam (rich, black dirt)

Slope—is the land: Level Hilly (If it's hilly, which direction does the hill face?):

- North East South West Rolling, no specific direction;

Vegetation (What is the predominant vegetation?):

Open: Bare soil Grass Crops (what kind): _____
 Flowering plants. List kinds you know: _____
 Brush. Predominant kind: _____
 Are the plants: Thickly stocked Scattered

Woodland—Predominant tree type:
 Deciduous (broadleaf, loses leaves in fall). List species you recognize in order of predominance: _____

 Evergreen (leaves are needles). List species you recognize in order of predominance: _____

Predominant tree size:

- Seedling (under 5 feet tall) Sapling (5 feet tall to 5 inches in diameter)
- Pole (5 to 8 inches in diameter at 4 feet above the ground [Dbh]) Sawtimber (over 8 inches Dbh)

Tree condition:

- Vigorous (no leaf discoloration, stems are straight without blemishes, no dead branches in the crown)
- In trouble—check conditions that apply:
 - Discolored or shredded leaves Odd growths on stems and branches
 - Many dead branches in tree crowns Many dead trees in the area

Are trees in rows? Yes No

Undergrowth: Pine needles or bare soil Short (<1ft) shrubs & forbs (species: _____)
 Medium brush (1-3 feet tall) (species: _____)
 Tall brush (over 3 feet tall) (species: _____)

Density: Heavy (hard to walk through) Moderate Sparce

Wetland—character:
 Open water: Lake Stream Pond
 Emergent vegetation (plants growing out of most of the water area). List kinds if known: _____

 Seasonally wet area (not always open water). Predominant vegetation:
 Bare soil Grasses Cattails Shrubs Other: _____

Developed:
 Homesite
 Predominant trees: Deciduous Evergreen—list species: _____
 (if evergreens, do a fire assessment)
 Tree size: Seedlings Saplings Pole Sawtimber
 Tree condition: Vigorous Problems. List: _____
 Other significant features: _____
 Utility right of way: Powerline Gas line Other: _____
 Roadway
 Other _____

Other features in this stand: Fence Nest (bird: _____) Animal den (animal: _____)
 Beaver dam Steep slope Water seep or spring Other: _____

Any variations within the stand? List/describe/sketch: _____

Management notes (what would you like to do with this stand?): _____

Planning Worksheet

Goals:

Reasons for owning this land:

- Place to live Retreat Investment Firewood source Recreation Other: _____

Overall goals:

- More wildlife Better fishing/hunting Recreation trails Income Other: _____

Initial goals. (Do reasons and overall goals coincide?) If not revise one or the other, then list your goals: _____

Assessment (information from Stand Inventory Worksheets):

Stand number: _____ Basic type: _____

Brief description (what's there, condition, unique features): _____

Management option (from section IV of guidebook): _____

When (when to start and finish the project): _____

Resources (list items you need to find out more about to accomplish the management option): _____

Stand number: _____ Basic type: _____

Brief description: _____

Management option: _____

When: _____

Resources: _____

Stand number: _____ Basic type: _____

Brief description: _____

Management option: _____

When: _____

Resources: _____

Stand number: _____ Basic type: _____

Brief description: _____

Management option: _____

When: _____

Resources: _____

Stand number: _____ Basic type: _____

Brief description: _____

Management option: _____

When: _____

Resources: _____

V. Yellow Pages

Assessment & Inventory

- 1 • Biomes—on the web see: www.dnr.state.mn.us/forestry/arborday/benefitingbiomes.pdf or www.dnr.state.mn.us/forestry/arborday/index.html
- 2 • “Natural Vegetation of Minnesota at the Time of the Public Land Survey: 1847-1907,” DNR publication, 1988
- 3 • Soil surveys are available from your local NRCS office or on the web at www.statlab.iastate.edu/soils/nssc/
- 4 • Soil tests can be obtained by contacting the Soil Testing Laboratory, Rm. 135 Crops Research Bldg., 1903 Hendon Avenue, University of Minnesota, St. Paul, MN 55108-6089, (612) 625-3101. For more information, check the web at <http://soiltest.coafes.umn.edu/>
- 5 • Topographic maps are available from local map retailers or Minnesota Geological Survey, 2642 University Avenue W, St. Paul, MN 55114-1057, (612) 627-4782, or on the web at www.geo.umn.edu/mgs/#docs
- 6 • Aerial photos are available from your local Soil and Water Conservation District office or on the web at <http://maps.dnr.state.mn.us/forestry/photos/>
- 7 • USGS quad maps are available from local map retailers or on the web at <http://mapping.usgs.gov/>
- 8 • Forest measurement information can be found on the web at <http://forestry.about.com/science/forestry/library/weekly/aa121398.htm>

Identification Guides

- 9 • “Wetland Plants and Plant Communities of Minnesota and Wisconsin,” Eggers, Steve D. and Donald M. Reed, 1997, 263pp. U.S. Army Corps of Engineers, 190 Fifth Street E, St. Paul, MN 55101-1638, (651) 290-5200, on the web at www.npwr.usgs.gov/resource/1998/mnplant/mnplant.htm
- 10 • “Newcomb’s Wildflower Guide,” Lawrence Newcomb, Little, Brown & Co., New York, NY, 1977, ISBN 0-316-60442-9. Available at the public library or many nature book stores.
- 11 • “Vascular Plants of Minnesota, A Checklist and Atlas,” Gerald B. Ownbey and Thomas Morley. University of Minnesota Press, Minneapolis, MN, 1991. 307pp. ISBN 0-8166-2326-0. Available at book stores and libraries.

Publications from the University of Minnesota Extension

- 12 • “Minnesota’s Forest Trees,” 1995, BU-0486, \$9.50, or on the web at www.extension.umn.edu/distribution/naturalresources/DD0486.html
- 13 • “Native Vegetation Poster,” 2000, MI-07448-GO, #2, or on the web at www.extension.umn.edu/distribution/naturalresources/DD7448.html

Woodlands

- 14 • Management: “Conserving Wooded Areas in Developing Communities,” 2000, 113pp., DNR Publication.
- 15 • “Protecting Water Quality and Wetlands in Forest Management—Best Management Practices in Minnesota,” 1995. DNR publication.
- 16 • “Woodland Stewardship—A Practical Guide for Midwestern Landowners,” 1993, MI-05901-GO, \$14.95, University of Minnesota Extension or on the web at www.extension.umn.edu/distribution/naturalresources/DD5901.html
- 17 • Specialty forest products information is available by contacting your local DNR Forester or on the web at <http://www.extension.umn.edu/distribution/naturalresources/DD7278.html>
- 18 • Tree planting information is available from the DNR Info Center or on the web at <http://www.dnr.state.mn.us/forestry/nurseries/treeseed.html>
- 19 • Tree problems: If you have a problem with your tree, contact your local city, county extension, or DNR forester. A diagnostic tool can be found on the web at www.dnr.state.mn.us/forestry/index.html
- 20 • Tree pest sampling and IPM information on the web at <http://everest.ento.vt.edu/~salom/Samplemeth/content.html>
- 21 • Tree pruning: “How to Prune Your Trees,” U.S. Forest Service publication available from the DNR or on the web at www.na.fs.fed.us/spfo/pubs/howtos/ht_prune/prun001.htm
- 22 • Tree selection information is available from the DNR Info Center or on the web at www.dnr.state.mn.us/forestry/nurseries/treetabl.html
- 23 • Tools and supplies can be ordered by contacting Forestry Suppliers, Inc., 1-800-647-5368,

www.forestry-suppliers.com/ or Ben Meadows Forestry Supplies, 1-800-241-6401, www.benmeadows.com

- 24 • Wildlife management: For a brochure explaining how to manage private land for deer, ruffed grouse, wild turkey or sharp-tailed grouse, call the DNR Info Center, or on the Michigan DNR website at <http://www.dnr.state.mi.us/Wildlife.asp?linkid=30&Link=link#>

General Forestry Information

- 25 • A variety of forestry information can be found on the web at www.cnr.umn.edu/FR/extension/
- 26 • On-line USFS publications: pest alerts, how to prune, etc., and other stewardship, FHP, and urban forestry information on the web at www.na.fs.fed.us/spfo/fth_pub.htm
- 27 • Minnesota Forestry Association, P.O. Box 496, Grand Rapids, MN 56601. 1-800-821-8733. Offers tree seedling program and woodland owners magazine. www.mnforest.com

Other Publications from the University of Minnesota Extension

- 28 • “Common Questions about Wildflowers and Native Plants,” 1998, FS-06065, \$0.50, or on the web at www.extension.umn.edu/distribution/horticulture/DG6065.html
- 29 • “Field Windbreaks,” 1999, FO-00824-GO; \$ 0.75 or on the web at www.extension.umn.edu/distribution/naturalresources/DD7311.html or www.dnr.state.wi.us/org/land/forestry/nursery/generalinfo/windbreaks.htm
- 30 • “Managing Woodlands for Wildlife,” 1993, VH-06214, \$30
- 31 • “Marketing Timber from the Private Woodland,” 1991, FO-2723-GO, \$3, or on the web at www.extension.umn.edu/distribution/naturalresources/DD2723.html
- 32 • “Native Plants for Sustainable Landscapes,” 2000, BU-07447-GO, \$6.75
- 33 • “Native Trees for Landscape Use,” 1998, FS-00466, \$0.50, or on the web at www.extension.umn.edu/distribution/horticulture/DG0466.html
- 34 • “Plan on It! Woodland Stewardship,” 1991, MI-05697-GO, Free or on the web at www.extension.umn.edu/distribution/naturalresources/DD5697.html

- 35 • “Preventing Pollution Problems from Lawn and Garden Fertilizers,” 1999, FO-02923, \$.75, or on the web at www.extension.umn.edu/distribution/horticulture/DG2923.html
- 36 • “Recommended Trees for: Northwest and Central Minnesota,” 1997, FO-06945, \$3, or on the web at www.extension.umn.edu/distribution/naturalresources/DD6945.html
- 37 • “Specialty forest products,” 1999, FO-7278-GO, \$1, or on the web at www.extension.umn.edu/distribution/naturalresources/DD7278.html
- 38 • “Tough Trees and Shrubs for Tough Sites,” 2000, FO-07502-GO, \$1 or on the web at www.extension.umn.edu/distribution/naturalresources/DD7502.html
- 39 • “Trees, Shrubs and Vines for Minnesota Landscapes,” 1988, BU-00545, \$4, or on the web at www.extension.umn.edu/distribution/horticulture/DG0545.html

Wetlands

- 40 • “Lakescaping for Wildlife and Water Quality,” Carrol Henderson, 1999. Minnesota Department of Natural Resources. 180 pp. Available from Minnesota’s Bookstore, DNR Gift Shop, or your local bookseller \$19.95
- 41 • “Wetland Plants and Plant Communities of Minnesota and Wisconsin,” 1997, USGS or on the web at www.npwrc.usgs.gov/resource/1998/mnplant/mnplant.htm
- 42 • “Storm Water and Wetlands,” Minnesota Storm Water Advisory Group, 110pp., (651) 296-6575, free.
- 43 • “Protecting Water Quality in Urban Areas,” MPCA, 700 pp., \$40 paper copy or free on the web at: www.pca.state.mn.us/water/pubs/sw-bmpmanual.html
- 44 • For more information on working around water, visit the web at www.dnr.state.mn.us/waters/permfacts/index.html
- 45 • “Burnett County Buffer Restoration Handbook,” Burnett County Land and Water Conservation Department, 7410 County Road K, #109, Siren, WI 54872, (715) 349-2186, visit the web at www.mwd.com/burnett/lwcd/restore.html

Publications from the University of Minnesota Extension

- 46 • “Living Shore, The Best Management Practices for Shoreland Vegetation,” 1998, VH-07129-GO, \$15
- 47 • “Protecting Our Waters, Shoreland Best Management Practices,” (series of fact sheets), 1998, MI-06946-GO, \$10, or on the web at www.extension.umn.edu/distribution/naturalresources/DD6946.html
- 48 • “Shoreland Landscaping Series,” 1999, PC-07357-GO, \$5, part of this series is on the web at: www.extension.umn.edu/distribution/naturalresources/DD7357.html
- 49 • “Standing Firm Against Erosion, Best Management Practices for Shoreland Stabilization,” 1998, VH-07130-GO, \$15
- 50 • “Turfgrass Management for Protecting Surface Water Quality,” 1997, BU-05726, \$4, or on the web at www.extension.umn.edu/distribution/horticulture/DG5726.html

Prairies

- 51 • “Going Native—A Prairie Restoration Handbook for Minnesota Landowners,” 2000, 63pp, DNR Publication, on the web at: www.dnr.state.mn.us/ecological_services/sna/help.html
- 52 • “Restoring the Tallgrass Prairie,” Shirley Shirley. University of Iowa Press, Iowa City, IA, 1994. ISBN 0-87745-469-8. Available at book stores and libraries.
- 53 • “The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands,” Stephen Packard and Cornelia F. Mutel eds. Society for Ecological Restoration. Island Press, Washington, DC, 1994. ISBN 1-55963-320-4. Available at book stores and libraries.
- 54 • Minnesota nurseries specializing in native prairie plants/seeds (this list is not complete and is not an endorsement by the Minnesota Department of Natural Resources):
 - Landscape Alternatives, Inc., Roseville, (651) 488-3142
 - Mohn Frontier Seed and Nursery, Cottonwood, (507) 423-6482
 - Feder’s Prairie Seed Co., Blue Earth, (507) 526-3049
 - Prairie Moon Nursery, Winona, (507) 452-1362 or 452-5231

Prairie Hill Wildflowers, Ellendale, (507) 451-7791
Prairie Restorations, Inc., Princeton, (763) 389-4342, Hawley, (218) 498-0260, Cannon Falls, (507) 663-1091
Rice Creek Gardens, Inc., Blaine, (763) 754-8090
Shady Acres Herb Farm, Chaska, (952) 466-3391

- 55 • Contractors who conduct prairie burns in Minnesota (this list is not complete and does not indicate endorsement by the Minnesota Department of Natural Resources):
 - Prairie Land Management (320) 268-3396
 - Salix Ecological Resources (507) 831-3483
 - Minnesota Native Landscapes (320) 968-4222
 - Applied Ecology (612) 724-8916
 - Prairie Moon (507) 452-1362

Homesite

- 56 • “Forest Home Fire Risk Form” available from your local DNR Forestry Office or on the Web at www.dnr.state.mn.us/forestry/fireform/fireintro.html
- 57 • Rural sewage treatment: visit your local environmental health, planning or zoning office or go to the web at www.pca.state.mn.us/programs/ists/homeowners.html
- 58 • “Erosion Control for Home Builders,” GWQ001, Cooperative Extension Publications, 45 North Charter Street, Madison WI 53715, (606) 262-4446, toll free 877-947-7827, \$.25 or on the web at <http://clean-water.uwex.edu/pubs/sheets/index.html>
- 59 • For more information on backyard tree care visit www.dnr.state.mn.us/backyard/treecare/index.html

Publications from the University of Minnesota Extension

- 60 • “Septic System Owner’s Guide,” 1997, PC-6583-GO, \$4.00 or on the web at www.extension.umn.edu/distribution/naturalresources/DD6583.html
- 61 • “Low Input Lawn Care,” 2000, FO-07552-GO, \$1.20, or on the web at www.extension.umn.edu/distribution/horticulture/DG7552.html

Property-wide Native, Non-native, and Invasive Plant Lists & Guides

- 62 • “European (Common) Buckthorn,” available from the DNR Info Center or on the web at www.dnr.state.mn.us/fish_and_wildlife/exotics/buck.html
- 63 • “Beware! Don’t Spread Loosestrife!” available from the DNR Info Center or on the web at www.seagrant.umn.edu/exotics/purple.html
- 64 • Detailed control measures for common nuisance plants, call the DNR Info Center or on the web at www.dnr.state.mn.us/fish_and_wildlife/exotics/
- 65 • “The Minnesota Conservation Volunteer,” Minnesota Department of Natural Resources. To subscribe, contact Sue Ryan at (651) 296-0888 or sue.ryan@dnr.state.mn.us
- 66 • “Natural Areas: Protecting a Vital Community Asset,” 1997, Laurie Allman, 148pp, DNR Publication, on the web at www.greatplains.org/resource/1999/natural/natural.htm

Publications from the University of Minnesota Extension

- 67 • “Pastures for Profit: A Guide to Rotational Grazing,” 1993, FO-06145-GO, \$3.50
- 68 • “Manure and Pasture Management for Recreational Horse Owners,” 2000. BU-07540-GO, \$5, or on the web at www.extension.umn.edu/distribution/naturalresources/DD7540.html
- 69 • “A Beginner’s Guide to Minnesota trees,” 1995, BU-6593, \$1 or on the web at www.extension.umn.edu/distribution/naturalresources/DD6593.html
- 70 • “Butterfly Gardening,” 1996, BU-06711-GO, \$5, or on the web at www.extension.umn.edu/distribution/horticulture/DG6711.html
- 71 • “Establishing and Maintaining a Prairie Garden,” 1997, FO-6748-GO, \$1.50, or on the web at www.extension.umn.edu/distribution/horticulture/DG6748.html
- 72 • “Recreation Trail Design and Construction,” 1997, University of Minnesota, BU-6371-GO, \$3, or on the web at: www.extension.umn.edu/distribution/naturalresources/DD6371.html

Wildlife Guides

- 73 • “Disappearing Wildflowers,” The Minnesota Conservation Volunteer, July-August 1998, pp 16-17, DNR Info Center or on the web at www.dnr.state.mn.us/information_and_education/publications/volunteer/articles/bigwoods.html
- 74 • “How to Manage Private Land for Deer, Ruffed Grouse, Wild Turkey or Sharp-tailed Grouse,” DNR Info Center
- 75 • “Landscaping for Wildlife,” Carrol Henderson, 1987, Minnesota Department of Natural Resources, 144pp. Available from Minnesota’s Bookstore or your local book seller. \$10.95
- 76 • “Lakescaping for Wildlife and Water Quality,” Carrol Henderson, 1999. Minnesota Department of Natural Resources. 180 pp. Available from Minnesota’s Bookstore or your local bookseller \$19.95
- 77 • “Planning for the Birds: Things to Consider When Managing Your Forest,” Carol Pearson, 1998. Minnesota Department of Natural Resources. 35pp. Available from the Minnesota DNR, Division of Ecological Services, Attention: Publications, 500 Lafayette Road, St. Paul, MN 55155-4025, (651) 296-2835
- 78 • “Woodlands and Nongame Wildlife,” 1992, DNR Info Center
- 79 • Problem wildlife? Contact the DNR Info Center or on the web at: www.dnr.state.mn.us/fish_and_wildlife/nuisance_animals/index.html

Wildlife Organizations

- 80 • Ducks Unlimited, State Chairman, Al Zender, 233 Teepeeotah Road, Tracy, MN 56175; (507) 763-3653, www.ducks.org
- 81 • Pheasants Forever, 1783 Buerkle Circle, St. Paul, MN 55110, (651) 773-2000, FAX: (651) 773-5500, toll free 1-877-773-2070, www.pheasantsforever.org/
- 82 • Minnesota Deer Hunters Association, 460 Peterson Road, Grand Rapids, MN 55744, 1-800-450-DEER, www.mndeerhunters.com
- 83 • Ruffed Grouse Society, 451 McCormick Road, Coraopolis, PA 15108, (412) 262-4044, FAX: (412) 262-9207, toll free 1-888-564-6747, www.ruffedgrousesociety.org/

Follow Up Contacts

- A • DNR Info Center/DNR Publications: The DNR Info Center can be contacted for all DNR Publications listed by calling (651) 296-6157 in the Twin Cities or 1-888-MINNDNR (1-888-646-6367) in Greater Minnesota, or stopping by 500 Lafayette Road, St. Paul, MN 55155-4040, or on the web at www.dnr.state.mn.us
- B • DNR Gift Shop: 500 Lafayette Road, St. Paul, MN 55155, (651) 228-9165
- C • DNR Waters: 500 Lafayette Road, St. Paul, MN 55155-4032, (651) 296-4800 or for your local contact, visit the DNR web at www.dnr.state.mn.us/waters/resources/index.html
- D • DNR Wildlife: 500 Lafayette Road, St. Paul, MN 55155-4007, (651) 296-3344 or for your local contact, visit the DNR web site at www.dnr.state.mn.us/fish_and_wildlife/wildoff.html
- E • DNR Forest Nursery: Tree Sales, General Andrews Nursery, Box 95, Willow River, MN 55795, (218) 372-3183 or on the web at www.dnr.state.mn.us/forestry/fornuop.html
- F • Local NRCS Office: Check the blue pages (government pages) of your phone book under U.S. Government, Natural Resources, Natural Resources Conservation Service.
- G • Local Soil & Water Conservation District: Contact your local watershed district office. If you don't have one, or don't know if one exists, you can contact the local Soil and Water Conservation District Office (SWCD) in the business pages of your phone book under the county name or the Board of Water and Soil Resources (BOWSR), St. Paul Central Office, One West Water Street, Suite 200, St. Paul, MN 55107-2039, (651) 296-3767 or check on the web at www.bwsr.state.mn.us/govt/govt.html
- H • Local County Extension Office: Check the blue pages (government pages) of your phone book under County Government. The local extension office will be listed as Minnesota Extension Service.
- I • Local City Forester: Check the blue pages (government pages) of your phone book under your city. Call the main city number and ask if they have a city forester on staff. Forestry may also be listed under Parks and Recreation or Maintenance department.
- J • Local DNR Forester: Check the blue pages (government pages) of your phone book under State Government and look for a Forestry listing under Minnesota State Offices, Natural Resources Dept. Of. You can also locate your local DNR Forestry Office on the web at www.dnr.state.mn.us/forestry/forregion.html
- K • MPCA: Minnesota Pollution Control Agency, 520 Lafayette Road, St. Paul, MN 55155-4194, (651) 296-6300, (651) 296-7523 (publications), 1-800-657-3864.
- L • Minnesota's Bookstore: 117 University Avenue, Room 110A, St. Paul, MN 55155, (651) 297-3000 or 1-800-657-3757.
- M • Minnesota Department of Agriculture: 90 W Plato Boulevard, St. Paul, MN 55107, (651) 297-2200, or toll free 1-800-967-2474, or on the web at www.mda.state.mn.us
- N • University of Minnesota Extension: Extension Distribution Center, 405 Coffey Hall, 1420 Eckles Avenue, University of Minnesota. St. Paul, MN 55108-6068, (612) 624-4900 or 1-800-876-8636, Fax (612) 625-6281 or on the web at www.extension.umn.edu/units/dc/catalog.html
- O • University of Minnesota Press: Suite 290, 111 Third Avenue S, Minneapolis, MN 55401, (612) 627-1970.
- P • U.S. Army Corps of Engineers: Check the blue pages (government pages) of your phone book under U.S. Government. The local office will be listed under Army Corps of Engineers, or check on the web at www.usace.army.mil/where.html
- Q • USGS: Prairie—Northern Prairie Wildlife Research Center, 8711 37th Street SE, Jamestown, ND 58401, (701)-253-5500, FAX: (701)-253-5553; Maps—Earth Science Information Center, U.S. Geological Survey, 507 National Center, Reston, VA 20192 USA, toll free 1-888-ASK-USGS (1-888-275-8747).
- R • U.S. Fish & Wildlife Service—U.S. Department of the Interior, U.S. Fish and Wildlife Service, Division of Fish and Wildlife, Management Assistance and Habitat Restoration, Branch of Habitat Restoration, 1849 C Street NW, Room 400—Arlington Square, Washington, DC 20240, (703) 358-2201 or on the web at www.fws.gov

This guidebook is intended to:

- Inspire you as a landowner to apply conservation practices to your land. There are many things you can do with your property! This guidebook is written to help you accomplish your goals without the undesirable effects that could result from decisions made without basic conservation management principles in mind.
- Create a greater understanding of conservation practices and increase your knowledge of resources available to assist in conservation management activities.

