Managing Michigan's Wildlife:

A landowner's guide

This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information, and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this guide provides you the knowledge and the motivation to make positive changes for our environment.

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MUCC

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FOREWORD

Michigan's landscape is changing, and many of these changes are threatening our state's wildlife heritage. Over the past 150 years, logging, agriculture, industry, and urbanization have changed the face of Michigan and the wildlife it can support. These actions, especially when done unwisely, have come at a cost we did not anticipate: polluted waters; contaminated soils; and the loss of wetlands, grasslands, and forests, and some of the wildlife they supported.

Change continues and will further impact our wildlife resources, and our own quality of life. Unlimited low-density growth is destroying and degrading our wildlife habitats. Open spaces that wildlife need to live are rapidly being converted to pavement, houses, and other human developments that are unsuitable to most wildlife. From 1982 to 1992, the state lost nearly eight percent of its farmland through conversion to other uses. This loss translates to over 850,000 acres per year, or 10 acres per hour. State planners project that between 1990 and 2020, 1.4 to 2 million additional acres of land will be converted to urban development, even though the state's population will increase by less than 12 percent. This conversion increase equals almost as much urbanized land as was recorded for the entire state in 1978. The amount of land in jeopardy is larger than four average sized counties. Low-density sprawl is a reality today and will become an even bigger threat in the near future. The continual loss of open space, and consequently wildlife habitat, is the biggest reason for population declines of many animals, both aquatic and terrestrial.

As a society, we must collectively find the will to address the issues of gain-now, pay-later development. Short-term gain achieved without giving proper concern to long-term environmental consequences may have devastating results for all of us. As property owners concerned with conservation, there is much we can do to protect and improve the wildlife habitat we own, and in turn, the environment we live in. Working as individuals, or in concert with our neighbors and community, we can become better land managers.

The purpose of this guide is to present landowners with a variety of methods through which they can improve wildlife habitat on their property, and ease the consequences of our changed ecosystems. Each chapter pertains to managing different ecosystems or species in Michigan. Regardless of the size of your property, whether it is an urban back yard, a "back forty", or more than a section, you can set goals and take the proper steps to improve your property for wildlife. Every piece of property is important to the big picture, and it is not too late to begin improving our land. This guide provides the information you will need to conserve Michigan's plants, animals, and ecosystems.

ACKNOWLEDGEMENTS

When the Private Lands Working Group discussed and approved the creation of this publication, it was evident that it would take the efforts of many individuals in order for it to be a success. With enthusiasm, the individuals or organizations detailed or noted below have contributed to this publication and demonstrated unequivocal commitment to the conservation and preservation of our Michigan natural resources. Together we had a vision -- together we accomplished our goal. Thank you.

First and foremost, thanks must be bestowed to Mr. Tom Huggler, Outdoor Images, who was hired to write the first draft of this publication. Tom persevered through endless meetings with the enthusiasm and the dedication of a true conservationist.

Another individual who made enormous contributions to this landowner guide is Ms. Amy Berry, MDNR, Wildlife Division. Amy has impacted all aspects of this guide through writing, editing, graphic design, and artwork. She arrived in May 1998 with a variety of skills and has demonstrated commendable commitment. Other individuals who provided artwork are Mr. Mitch Smith, former MUCC Art Director, and Ms. Marie Gougeon, MSG Graphics. As you can see, these three individuals did an extraordinary job bringing our Michigan plants and animals to life throughout the pages of this guide.

Mr. John Paskus from the Michigan Natural Features Inventory must also be individually recognized for his contribution to this guide. The editors believe John's expertise, dedication, and strive for excellence substantially increased the quality and broadened the scope of this publication.

As with any publication, there are many individuals who work behind the scenes making copies, assembling information, and providing support. We would like to thank them as an entity and let them know how much they are appreciated. One critical team player was Mr. Bruce Warren who should be applauded for not only his humor, but for preparing several chapters of this guide and being there whenever he was needed.

Michigan United Conservation Clubs was commissioned to layout and print the manual. In particular, Ms. Jeanne Esch, MUCC Art Director, deserves esteemed recognition for her efforts in this area. Throughout the entire process, which at times was tedious and deadline demanding, she maintained a positive attitude and was truly a pleasure to work with. The editors would also like to thank Mr. Michael Soczik, MUCC Marketing Director, who provided financial administration.

As mentioned earlier, the Private Lands Working Group contrived this project. The Group is an assembly of public and private organizations with the goal of developing programs and projects to facilitate habitat development on private lands. In 1995, the group collectively set out to create a landowner guide that would instruct individuals how to manage their land for wildlife. The individuals listed below have been instrumental in the creation of this guide through one or more of the following ways: writing, reviewing, expertise, or support.

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Soon after the group began discussing the possibility of this publication, federal, state, and conservation organizations quickly provided the necessary funds to make the groups vision reality. The organizations listed below enthusiastically stepped forward to make a difference for the future of Michigan's wildlife.

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The Hal and Jean Glassen Memorial Foundation
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Michigan Farmers Union
Michigan National Wild Turkey Federation
The Nature Conservancy
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The Ruffed Grouse Society
United States Fish and Wildlife Service

Although at times we felt the end was far, far away, it is with much excitement that we provide this product to the public. Throughout this lengthy process, we have increased our own knowledge, built friendships, and strengthened ties -- all in the best interest of wildlife. Once again, thank you to all the individuals in the foreground and background that contributed to this publication and, most importantly, to you the public for taking steps toward natural resource conservation. Working together we can make a difference for wildlife.

Editors and Project Coordinators:

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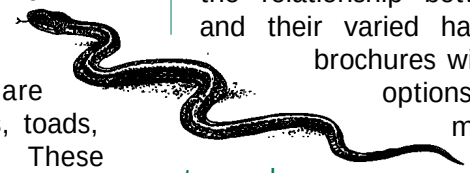
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

INTRODUCTION TO WILDLIFE & HABITAT MANAGEMENT

Wildlife are the animals that live freely in the natural environment. Wildlife includes all species--game and non-game. Songbirds are wildlife. So are snakes, toads, butterflies, and fish. These wildlife species and numerous others provide us with beauty, recreation, economic opportunities, and maintain our quality of life by regulating and modifying how our ecosystems function.


garter snake

What Is Habitat?

Wildlife needs a place to live. For people, such a place is called "home." For wildlife, the place is called "habitat." But wildlife habitat is not just trees, shrubs, grass, or crops. It is a complex mixture of plant communities, water, weather, animals, and other environmental features that provide the cover and food that wildlife need.

Landowners who want to improve habitat for wildlife must realize there is a great deal to learn. Fortunately much is known, thanks to more than 100 years of research by natural resources schools within our colleges and universities and by state and federal agencies charged with natural resources management. Landowners should also know there is a push for every pull. Changes that produce more ducks, for example, may not produce more deer. Changes which help squirrels may not help certain songbirds.

The chapters throughout this guide will help you to understand the relationship between wildlife and their varied habitats. The brochures will explain the options available for managing your land for wildlife, and they will offer detailed and specific practices to help you do it successfully.

The Components of Habitat

Habitat can be broken into four parts: food, water, shelter, and space. When all parts blend together, wildlife not only survives, they thrive. Remove any one of the four and wildlife must travel to find the missing component. As human populations increase, so does our impact upon the natural environment. When habitats are isolated or destroyed, wildlife are crowded into smaller areas, or they are forced to find a new area. These conditions put wildlife at risk, including vulnerability to predators, parasites, accidents, and starvation. Some types of wildlife are not very mobile and local populations may be easily extinguished when habitat is destroyed or significantly altered.

Food needs occur year around, and yet habitat may produce food only on a seasonal basis. For example, cottontail rabbits eat the inner-bark of young trees and shrubs in fall, winter, and spring when cold weather has eliminated green leafy food. Food sources available one year may not be available the next. Certain varieties of acorns may feed deer, squirrels, and wood ducks but only in those years when there is a crop. Planting trees, shrubs, grasses, and flowers and installing bird feeders are ways that landowners can help provide food for wildlife. More than 50 species of birds, for example, will eat sunflowers. Almost as many kinds of birds eat the berries of silky dogwood.

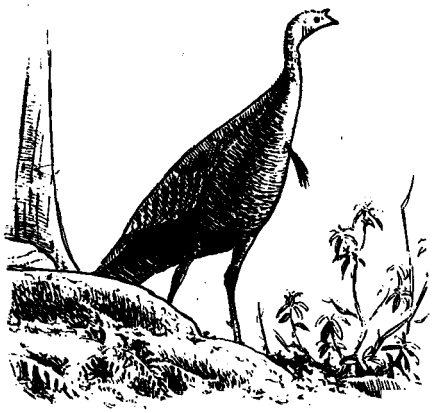
Water is needed by every living thing on earth. Wildlife's water needs are met by rivers, creeks, ponds, springs, seeps, and other wetlands. Some birds, like bobwhite quail and pheasants, can survive on moisture content from insects, seeds, berries, and dew. Maintaining existing water


forested wetland

resources on your property may be enough to help wildlife. Restoring wetlands and increasing the amount of water available, such as building ponds, are bigger challenges to consider.

Most kinds of wildlife need shelter to protect themselves from predators and, especially during winter, from severe weather. Other types of wildlife, such as ground-nesting birds, require a safe place to lay eggs and to raise their young. Shelter can be as basic as a hollow tree used by a screech owl to rear its young or as complex as a large stand of switchgrass where a pheasant can survive a severe snowstorm.

All creatures need room to roam, and many establish territories to defend from others of their kind, especially during the breeding season. This type of habitat requirement is called living space or simply, space. The exact needs and the arrangement of space differ according to species. Red squirrels, for example, can usually find enough seeds and den sites to survive in an acre or less of pine, spruce or balsam fir trees. Wild turkeys require 500 to 2,000 acres of mature woods mixed with open fields. White-tailed deer need a several square miles of mixed-aged woodlots, brush, and openings. The home territory of a gray wolf pack is 50 to 150 square miles of mostly forest and other undeveloped land.



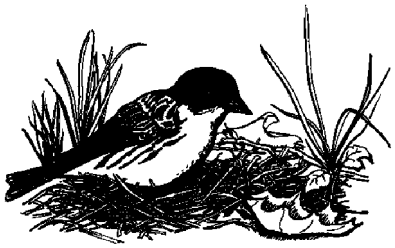
eastern wild turkey

What Is Wildlife Management?

Wildlife management is the "manipulation" of populations and habitat to achieve a goal. The goal is usually to increase populations but can also be to decrease or sustain them. Wildlife managers may try to change habitat in a way that benefits not only wildlife but also helps people, as well as the habitat itself. Although the definition of wildlife management includes the word "manipulation," wildlife managers realize that this includes natural changes or manipulations that may occur over a lifetime.

Improving habitat for a particular kind of wildlife means understanding what the animal needs to live. It also means knowing how changing habitat to increase one kind of wildlife will affect other forms of wildlife.

Most of the land in Michigan is privately owned. In the southern half of the Lower Peninsula, where most of the people live, over 95 percent of the land is privately owned. Most property owners--large and small--want to do good things for wildlife, and they have several options for managing their land. When two types of wildlife with different habitat needs are desired and it is not possible to manage for both within the boundaries of your land, long-term plans may then be necessary. Often, initial work favors one species while the overall objectives favor others.



Kirtland's Warbler

What Is Biodiversity?

Usually, the more varied the habitat conditions are over a large area, the greater the variety of wildlife will be. "Biodiversity" is the term used by scientists to describe the variety of living organisms (plants, animals, and even microorganisms) upon the earth and the interactions and environments they form. Biodiversity can be viewed in numerous ways and in varying levels. For example, locally, there is the diversity of genetic stocks of a rare animal; regionally, the maintenance of a viable population within a certain species; and globally, the concerns focusing on the loss of a unique plant and animal community.

One way to conserve biodiversity is to develop "structural diversity" in habitat projects. Structural diversity can be either vertical (layers of vegetation such as woods with an understory of shrubs) or horizontal (patchiness: scattered openings within a forest or, conversely, large tracts of trees).

Creating structural diversity is possible within most types of habitat. For example, a landowner who wants to thin a mature woodlot might leave a poor-quality black cherry tree for the fruit it offers to birds and animals. A hollow, dead portion of the same tree becomes a home for a chickadee and provides

insects for insect-foraging birds such as nuthatches and woodpeckers. A heavy limb that fell years earlier is now a drumming log for a ruffed grouse. Finding habitat under the limb is a salamander; later, a garter snake may move in. When a tree eventually dies and a trunk cavity forms, a raccoon will claim it as its own although a swarm of honeybees may have a different idea.

Habitats, large and small, are governed by both natural occurences and disturbances and cultural changes. Hydrology, geology, and soil types all influence how habitats develop while roads, fences, and property boundaries modify this development. Wildlife habitat may vary in size from "macrohabitats" containing hundreds of acres of trees or crops to "microhabitats" such as the bank of a brook or a single boulder occupying only a few square feet. The black cherry tree described above is actually several microhabitats, each of which helps support a certain wildlife species.

How Habitats Change

Most habitats are not stable, and they change over time. Before people settled Michigan, new habitats were created and others changed by glaciers, wildfire, floods, windstorms, and the natural birth-to-death process of trees and other plant communities. In less than 200 years humans have dramatically altered habitat--destroying some and creating others--in ways that may have never occurred naturally. The axe and the plow are tools often mentioned as the most destructive. But properly applied, the axe and the plow, along with the chainsaw and controlled fire, can also lead to healthier habitat.

What You Can Do

Wildlife is a product of land and water, and anyone who owns land or is charged with its responsibility is a manager, or manipulator, of habitat. The decision to do nothing with your land can have as big an impact on wildlife--because of the changes that occur naturally--as a detailed management plan. Farmers who plant crops or choose not to plant crops affect wildlife. Homeowners who plant shrubs and maintain lawns manage wildlife, just as those who feed backyard animals and erect bird houses do.

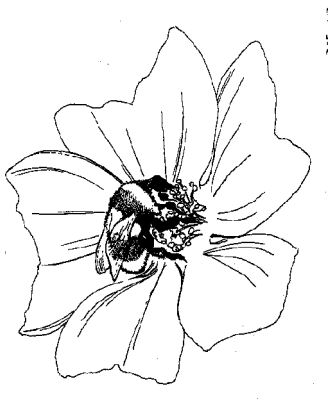
To make a positive difference, one that helps wildlife the most, you should have a plan; even if you wish to allow the landscape to take care of “itself”. The first steps are to understand what wildlife in your area need and to identify the kinds of habitat on your property (as well as on adjacent land). Even if your property is only a small backyard, by providing a single component of habitat--food, water, shelter, or space--you can help wildlife. Working with your neighbors on a combined management plan will help even more.

What Are the Benefits?

Americans' fascination with wildlife can be traced to the explorers and settlers, the pioneers and market hunters. The days when bison blanketed the plains and passenger pigeons darkened the skies are no more, of course, but another kind of "good old days" is occurring. Today, people better understand their relationship to the environment, and many accept the responsibility that modern conservation practices require. They care about wildlife and the habitats that support them, and they want to help. But why?

The answer is "benefits," which are as varied as wildlife themselves. Tangible rewards--those that we can see--include:

- More animals to watch, photograph, hunt, or enjoy.
- Improved soil conservation resulting from less wind and water erosion



•Enhanced natural beauty that comes from creating land scapes, planting wildflowers, and growing healthy woodlots

•Better insect damage control through natural predators like bats, swallows, dragonflies, and bluebirds instead of relying on insecticides and bug zappers

•Added income by enrolling land in the federally funded conservation programs

•Improved energy conservation through landscape design that reduces home heating and cooling costs

•Reduced noise, dust and snow accumulation that results from planting shelterbelts

•Higher property values that result from attractive, well-managed land

•Protecting threatened and endangered species or helping to protect a species from becoming rare.

•Increased consumable value. Examples include:
(1) properly cutting trees for timber income and firewood;
(2) harvesting portions of crops not needed by wildlife;
(3) collecting mush rooms, berries, and other wild edibles; and
(4) hunting surplus game animals.

Intangible benefits are also important but not as easily identified. A diverse landscape--one that has a mixture of habitat conditions supporting a wide variety of wildlife is less vulnerable to destruction by insects, diseases, and severe weather. Complexity, therefore, will help maintain Michigan's diverse wildlife populations for generations.

Your goal may be to preserve a certain species or to conserve natural resources in general. Either way, managing your land for wildlife helps assure that succeeding generations will be able to enjoy them as you have. To many people, that goal is the most important of all.

FOR ADDITIONAL CHAPTERS CONTACT:
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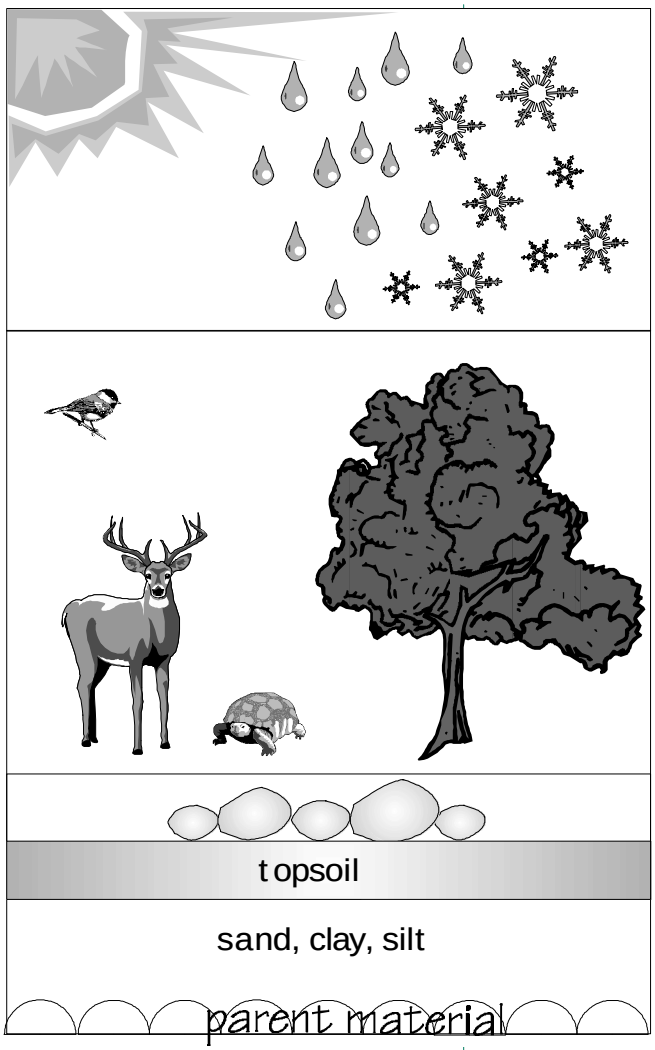
FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

ECOSYSTEMS, LANDSCAPES, & YOUR PROPERTY

From the large forest tracts of the Upper Peninsula to expansive wetlands of Lake St. Clair, Michigan is a wonderful and diverse place. As a Michigan landowner, your property fits into the big picture, as it is a single piece of the large jigsaw puzzle of the state. Each land parcel, regardless of size, fits with other pieces to form a neighborhood. The neighborhoods then come together and form an ecosystem. Ecosystems collect to form a regional landscape, and these together, in turn, link the State of Michigan with surrounding states and provinces. It is important to understand this concept because what happens on your property--your individual piece of the puzzle--has an impact on your neighborhood, the local landscape, the regional ecosystem, and ultimately the areas surrounding the state. Therefore, the collective set of management practices on a landscape ultimately determines which communities of species will prosper.

"Ecosystem" refers to the relationship between a community of plants and animals and its living and non-living environment. This relationship includes the rain, sun, wind and elements of the atmosphere; the plants and animals, including people, on the land and in the waters; and the soil, geology and water that occurs on or in the land. Interacting together, these diverse environmental factors form an ecosystem. Each ecosystem can be defined both as an individual, self-contained complex, and as part of larger ecological systems.



Climate, heat, and precipitation

Plants and animals

Rocks and soils

Ecosystems can be as small as several square feet around a fallen log in a forest, or as large as the Great Lakes region. Size of the ecosystem is not nearly as important as the interactions within the ecosystem. The bacteria, fungi, and insects on the log help to decompose the log into a soil-enriching humus, which some day will support a new tree. The currents and water temperatures of the Great Lakes will impact the growth and location of invertebrates, which will in turn impact the entire food chain, including people. Again, it is the relationships within the ecosystem, and not its size that defines it.

Ecosystems change over time. Even habitats that have been badly damaged or destroyed may restore themselves, or new habitats may be created instead. Part of the process of habitat creation or restoration is the succession of plant communities. For example, a once-bare crop field left fallow for years will first support annual weeds and flowers. Later, perennial plants invade, followed by shrubs and trees, which some day may make a forest. Natural disturbances may also cause the succession to move backwards, such as a fire returning a forest to bare ground.

As lakes age, over thousands of years, they may fill with sediments and grow warm and shallow. Eventually cattails and other wetland plants may invade, and the lake could become a marsh, or swamp. Someday, it may turn into upland habitat and may later support a forest. Nothing remains static in the world, and that is why the composition of ecosystems are always changing.

Michigan's Four Regional Landscapes

Many observers think of ecosystems as a hierarchical arrangement, where one system fits naturally within another. For example, the rotting log ecosystem may be part of a larger complex of lowland evergreens, embedded in a northern hardwood forest ecosystem, which stretches from Wisconsin to the southern Michigan ecosystem, all of which are modified by the Great Lakes ecosystem. Taken logically to its conclusion, Planet Earth is an ecosystem. There are other ways to look at this fascinating phenomenon, too. Looking at cover types or wildlife habitats, for example, offers another lens through which to view ecosystems on the scale of landscapes. In this way, ecosystems can be wetlands, woodlands, grasslands, brushlands, or farmlands.

Ecosystems also vary geographically. In Michigan, each part of the state is dominated by different landscapes, each of which functions differently, and will respond differently to management. Biologists and ecologists have divided Michigan into four major geographic landscapes: the southern Lower Peninsula, the northern Lower Peninsula, the eastern Upper Peninsula, and the western Upper Peninsula. Below is a brief description of each region to help you understand how your property fits into these bigger pictures.

Southern Lower Peninsula

Southern Michigan is characterized with a warmer climate and a longer growing season than elsewhere in the state. This region receives more precipitation in spring than in fall, with total amounts more variable than other regions of Michigan. The geology of this region is soft limestone covered by glacial deposits. The topography has an elevation of less than 1,200 feet and features low, flat plains with hilly areas in the southwest and also along a line from Hillsdale to Lapeer. Predominant soils include loams and clays in variations of dry or wet environments, and sandy soils near Lake Michigan and near hilly areas.

Prior to European settlement in the southern Lower Peninsula, oak-hickory forest, beech-sugar maple forest, oak-savanna, wetlands, and deciduous swamps were the dominant land types. Today, agriculture, homes, businesses, and roads have replaced most of these original land types. Scattered woodlots remain mainly in areas with moist or wet soils, which are harder to

drain and convert to other land uses. In many areas over half of the pre-settlement wetlands have been drained, and a few isolated oak-savannas remain.

Northern Lower Peninsula

Even though the geology of this northern area is similar to southern Michigan, with its soft limestone bedrock covered by glacial deposits, the climate, soils and cover types begin to change north of a line from Muskegon to just north of Bay City. This line marks a transition or "tension zone" that separates the Lower Peninsula into north and south ecosystems. The topography of the northern lower peninsula is mainly hilly with elevations as high as 1,600 feet, but features relatively flat areas in the central portion and along the eastern Lake Huron shoreline. The climate of this region is cooler and more variable than in southern Michigan.

Prior to European settlement in the northern Lower Peninsula, the major cover types were northern hardwoods, oak-pine barrens, pine forests, and conifer swamps. Today, this regional landscape is still covered with forest, although in some areas agriculture and homes have replaced the forest. Also, because of past and present timber harvest methods, there has been a rapid increase in aspen across the region. There has also been a conversion of conifer swamps into swamp brushlands.

Eastern Upper Peninsula

This area is characterized by limestone and dolomite bedrock, which is softer than the underlying deposits of the western Upper Peninsula. The overall flat eastern end is characterized by elevations under 800 feet and climates that are greatly influenced by the Great Lakes. The frost-free period and the growing season are short compared to southern Michigan. Major soil types in this region are wet sands, clays, and organic soils.

Prior to European settlement, the region was covered with northern hardwood forests, conifers, conifer-hardwood swamps, aspen-birch, peatlands, and vast marshes along the Great Lakes. Today, many of the Great Lake marshes have been lost, some forest areas have been converted to agriculture, and areas once supporting mixed pine have been converted to red pine plantations.

Western Upper Peninsula

In the western Upper Peninsula, the underlying hard and erosion-resistant bedrock of granite is responsible for the area's rugged, hilly terrain, which includes the only mountainous area in Michigan. Elevations in the Huron and

Porcupine mountains reach more than 1,800 feet. The climate is less influenced by the Great Lakes, as it is impacted more by the inland land bases of Wisconsin and Canada. The winters are very cold due to northern winds that are not buffered by the Great Lakes. Predominate soils in this region include loams, thin loam over bedrock, clay and wet clay. This area receives more precipitation than the eastern Upper Peninsula.

Prior to European settlement, the western Upper Peninsula was dominated by northern hardwood forests, jack pine and red pine-jack pine forests, and shrub and conifer swamps, and bogs. Today, much of this area is still forested, though present timber management methods have reduced the forest diversity.

Looking at Local Landscapes

To understand how your property fits into the landscape as a piece of a puzzle, you must imagine a bigger picture. If you have become familiar with your land by taking inventory during walks (see the chapter on **Evaluating the Land** in the Habitat Planning section for information), you may already have an understanding of how the pieces of your property fit together. This understanding can be obtained by asking yourself a few questions about the surrounding areas. What is the landscape in your neighborhood, township, and

county comprised of? Is it mostly woodlands, grasslands, wetlands, or brushlands? Are certain areas large or small? Are they being farmed, and if so, how?

You can further your understanding of the landscape by observing what species are seen there. The type of wildlife you see in your part of the county is determined by habitats in your local landscape. When travelling to places that surround your property, if you see pheasants, bobolinks, and meadowlarks, the landscape most likely is comprised of grasslands. The presence of ruffed grouse, scarlet tanagers, least flycatchers, or snowshoe hares indicates that landscapes are probably more forested. Agricultural landscapes often support American kestrels, killdeer, and woodchucks. Brushland habitats attract ruffed grouse, indigo buntings, deer, and cottontail rabbits. And in areas where you see ducks, geese, herons, grebes, or kingfishers, the landscape is mostly wetland-related.

The general habitats in your area can provide you with guidance on the types of wildlife you are most likely to attract with habitat projects on your land. For example, if your property is in southeast Newaygo County, the local landscape is comprised of oak forest with a scattering of old fields. Historically, this area was comprised of oak forest, oak-pine forest, and white pine-hardwood forest mixed with prairies. You could manage your woodlands for oak by adopting specific timber-management recommendations. Further, you could manage old fields as tallgrass prairies. These decision might help you to attract deer, wild turkeys, and grassland and woodland birds as well as the rare Karner blue butterfly.

Now that you have an idea how your property fits into the bigger picture, you can also look more critically at the types of habitat on the land next to yours and the parcels that make up the neighborhood. Wildlife species do not understand human or political boundaries such as property lines, roads and counties. By evaluating your neighbors' land and surrounding properties, you can get an idea as to which wildlife habitat components are available and which are missing. In conjunction with the land next to yours, and in the extended neighborhood, you may be able to provide all of the habitat components that are necessary. Perhaps you and your neighbors can manage these shared habitats for a common goal.

In summary, ecosystems involve relationships between plant and animal communities and their environments. For this reason, everything in the natural world is part of an ecosystem. No ecosystem stands alone, as it is part of a larger natural order to which it both contributes and is dependent upon. Learning to look at how your property fits into local neighborhoods, area landscapes, and regional ecosystems will help you to develop wildlife habitat goals that will be successful. By taking such an approach you will be able to more easily attract and benefit wildlife. Understanding and appreciating your part of the big picture will help wildlife on your land and beyond.

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GLOSSARY

Acidic - Soil reaction with a pH value less than seven on a scale of 1 to 14.

Acre - A unit of land equal to 4,840 square yards, or 43,560 square feet.

Aesthetic- Pertaining to the natural beauty of an area or subject.

Alkaline - Soil reaction with a pH value greater than seven on a scale of 1 to 14.

Altruistic - Concerned with the welfare of others.

Annual - A plant with a life cycle which includes germination, growth, flowering and fruiting, then dieing, all taking place in one year.

Backfire - A purposely ignited slow burning fire on the downwind side of the field often used in conjunction with other burn methods.

Baffle - Cone usually made of metal used with a bird feeder to help deter squirrels.

Barren - An area of droughty, sandy soils dominated by grasses, sparsely inhabited by low shrubs and small trees.

Bedrock - Rock substrate that underlies all soil, sand, clay, gravel, and glacial material on the earth's surface.

Berm - A narrow embankment along a slope often used as dike or dam.

Biennial - A plant that normally takes two years to reach sexual maturity, producing leaves in the first year, blooming and producing fruit in its second year, and then dying.

Biodiversity - The variety of living organisms (plants, animals, and micro-organisms) upon the earth and the interactions and ecosystems they form and are part of.

Bog - A peatland that receives water primarily from rainfall and is dominated by sedges, sphagnum mosses, low shrubs, and evergreen trees.

Brambles - Any prickly shrub or bush, such as raspberry.

Broadcaster - Equipment used to scatter seeds.

Brood - The young of certain animals; especially, young birds and fowl hatched at one time and cared for by the same mother.

Browse - Leaves, young shoots, and other vegetation that serve as food for animals; the act of eating such food.

Buffer - An area surrounding a sensitive habitat such as a wetland, which lessens or absorbs the shock of an impact.

Calcareous - Containing calcium carbonate, calcium, or lime, which typically causes an alkaline condition, (a pH greater than 7).

Canopy - Any high covering that creates an umbrella of foliage.

Carnivore - Any flesh-eating or predatory organism.

Carrying-Capacity - The number of wildlife individuals or a population size that can be supported within a particular area.

Catkins - A dense, often drooping flower cluster, consisting of small scale-like flowers aggregated into short, tubular spikes.

Clearcutting - A technique used in even-aged timber management that involves one cut, and which may remove an entire stand.

Clutch - The number of eggs produced or incubated at one time.

Colony - A group of the same kind of animals or plants living or growing together.

Community - A group of plants and animals living in a specific region living under relatively similar conditions; and the region or habitat in which they live, i.e., forest community.

Conifer - Any of various predominately evergreen, cone-bearing trees and shrubs such as a pine, spruce, hemlock, fir, and juniper or yew.

Conservation - Human use and stewardship of the environment such that natural resources and biodiversity are self-sustaining.

Conservation District (CD) A local government office which provides advice and assistance to landowners regarding land use practices.

Conservation Reserve Program (CRP) - A federal program that offers annual rental payments and cost-share assistance to establish long-term vegetative covers on eligible land.

Cool Season Grasses - Grasses that develop most rapidly during spring and fall when cool nights follow warm days.

Competition - A variety of plants or animals vying for certain resources, such as food, moisture, nutrients, or sunlight.

Corridor - A tract of land forming a passageway; an ecological connection between two areas.

Cover (Shelter) - Part of an animal's environment that enhances survival or reproduction, such as winter or nesting cover.

Creosote - A yellowish to greenish-brown oily liquid obtained from coal tar and used as a wood preservative and disinfectant.

Cultipacker - Equipment used to firm and press the soil before planting. May also be used to push seeds into ground after broadcasting.

Cultivate - To improve or prepare land as by plowing ; to till; to loosen soil around growing plants.

Culvert - A drain crossing under a road or embankment

Deciduous - A woody plant that sheds or loses foliage at the end of the growing season.

Department of Environmental Quality (DEQ) - A state agency with the legal mandate for management and protection of the state's environment.

Department of Natural Resources (DNR) - A state agency with the legal mandate for management and protection of the state's natural resources.

Dibble Bar - A pointed tool or bar used to make holes in soil; used most often for planting tree or shrub seedlings, bulbs, and plant sets.

Dike - An embankment of earth and rock; especially, a levee built to hold water.

Disking - A technique that breaks-up the soil in preparation for planting.

Ditch Plug - Filling a portion of the drainage ditch to natural ground level.

Diversity - Variety.

Dormant - In a relatively inactive or resting condition in which some metabolic processes are slowed down or suspended.

Draw-Down - Remove or decrease water levels within a wetland.

Drumming Log - A fallen log on which a male ruffed grouse performs his courtship display.

Duff - A build-up of organic material, such as dead grass, leaves, conifer needles, and other plant parts.

Ecology - The study of the relationship between organisms and their environment.

Ecosystem - An ecological community together with its physical environment considered as a unit.

Edge - Where two different vegetation or community types meet, i.e., woodland and grassland. Also called an ecotone.

Emergent Vegetation - Aquatic plants which have some portion of the plant extended out of the water.

Endangered Species - A species in danger of becoming extinct within a portion or all of its range.

Environment - The living and non-living components that comprise one's surroundings.

Erosion - Process by which soil or rock material is worn or broken down and transported by water, ice, wind, or gravity.

Even-aged Timber Management - Type of forest regeneration management practice that creates stands consisting of shade intolerant trees of the same age class. Includes clearcutting, seed tree, and shelterwood techniques.

Evergreen - Having foliage that persists and remains green throughout the year, such as pine, spruce, or juniper.

Exotic Species - A plant or animal that is not native to a particular area.

Fallow - Plowed and tilled but left unseeded during a growing season.

Fauna - Animals

Fen - A type of peatland that receives mineral-rich inputs of ground or surface water dominated by sedges, other grass-like vegetation, and woody plants such as larch, white cedar, and shrubby cinquefoil.

Fencerow - Rows of trees, conifer, shrubs, or groundcovers that provide food and cover for wildlife.

Feral - Existing in a wild or untamed state; especially having reverted to such a state from domestication, i.e., feral cat.

Field Tiles (Drainage Tiles) Perforated plastic or clay pipes that are buried under the surface of the ground to facilitate drainage.

Flank Fire - A fire ignited on the sides of the burn site parallel to the wind direction.

Floodplain - A plain bordering a river, subject to flooding over various time intervals or cycles, with the areas closest to the river being flooded more often.

Flora - Plants.

Forage - Plant material that serves as food for animals; the act of looking or searching for such food.

Forb - Any herbaceous plant other than a grass, tree, or shrub, i.e., wildflowers.

Fragmentation (Land) - The act or process of splitting land into smaller or different pieces, both physically and ecologically.

Furrow - A long, narrow, shallow trench made in the ground by a plow or other implement.

Germination - The process by which a seed sprouts after being dormant and attaining sufficient moisture to sprout.

Girdling - A method used to kill trees in which two-inch rings are cut around a tree through the bark and growth layer i.e., to create a snag.

Grit - Fine sand or gravel that is swallowed by birds and retained in their gizzards to grind up their food.

Groundwater - Water that exists below the surface of the ground and fills interconnected pores in the soil and cracks in the rocks.

Group Selection - Technique used in uneven-aged timber management that selects groups of trees for harvesting within a stand.

Habitat - The area or type of environment in which a plant or animal or their population normally lives or occurs.

Hardwood - Generally, a tree or shrub with broad, deciduous leaves.

Headfire - A purposely ignited fire burning with the wind.

Hedgerow - Rows of trees and shrubs that form a border and can provide food and cover for wildlife.

Herbaceous - Non-woody vegetation, i.e. grass or forbs.

Herbicide - A chemical used to kill plants.

Herbivore - Any organism feeding on plants.

Hydric Soil - A soil that is water saturated through a significant part of the growing season, or flooded long enough to eliminate oxygen in the root zone.

Hydrology - Distribution and circulation of water within an area; presence of water.
Idle Field - An inactive or fallow agriculutural field.

Insecticide - A chemical used to kill insects.

Interseeding - The process of sowing seeds into the existing vegetation.

Intolerant - Unable to withstand or endure adverse environmental conditions, i.e., shade, drought.

Landscape - The aspect or formation of the land characteristic of a particular area or region.

Legume - Pod-bearing plant, characterized by their fruits having a single-cavity ovary, such as peas, beans, and clovers. Legumes contain nitrogen-fixing bacteria in their root nodules.

Limiting Factors - When one or more habitat components are in limited supply, and is not available to support a species, this component is considered a limiting factor.

Marsh - Shallow-water areas that sustain water-loving plants such as cattail, sedge, arrowhead, bulrush, water-lily and pondweeds.

Mast - Soft mast - the berries or fruit of shrubs and trees; Hard mast - the acorns or nuts of shrubs and trees.

Meadow - A tract of grassland, either natural or used as pasture or for growing hay.

Mesic - Soil that is moderately moist, midway between droughty (xeric) and saturated (hydric).

Mineral Soil - Any soil consisting primarily of sand, silt, or clay materials rather than organic matter.

Muck - Dark-colored, finely textured, well-decomposed organic soil with little or no reconizable fiber.

Mulch - A protective covering of various substances, especially organic, placed around plants to prevent evaporation of moisture, freezing of roots, and to control weeds.

Native - A plant or animal originating, growing, or produced in a certain place; Indigenous as opposed to exotic.

Natural Resource Conservation Service - A unit of the federal U.S. Department of Agriculture that provides assistance to landowners to help conserve, improve, and sustain our resources and environment.

No-till Drill - Equipment used for planting crops that require no seed bed preparation. Opens the soil for seed placement at the intended depth.

Nutrient - Any mineral, compound, or element that sustains biological growth or development.

Old-Growth - Generaly,a forest stand that has reached a stage of extreme maturity.

Omnivore - Any organism that eats both plants and animals.

Organic - Pertaining to, or derived from living organisms.

Organic Soil - Soil derived from once living organiams, such as peat or muck.

Organism - Any living plant or animal.

Overstory - Crown or canopy of branches and leaves that decresaes the amount of sunlight reaching the ground.

Peat - A low density, slightly decomposed, fibrous organic soil composed largely of plant material, such as sphagnum moss, reeds, and sedge.

Perennial - A plant having a life span of more than two years.

Perimeter Fire - A burning method that starts with a backfire, followed by lighting the sides, and finished by lighting the upwind side of the burn site, called the head of the site

Pesticide - A chemical used to kill fungi, insects, plants, or rodents.

pH - A measure of the acidity or alkalinity of a solution based on a scale from 1 to 14; numerically equal to seven for a neutral solution.

Pioneer Species - An animal or plant species that establishes itself in an environment where it did not exist, or a species that colonizes an area during an early successional phase i.e, aspen establishing itself within an idle field.

Poles (Tree) - A tree 5 to 9 inches diameter at breast height (dbh).

Pothole -A circular depression within a landscape .

Prairie - An extensive area of flat or rolling grassland, vaarying from open largely treeless grasslands to savannas, and whose communities are moatly fire dependent for their maintenance.

Predator - An animal that lives by preying upon other animal species.

Prescribed Burn - A planned fire, burning with a specific purpose.

Preservation - To keep in an unaltered condition; maintain in an unchanged form, or to allow to exist subject to natural environmental conditions.

Prey - Any creatures killed for food.

Propagation - Increase or spread by natural reproduction.

Regeneration - The regrowth of lost or destroyed vegetation and ecological communities.

Restoration - The act of putting something back into a prior condition.

Rip-Rap - A layer of medium to large rocks that is used to stabilize banks along ponds, lakes, rivers, and reservoirs.

Riparian - The area of land that is adjacent to a stream, river, or other type of watercourse

Roost - A place where birds rest or sleep.

Sapling - A young tree less than five inches diameter at breast height (dbh) and less than or equal to 20 feet in height.

Savanna - A transitional grassy area with scattered trees and shrubs positioned between a grassland and a forest, an area usually with no more than 50% trees.

Sawtimber (Trees) - A tree ten inches or larger in diameter at breast height (dbh).

Seed Tree Technique - Technique used in even-aged timber management that involves removing an entire stand in one cut, while leaving a number of trees behind to provide seed for regeneration.

Seep - A spot where water slowly trickles out of the ground that often forms a pool.

Shelter (Cover) - Part of an animal's environment that enhances survival or reproduction, such as winter or nesting cover.

Shelterwood Technique - Technique used in even-aged timber management that involves a series of two or more thinnings over 15 to 30 years, and is used to provide protection and shade for the regeneration area.

Shrub - A woody plant usually branched several times at or near the base giving a bushy appearance, usually less than 20 feet tall.

Single-tree selection - Technique used in uneven-aged timber management that selects single trees within a stand for harvesting.

Slash - Branches or other woody residue left on the ground after cutting a tree.

Snag - A standing dead or decaying tree, important for providing nesting, and feeding sites for wildlife.

Space - The area a species needs to survive.

Species - A group of interbreeding populations that are more or less reproductively isolated from all other kinds of organisms.

Spring - Water with a single concentrated source that has a fast discharge rate and flows to the surface, a groundwater source site.

Stand - An area composed of trees that are similar in type, or age, or size.

Stewardship (Land) - To care for and manage land in a way that maintains its ecological integrity for the benefit of present and future generations; an essential element of conservation.

Strip Fire - Series of lit strips burning only one at a time, starting at the downwind side of the site.

Stubble Fields - The remains of stems following the harvest of a field.

Succession - A process in which one habitat or community type changes into a different stage over time.

Sucker (root) - A means of vegetation reproduction in which some trees and shrubs send up new sprouts from their root system or rhizomes.

Submergent Vegetation - Aquatic plants that live and grow entirely below the water surface, such as pondweeds, and coontail.

Suet - High-energy winter food created from fat derived from cattle, sheep or deer.

Swamp - A forested wetland.

Tension Zone - An ecological line running from Muskegon to Saginaw Bay that identifies the change in climate, geology, and soil.

Thatch - The dead tops of clovers, grasses, and wildflowers.

Threatened Species - One that is likely to become endangered in the near furture over most of its range.

Tolerant - Able to withstand or endure an adverse environmental condition, i.e., shade, drought.

Topography - Detailed and accurate description of a place or region outlining such landform characteristics as elevation, slopes, and water courses.

Toxins - A substance poisonous to organisms.

Trade-off - Exchange of one thing for another; especially, the giving up of something for another that is regarded as more desirable.

Transpiration - The process in which vapor is released through the pores of plant tissue, simultaneously causing water to be absorbed by the roots.

Understory - Assortment of plants that grow underneath the canopy as ground cover, forbs, and shrubs.

Uneven-aged timber management - Type of forest regeneration management practice that creates stands consisting mostly of shade tolerant trees of the varying age and size classes. Includes group and single tree selection techniques.

United States Forestry Service (USFS) - A unit of the U.S. Department of Agriculture with the legal mandate to manage the nation's national forests.

Upland - A higher area that does not hold water for an extended period of time (less than two weeks).

Vermiculite - A mineral containing mica used as a medium for starting seedlings and root cuttings. The medium supplies plants, water, and air pockets within the soil helpful in growing and developing dense root systems. Also mixed with seeds to facilitate distribution and planting.

Warm Season Grasses - Grasses that develop most rapidly during the summer when warm nights follow hot days.

Watershed - A land region which drains into a river, stream, creek, or body of water.

Weed - A plant considered undesirable, unattractive, or troublesome; a plant growing where it is not desired.

Wetland - An area distinguished by the presence of water at or near the surface, having unique soil conditions, and supporting vegetation adapted to wet conditions.

Wildlife - Wild animals including birds, mammals, reptiles, amphibians, fishes, and invertebrates.

Woodlot - A tract of forest.

Xeric - Pertaining to conditions of extreme dryness.

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PLANNING PROCESS: NEED AN OVERVIEW

Careful Planning Equals Success

People value land for many different reasons. The housing developer and the farmer have a different perspective on what a certain property can or cannot do for them. A family who plans to build a house on their land but who also want to attract wildlife may have a different point of view. No matter how you intend to use your land, you should always have some kind of plan or strategy. When the family is ready to build that house, for example, they would not have a builder order materials without first deciding what kind of house they want to build. An accurate plan helps the builder know what kind of materials and how much of each are needed. It also helps to determine the cost of materials and labor. Through careful planning, you will have a good idea if your project will succeed even before you begin.

When managing your land for wildlife, the planning process should involve five steps: (1) evaluating the land, (2) setting goals, (3) considering alternatives, (4) writing a management plan, (5) implementing the plan and monitoring the results. This chapter introduces the overall process to you, and the chapters in this section will explain in greater detail how to accomplish the process, step by step.

Key Terms

Before the planning process begins, you should be familiar with a few key terms that will aid in understanding your land and its potential for wildlife. These terms are briefly explained here as an overview of the factors involved in providing habitat.

Habitat Components

There are four basic habitat components needed for a species to survive. These are food, water, cover, and space. Even though all species need these components, the amount and type of each differs by individual species. Knowing the specific needs of each species will allow you to provide the correct habitat components. For more information on specific species refer to the section on **Species Management**.

Limiting Factors

When one or more habitat components is lacking and insufficient, this component is considered a limit to the amount of wildlife that can exist there, or a limiting factor. Each species has specific habitat component requirements, and therefore will have different possible limiting factors. Being aware of the limiting factors present on your land may help in providing better quality habitat.

Carrying Capacity

All habitats have a maximum carrying capacity; that is, they will only support or carry a certain number of a wildlife species within a particular area. Usually, a limited supply of one component will control how many animal species the habitat will support. Thus, when there are no longer habitat components that a species can use, the land has reached its carrying capacity. Land managers, by providing or removing key habitat components, can affect carrying capacity thus increasing or reducing wildlife populations.

Trade-offs

It is important to understand that you may not be able to manage for all of the goals that you may have in mind. When managing for specific species, there will always be other

species that habitat is not provided for. Therefore, when managing for certain species you will eliminate other species from your land. However, when planned properly, managing for a group of species, instead of one particular species, will most likely provide the least amount of trade-offs. Managing for a diversity of species, however, will reduce the number of any one species.

Planning Steps

1. **Evaluating the Land**

Before you manage your land for wildlife, it is important to learn as much as possible about the animals that live on your property, and their specialized habitat needs. It is also important to determine the kinds and amount of habitat on yours and surrounding properties. The best way to obtain this information is to become familiar with your property by studying it during different seasons and making separate inventories of the plants and animals you are able to identify. Also, look for physical changes that may vary by season. For example, where is it sunny or shaded; are there seasonally wet areas, what happens after a major rainfall or snowstorm? Additional information that may help in managing your land is available from many sources, including chapters in this guide, local libraries, videos and television programs, adult education courses, and individual experts. Some of these experts may be neighbors, former owners of your property, or local people such as biology teachers or naturalists who have specialized knowledge. Further, consider consulting with a professional land manager, such as a wildlife biologist.

In addition, think about how your property fits into the local landscape. Do your woods, for example, merge with your neighbors'? Do fencerows connect your land to other properties? What land-use practices are occurring on land around yours, and what impacts do they appear to have on local wildlife? Finding answers to these questions will help you to decide what you'd like to do with your property and whether or not your expectations are realistic. For more information, see the chapter on **Evaluating the Land**. You may also find the following chapters, within this Habitat Planning section, to be helpful: **Presettlement / Past Vegetation Types; Edges and Fragments; and Knowing Your Soils**.

2. **Setting and Prioritizing Goals**

Setting management goals is an exciting part of the planning process because you are now thinking about what measurable differences you can make for wildlife. Problems will occur, though, when landowners do not think the process through to a logical conclusion. For example, the desire to attract pheasants, which are grassland birds, is not realistic if the land you wish to manage is a 40-acre woodlot. You should become familiar with the habitat needs of the desired species, and be realistic in your appraisal of whether you can meet those needs. Think, too, about the values you ascribe to your land. Do you want it to produce income, provide hunting or other recreation, or are you more interested in aesthetic returns such as creating natural beauty, providing wildlife habitat for viewing pleasure, or protecting rare species?

To accomplish a goal, it is often useful to break it into smaller subgoals or objectives, and then identify actions to be completed. While a goal is generally broad in scope, objectives are more specific measurable outcomes and actions are very task-oriented. Your goal, for example, might be to attract bluebirds to your property. A review of your property suggests nesting structures and foraging habitat are lacking. One objective might be to have enough nest structures to attract three nesting pairs within three years. The action needed to achieve that objective may include constructing and placing six nest boxes in suitable locations within the next two years. A second objective might be to pro-

Setting goals involves breaking your ideas into goals, objectives, and actions. Below is a flow chart outlining how to accomplish your goals.

Ideas
- Goal
  - Objective 1
    - Action 1
    - Action 2
    - Action 3
  - Objective 2
    - Action 1
    - Action 2
    - Action 3

vide two acres of high quality foraging habitat within three years. Specific actions, such as mowing a portion of an old field, might be used to achieve the objective.

By thinking about goals in a broad sense, and then moving through objectives and actions, you can focus your efforts into smaller, timely pieces that fit well together. Too often you may want to take action without thinking adequately about an overall goal or the "big picture." The result is often a set of mismatched pieces that have to be redone or eliminated. On the other hand, you may be overwhelmed by the "big picture" and do not know where to begin. Moving from broad goals to specific actions is a good way to avoid wasted time, effort, and financial resources.

Once your goals are set, prioritize their importance and determine whether they can be realistically achieved. Prioritizing your goals is a way to view the "big picture" in small, organized pieces. This will help you to plan accordingly and complete the most important goals first. For more information on this and the following step refer to the chapter on **Setting Goals and Considering Alternatives** in this section.

3. **Considering Alternatives to Meet the Goal**

There is usually more than one way to achieve a goal, and wildlife managers in particular often have to sort through many options to find the best method. Every decision made will affect wildlife and wildlife habitat in some way, but some impacts may be beneficial to your goal while others are harmful. The successful manager is one who tries to anticipate how each decision will make a difference and which decision is the best one to meet the goal.

There may be many alternatives to choose from. Once you have determined an array of alternatives that would meet your goal, you must decide which one is the best for your situation. You must consider cost, time involved, and impacts on neighbors and on other forms of wildlife before choosing an alternative. In other words, choosing the alternatives with the least amount of trade-offs is usually the best option. Consider how much time and money you have to spend, what kind of equipment might be needed, and the impacts your decisions will make on your neighbors, the local landscape, and other kinds of wildlife besides the types you wish to attract.

4. **Writing a Management Plan**

Once you have decided on your goals and examined all possible alternatives, it is time to write a management plan. The purpose of this plan is to outline the steps that will be taken in order to reach your goals. These steps include creating a project map (that will highlight types of habitat and management projects), determining management actions, and creating a timeline to implement these actions. For more information on this and the following step refer to the chapter on **Writing a Management Plan.**

5. **Implementing the Decision, Monitoring the Result**

Once you have finished writing the management plan, you will implement the decisions you outlined. Monitoring the results of those decisions, is a way to determine if your goals have been met, or if the management project needs to be altered. Do not expect the results to occur instantly; be patient as sometimes it takes two or more years for results to become apparent.

However, conditions may change, and it may be necessary to revise a goal. For example, in the planning process, a landowner decides to establish a 40-acre field of warm season grasses, beginning in three years. When it comes time to start, seed prices have risen and the landowner can only afford to prepare and seed 20 acres. Twenty acres of warm season grasses are planted, and the other 20 acres revert to an old field. This decision allowed the landowner to stay within the set budget, but did not provide the amount of grassland cover for pheasants that was originally planned. However, the landowner was pleased with the number of rabbits that used the 20-acre old field.

Working with Neighbors

Working in partnership with other landowners is often an exciting alternative to doing everything yourself. As Michigan wildlife habitats become more fragmented due to the selling and dividing of land, small property owners sometimes find themselves wondering what they can reasonably expect to do with their

backyard, part of a former pasture, or sliver of woods. The answers may lie in providing one component of wildlife habitat and letting your neighbor provide another component. For example, the wetland on a neighbor's property and the upland field on your land can be co-managed for the benefit of birds and mammals that rely on these habitats. The chapter on **Working with Neighbors** offers more information and examples.

In summary, the planning process for land management begins with an evaluation of the property and a personal appraisal of what you would like to do with it. Establishing realistic goals will help you to choose specific objectives for meeting the goals. Along the way, a constant evaluation of the progress made and the alternatives that appear will assure that the goals remain realistic, even though they may have changed. Once the goals are achieved, you must decide whether to maintain the project, alter it in some way, or start a new cycle of management. Although this entire planning concept may appear complicated, it is in reality a logical, step-by-step way to assure that your land lives up to the expectations you have for it.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

EVALUATING THE LAND

Evaluating the Land

- habitat, plant, and animal inventories
- soils
- base map

The first step in the planning process is to evaluate the current types of habitat, wildlife residents, and plant life on your property. Finding out what plants and animals live on your land will help you understand their habitat needs and how you can better manage for those needs. Also, it is important to look at your surrounding landscapes and determine how your land fits into the bigger picture. Your inventory will yield clues as to what degree of success you can expect to achieve, and it will provide information that is useful in working with your neighbors. Finally, the information you compile in this inventory will be useful in writing your overall management plan. Keeping a journal of information throughout the planning process will simplify your efforts.

Before you begin, you may have broad ideas of what you want to do with your land. Evaluating your land enables you to make these ideas more concrete, or even find that they are not feasible. After this evaluation, you should be able to set goals that are appropriate for your land. For more information refer to the chapter on **Setting Goals and Considering Alternatives.**

By taking such a broad initial view of your land and surrounding landscapes, you can begin to get a perspective of its suitability for attracting wildlife. It is also important to gain a historical perspective of the land's past uses. Do you have agricultural fields that have been tiled? Do you have forests that have been logged in recent memory? Was your grassland pastured some time ago, can you find out how long ago? Did farming practices over the years change the soil's pH? The more information you find about your property, the more you will learn of its wildlife-producing history, suitability and potential. Ask these questions of longtime neighbors and former owners. Search the local library for historical information about farming practices, flooding incidents or area fires that might have involved your property. It is also helpful to obtain a pre-settlement map that will give you clues as to what habitat types were present before European settlement. See the chapter on **Presettlement/ Past Vegetation Types** for more information.

Make a Habitat Inventory

Many of the chapters in this manual will help you understand the different types of habitat and what species of wildlife use them. Try to assess the condition of the property and how it is being used. As you learn about your land's attractiveness to wildlife, begin to classify the types of habitat found there. What follows are the five broad kinds of Michigan habitats. The questions below may be useful in an initial evaluation of your land.

•Is your property largely farmland, grassland, woodland, wetland, brushland, or a combination of two or more types?

•What habitat surrounds your property?

•What type of soils do you have? Are they sand, clay, or muck? Wet or dry?

•Are there exotic species present? If so, what species?

Woodland

•What type of forest exists? Is it young, mature, or mixed? How large is it?

•Is it fragmented by trails or openings?

•Is the understory open or is there a lot of growth such as brush and shrubs?

•Are there dead or decaying trees? How many? Where are they located? Are there stumps?

•Has the forest been logged or pastured, and, if so, how long ago?

•Is the stand even- or uneven-aged?

Wetlands

•What type of wetland is present?

•Is there a stream present? If so, what is the stream's origin?

•Is the wetland permanent or temporary (seasonal)?

•Is the wetland isolated or part of a larger complex?

•Is there open water present?

•How large or small is the wetland?

•Has the wetland been altered by draining, grazing, or mowing?

•Do trees, brush/shrubs, cattails, grass, or sedges dominate the wetland?

•Are adjacent uplands being fertilized?

Grassland

•Is your grassland an old field, pasture, hayfield, or forest opening?

•Are there any remnant native plant species present?

•How much invasion is occurring from shrubs, trees, or other woody plants?

•Has your grassland been hayed, mowed, or used for pasture? How long ago?

•Do you mow the roadside ditches? If so, how often?

Farmland

•What is the recent crop history?

•What kinds of herbicides, insecticides, or other chemicals were recently applied?

•Are there livestock present? How many?

•What type of farming operation (if any) is occurring? Is it small grain, row crop, dairy, or other livestock?

•Is it flat or rolling farmland?

•Is the farmland being cultivated right up to the fences?

•What type of irrigation practices are being used? Are the fields ditched or tiled?

•Are there areas of cropland that will not grow, or muddy places where equipment gets stuck? These areas may be former wetlands.

Brushland or Shrubland

•Are shrubs large or small, in clumps or individuals?

•Are they fruit producing?

•Can you determine the stage of succession (is it closer to the forest or grassland stage)?

•Do the plants growing there favor a wet or dry environment?

•What types of habitat surround the brushland?

•Are there fencerows or hedgerows present?

Make an Animal Inventory

Knowing what animals currently live on or around your property is a starting point for your animal inventory. If you are already familiar with your property, take time now to write down as many kinds of wildlife as you can recall. Separate them into categories such as mammals, birds, reptiles, and amphibians--even fish and insects if appropriate. Indicate where and when you have seen them. If you do not know the names, simply describe them, or sketch them if you can.

If you're not familiar with your property, take walking tours as often as possible. Armed with a notebook and a good field guide, look and listen for animals. Try to sharpen your evidence-gathering skills. For example, a small, chipmunk-sized burrow or a large woodchuck den in the side of a hill are clues as to what lives there. Hoof or paw prints in the mud or snow are evidence of the presence of wildlife. Brambles whose branches have been nipped could be the work of a rabbit or deer. The persistant smell of a skunk may let you know of this animal's presence. You may be surprised at all the wildlife that exist on your property, even if you never actually see them.

Become a wildlife detective and see how many of the following ani-

Example worksheet:			
Area (Habitat Type):	Grassland		
Animal species	Plant species	Invasive plant species	Practices present (logged, drained, tiled, etc.)
Quail	Orchard grass	Quack Grass	None
Goldfinch	Timothy grass	Sweet Clover	
Sparrow	Smooth brome		
Meadowlark			
Rabbit			
Pheasant			
Red-winged blackbird			
Deer Mouse			

mal signs you can find. Add them to your animal inventory as you discover them.

- Young trees with bark rubbed off in autumn by a buck deer polishing his antlers.
- A large stick nest high in an oak tree, which may be home to a red-tailed hawk or great-horned owl. Similarly, a large leafy nest may indicate the presence of fox or gray squirrels.
- Holes in dead trees may be a home for a woodpecker or black-capped chickadee.
- Furry pellets, or hairballs, regurgitated by an owl.
- Runways through a field of grass made by small rodents.
- Black walnuts cracked in half by fox or gray squirrels.
- Pine cone "cobs" left behind by red squirrels.
- Porcupine droppings (they are orange) at the base of a tree.
- Hickory nuts nibbled on the edges by deer mice.
- A mud nest under a house or barn eave made by cliff swallows or barn swallows.
- Last year's bird nests.
- Dusting bowls made by pheasants used for delousing.
- Scattered feathers or fur from a predator's meal.
- Spider webs, or other such insect signs.
- An ant mound.
- A butterfly chrysalis or moth cocoon.
- The call of sandhill cranes, loons, or Canada geese in the distance.
- The trill of courting toads.
- Tracks or droppings created by mammals and birds.

Because not every animal will be visible on any given walking tour, be sure to periodically walk your property during different seasons and times of day. Keep notes on what you observe and when. Try to determine if the wildlife are feeding, seeking shelter, building nests, or using your property for some other purpose. Your journal will help you to accurately describe your land and will become the basis for writing a wildlife management plan. The more you walk your land, the better you'll get to know it and its inhabitants.

Make a Plant Inventory

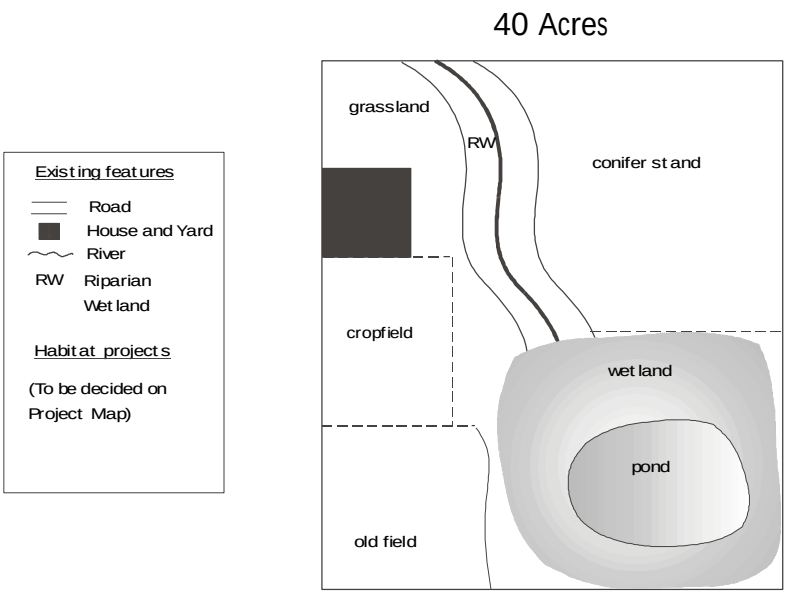
What grows on your property determines what wildlife will live there. While walking your land, begin to develop a list of existing plants along the way. Again, field guides to trees, shrubs, flowers, and grasses will be a big help. Sketch, describe, or photograph plants that you are unfamiliar with. As you read, check sources and ask questions, your experience and confidence will grow.

Management recommendations are often based on the predominant plant species in an area. Therefore, make observations about the predominant species that are present in each habitat type on your land. For example, is your forest predominantly Beech/ Maple, or Oak/Hickory? Note if the species present are native or exotic. This helps you to determine the condition of your land. For example, if your grassland possesses species such as big bluestem, little bluestem, and switchgrass, it may be a remnant of a native prairie. Note any species that you think may be rare. In addition to this, identify nuisance weeds such as purple loosestrife, glossy buckthorn, autumn olive, honeysuckle, and others, and plan for their elimination.

Soils

Learning about the soils on your property will help you to know what may and may not grow there. Sandy, light soils, for example, allow water to drain readily. Therefore, they are usually low in nutrients and tend to be more acidic than other types. Heavy, clay soils consist of small, tightly packed soil particles. Rich in nutrients, they have a high capacity to hold water. Loamy soils are intermediate between clay and sand. Composed of many different sized soil particles, they combine fertility and moisture-holding capacity with good drainage. Each soil type grows its own particular kinds of plants. For more information, including how to sample your property's soils, see the **Knowing Your Soils** chapter.

In addition to the soils, learn everything you can about the hydrol-



After land evaluation, create a base map featuring the habitats present on your property. Outline any special features such as den sites, bird feeders, travel lanes, fencerows, etc. This map will serve as the base to the project map created later in the planning process.

ogy, or water resources, of your land. For example, swamps, marshes, and streams are obvious wetlands. But spring seeps, potholes, or wet meadows dry out during part of the year and are not easily identified as wetlands. Clues are waterlogged soil, peat, or muck. Willows, cottonwoods, green ash, buttonbush, sedges, cattails and smartweed are typical of plants that grow in wet places. For more information, see the introductory chapter on **Wetland Management.** If you find evidence of wetlands, either current or former, your property may have the potential for attracting many types of wildlife.

Creating a Base Map

A base map is a layout of your property that shows each type of habitat and any special features that need to be taken into consideration. It includes such components as forests, grasslands, wetlands, streams, lakes or ponds, shelterbelts, hills, drainage ditches, buildings, fencerows, logging roads, cultivated fields, and roadways. Also, highlight those features of special importance to wildlife: ground dens, dead trees, living trees with large cavities, bird feeders, nest boxes, mature nut trees, major travel lanes, and more. The base map provides the basis for your management projects, and will later be used in writing the management plan. Make sketches of your property as you increase your knowledge about it. It may be helpful in creating a base map to obtain aerial photos and topographic maps of your property. Aerial photos are available at your local USDA agency office. The more you learn, the easier it will be to focus on specific areas for habitat improvement.

Put Your Inventory Into Context

Keep in mind that everything is connected. The plants on your property, for example, can act as seed sources for your neighbor's land and vice versa. Animals using your site do not know the meaning of a property boundary. So, it is important to remember that the landscape around you determines what you can realistically expect to do on your property. And the reverse is also true: what management decisions you make on your land will affect the landscape around it. The chapter **Working with Neighbors** gives more information.

In summary, it will help tremendously if you understand what plants and animals you can reasonably expect to flourish on your property before you set goals, write a plan, or begin to make management decisions. Working within the context of your land and surrounding landscapes will help you to create a successful wildlife management plan.

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SETTING GOALS & CONSIDERING ALTERNATIVES

Some landowners have very clear ideas about what they want to do with their land. Most, however, have vague goals or no goals at all. In some cases landowners are not aware of the range of opportunities available to them. Once they become aware, they may begin to change their plans. The process of decision making includes understanding what trade-offs will occur, what constraints certain actions may place on the land, what is realistically possible on the land, and what commitments of time and cost are involved. The more knowledgeable a landowner becomes, the more realistic the landowner's goals often become. Therefore, clear, well-defined goals, are necessary for a successful plan.

A goal is essentially what you want to do with your land, a wish to be fulfilled. Although setting goals may seem like a simple process, it is often complex and constantly changing. Planning and goal setting is a continual process in which the results of your first decisions influence all management options. Your goals will often overlap, and do not necessarily need to be seen as mutually exclusive. In other words, it is possible for your property to be managed to enhance conservation, provide recreational enjoyment, and produce income at the same time. This chapter will focus on how to set goals, how to accomplish these goals, and what to consider when creating a feasible management plan.

Setting Goals

To create management goals for your land, begin by making a list of what you value about your property and how it may be valuable to others. These values will reflect what you expect from your land, and essentially your prospective goals. Try to prioritize the goals from what you think is most important to least important. Arranging your goals by priority, and reviewing them periodically, will help you to plan the step-by-step process toward achieving them. Don't worry if you don't know. Simply listing your views may help you to think about what you know and don't know about your property and what it can--or cannot do--to satisfy your interests.

The land's capabilities define the limits of management possibilities. Thus, the goals that you set will depend on your property and the surrounding landscape. You will also need to know the habitat requirements and life history of the wildlife

GOALS TO CONSIDER

Conservation Goals
- Stop erosion
- Restore wetlands, grasslands, or forestlands
- Create windbreaks
- Promote habitat diversity
- Manage for the greatest variety of wildlife species or for rare species
- Increase the health of the landscape

Recreation Goals
- Increase one or more species for hunting
- Increase wildlife viewing opportunities
- Enhance aesthetic value
- Create nature trails for hiking

Economic Goals
- Timber and firewood harvesting, which may improve habitat for squirrels
- Farm and graze, which may enhance grassland birds
- Allow access to others such as hunters or tourists
- Create conservation easements to save tax dollars
- Enroll in state and federal conservation programs

Social Goals
- Leave something behind for family/society
- Leaving land "better" than you found it
- Improve environment for others
- Make the land aesthetically pleasing

LIMITATIONS TO CONSIDER

1. What possibilities of attracting wildlife does my land have?
2. To what degree could I manipulate my land to attract more wildlife?
3. What possibilities do the adjoining properties have for attracting wildlife?
4. Will my goals enhance or detract from those possibilities?
5. What trade-off associated with my management goals may occur?
6. Do I have the time and the financial resources to carry out the goals I have set?

you intend to manage. Once you determine what you will need to support the species you desire to attract, you must determine if the habitat is there, if it can be created there, and if you could sustain it there. For example, it is not possible to manage for species that require hardwood forests if you have no hardwoods on your property. In addition to this, you must also determine what limiting factors are there, the carrying capacities of your land, and what trade-offs are involved. For such information on the specific needs of wildlife, see the chapters in the **Species Management** section.

Considering your neighbors is another important aspect of determining goals. It is possible to manage for larger areas if you and your neighbors have similar goals and can combine management efforts. For example, if both you and your neighbor want to attract a large diversity of woodland birds, you could create a management plan that incorporates both properties.

Because other activities conducted on your land will also affect wildlife, you should try to anticipate those effects when making your management goals. When improving habitat for wildlife, you can usually combine wildlife management with timber management and agricultural practices. However, for best results, you may need to modify these practices to benefit wildlife. In most cases, timber and farming activities help some wildlife species but may harm others. You will need some understanding of these effects if your management goals are to be realistic. As a general rule, for example, timber harvest benefits deer, rabbits, grouse, and certain songbirds such as towhees and indigo buntings, that get food and cover from low-growing plants. On the other hand, some forms of timber harvest can harm forest wildlife species like barred owls or woodpeckers that use den cavities, or squirrels and turkeys that rely on mast-producing hardwoods. The degree of management practiced and any tradeoffs in timber, agriculture, or wildlife values will be your decision.

Try to be realistic about the time involved in carrying out your plans. Consider low-cost, low-maintenance projects and think in terms of the many shorter steps required to achieve a long-range goal.

BEFORE SETTING YOUR GOALS, THINK ABOUT THE FOLLOWING . . .

1. Does wildlife use your property to connect other habitat nearby?
2. Do your woods, for example, stand-alone or do they form the core of a large forested area owned by your neighbors?
3. Is restoring a wetland going to flood your neighbor's land?
4. How is your neighbor managing his/her land?
5. Would your neighbor(s) be interested in managing their land cooperatively with you?
6. Have significant alterations been made to the land surrounding your property?
7. Would these changes affect your ability to suceed with your goals?

Objectives

A landowner who has evaluated the land, identified their goals, and determined which goal is the most feasible and important, can then determine what objectives are required to achieve this goal. Writing objectives is a way of turning your ideas, or goals, into tangible strategies. One way of determining your objectives is to decide what important elements are missing from the land. In other words, ask what features can be enhanced, and always consider what is feasible on the land. For example, during evaluation of the land, you sighted several grassland birds. It was determined, from information gained on the habitat components needed by grassland birds, that your land only provides winter cover, and not nesting habitat or a reliable food source. Because having grassland birds was an important goal in this instance, an objective to achieve this goal would be to consider the creation of year-round habitat. In other words, in finding what your objectives are, you must determine what is needed to fulfill your goal.

Actions

Once the objectives required to achieve the goal are determined, the actions needed to fulfill the objectives must be decided. Actions are what are needed to obtain your objectives. For example, an action to help fulfill the objective mentioned

above (to maintain year-round habitat for grassland birds) would be to plant vegetation that would provide nesting cover and a food source. This action would take care of an objective that was needed to fulfill your goal. Once you are at this level, fulfilling one action at a time will break up a seemingly overwhelming task into smaller, manageable pieces.

Creating Alternatives

Looking at alternatives to meet your goals, and perhaps even redirecting your goals may become necessary as you continually evaluate what you have in relation to what you want. There are two different times to look at alternatives. The first is before you set your management plan into action, and the second is after your plan has been implemented.

Before Implementation: Different Options

Before you implement any plan, it is wise to consider different options to achieving your goal. Sometimes these alternatives can save money, work, and time. You should not jump at the first option made available, as it may not be the best for your situation. It is best to weigh several options and choose the one that is the least expensive and takes less time, but achieves the same goal.

After Implementation: How Goals Change Over Time

Landowners whose land has changed, or who have run out of time, money, or patience may need to consider alternative goals for their Management Plan. In some cases, when property is sold or subdivided, or natural disasters such as fire or flooding occur, the plan may need a major overhaul or be completely rewritten. Furthermore, the habitats you are trying to protect or improve for wildlife change with the seasons and the years. Expect your goals to change over time as surrounding landscapes change. When your plans finally become reality, you may notice that you have created partial habitat for wildlife species you may or may not have wanted to attract. Encouraging or discouraging the new wildlife, or getting rid of non-native nuisance plants, may mean an adjustment in your goals. Land-owners who become confused or frustrated when their goals suddenly seem unreachable can still make a positive difference for wildlife if they learn to be flexible. Keep in mind that your road map, the management plan must be flexible in order to be successful. Even wildlife managers can not always predict what will happen when they begin to manipulate habitats.

In summary, management options are always based on the goal, but deciding what to do can be difficult at times as there are many things to consider. If you break down the process into goals, objectives, and actions, it makes it easier to determine what you are looking at in your plan, and what you need to do to get there. Some practices are more expensive and take more time than others. Considering alternatives is always wise as it may prevent problems that you might have overlooked. Remember, the management plan is never static, and your goals may need to be changed as your land or circumstances change, but there are usually many ways of obtaining your goals.

RE-EVALUATE YOUR ORIGINAL GOALS

The following 10 factors will assist you in evaluating your original goals, and should be asked before you implement your plan. Evaluating these considerations from time to time will also help you to consider alternatives that are available and to redirect goals as necessary.

1. Do I have the necessary funds to complete my management plan?
2. How much time do I have to do the work involved?
3. What kind of equipment is needed and where do I get it?
4. Can I provide the maintenance required once the goal is achieved?
5. What impacts to wildlife would my plan create?
6. How long will it take to achieve the results I want? Are there alternatives that are faster, less expensive and less time-consuming?
7. What impacts will my decisions have on my neighbors?
8. How have my neighbors' management practices affected me?
9. Will any legal implications occurr as the result of my management?
10. Are there any future ramifications I can reasonably expect?

GOALS, OBJECTIVES AND ACTIONS

This is an example of how to outline goals, objectives, and actions based on the habitat types outlined on the base map within the Evaluating the land chapter.

Goal: To attract pheasants and other grassland birds

Objective one: Create year round food source
- Action one: leave corn stubble
- Action two: plant fruit producing shrubs
- Action three: plant cool season grasses and clovers
- Action four: plant warm season grasses and forbs

Objective two: Create travel corridors
- Action one: plant shrubs

Objective three: Create winter cover
- Action one: plant switchgrass
- Action two: plant warm season grasses and forbs

Objective four: Create nesting and brood rearing habitat
- Action one: plant cool season grasses and clovers

Objective five: Create artificial nesting sites
- Action one: build and place nest boxes

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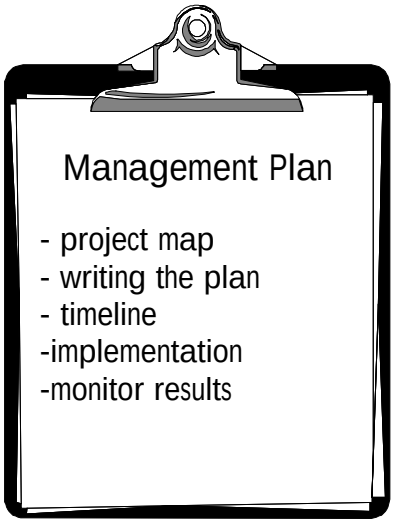
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

WRITING A MANAGEMENT PLAN



The Management Plan is a document that describes what you want to do for wildlife on your property, and how it will be accomplished. It is a step-by-step formula for what you want to do on your land, and when, where, and how you will accomplish the plan. The plan provides a timeline, which can project future phases of improvement, management, or maintenance. Further, it can be a record of what you have already done. As you write down the differences your efforts have made, you will most likely also realize impacts you probably could not have predicted. Such realizations will help you to consider changes in your plan, new goals and objectives, and alternatives for achieving them.

Although some people dread actually writing the plan, it does not have to be difficult. For smaller projects it can be as simple as a quick sketch and a few notes. Larger projects may be more complex with maps, photos, drawings, references, and detailed outlines of habitat improvement projects as time and energy allow. As you might expect, the management plan is a clear reference that will guide you to accomplishing your goals. This chapter will show you how to write a management plan that is focused, realistic for your expectations, and --most importantly-- doable.

Creating a Project Map

The other chapters in this section on Habitat Planning explain the many considerations that you must ponder before writing the plan. Now that you've decided on one or more specific projects, you can write your management plan. A good way to visualize your plan, before actually writing it out, is to create a project map. The project map will help you to see where you've been and where you want to go next. This map is dependent on the Base Map created in the first step of the planning process, **Evaluating the Land**, which shows how to make inventories of habitat types, plants, and animals that already exist on your property. The Base Map includes the major existing habitats and land features. This information helps you determine what you could reasonably expect to do within the context of the surrounding landscape.

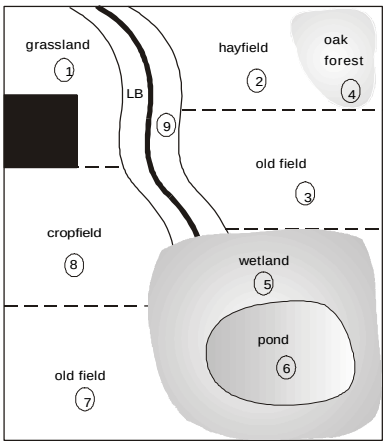
To create a Project Map, use the Base Map as the foundation, and for each habitat, or site, write in the habitat projects that will be implemented. This entails either leaving existing features that already benefit wildlife, enhancing them, or replacing non-beneficial existing features with the management action you decided on in the previous planning steps. Numbering each site on the base map before creating the Project Map will help in writing the management plan as it will organize the areas into workable units. The example maps shown on the next page illustrate this process.

Writing Out the Plan

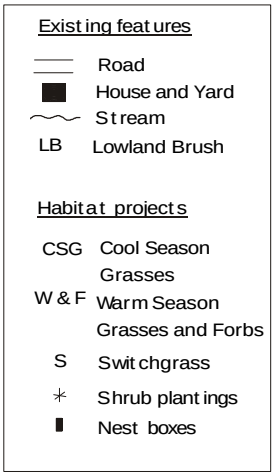
The next step to writing a management plan is to actually write out the final draft of the plan. This includes listing your goals along with the objectives and actions that will take place at each site. A good way to organize your final draft is to write out your habitat projects by site. Under each site, list in detail the objectives that will be fulfilled, the actions that are required, and when they will be implemented. Be as specific as possible as this is the write-up that you will refer to for details. Please see the accompanying example of a written management plan on the last page of this chapter.

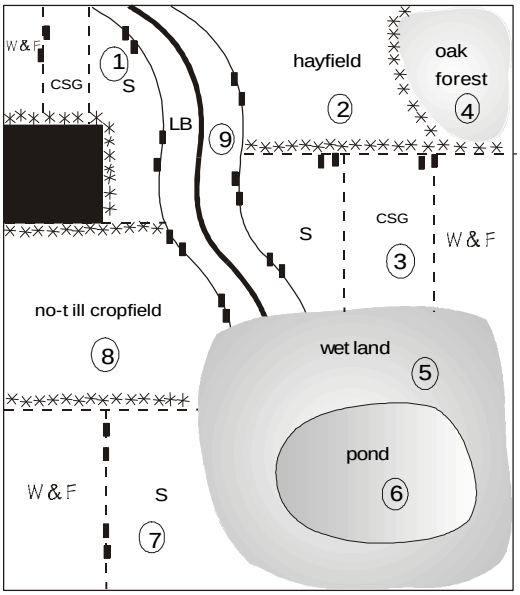
Since maintenance is also a key part of any management plan, consider adding a maintenance schedule to your plan. For example, your

40 Acres



Base map created during evaluation of the land. Sites are numbered for organizational purposes





Once you have decided on what projects will be completed, create a project map from the base. This map will show where the projects will take place and is used as a visual reference to the written management plan.

field of switchgrass for winter cover may require mowing or burning every three years, or perhaps you have adopted a rotational maintenance schedule where you treat one third of the field each year. Writing down maintenance schedules will help you to plan your time, and is also the best way to remember the important things that need to be done. Ignoring the necessary maintenance will prevent you from enjoying the full benefit of your habitat plan.

This is also a good time to review your plan to determine which goals are short-term and which are long-term. In other words, it is important to know which projects may produce immediate results, and which may not show results for years. Because long-term projects may take years to implement, you may also want to plan some activities that will produce immediate results, such as building nest boxes for certain bird species. Remember to be patient, most management plans require several years before tangible results can be seen. Wait for vegetation to become established. After that, wildlife should move into the habitat you have created.

Creating a Timeline

A supplemental tool to your management plan is a timeline that consists of your management activities. This year-by-year list of actions will help you to stay organized, and to keep track of what action must occur when. A timeline is another way of writing out your plan as it allows you to view the actions chronologically, rather than site-by-site. While keeping track of the overall big picture, a timeline helps you focus on the step-by-step process one task at a time. Not only will this give you a sense of accomplishment along the way, but it will also make the overall plan less overwhelming. Please see the example timeline.

Implementation and Monitoring your Results

Once you have written your plan, it is time to implement it. Implementation means turning your plan into reality as you begin to accomplish your goals. During implementation, follow your plan and timeline carefully, but realize that changes can always be made if problems arise. Flexibility is important in a good management plan.

After you have implemented your plans, it is important to monitor your results and determine if you have accomplished what you wanted. Sometimes, unexpected results occur, such as changes in

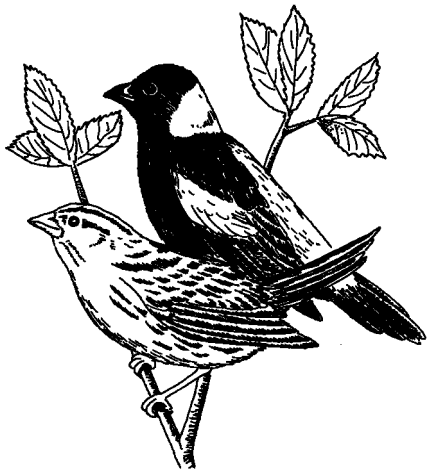
Timeline

This is an example of a timeline for completing habitat projects based on the example project map. Following a timeline will break the project up into workable pieces, and allow you to visualize both the short and long term results.

Year One	
Spring:	Planning process
Fall:	Remove encroaching trees and brush
	Prepare site 1 for planting (could include mowing, Round-up, plow and removal)
	Begin no-till farming in site 8
	Erect nest boxes
Year Two	
Spring:	Plant NWSG and wildflowers in section 1, site 1
	Plant CSG and clover in section 2, site 1
	Plant switchgrass in section 3, site 1
	Plant shrubs on site 1 and around house
Fall:	Prepare site 3 for planting
	Check nest boxes and repair any damage
Year Three	
Spring:	Plant switchgrass in section 1, site 3
	Plant CSG and clover in section 2, site 3
	Plant NWSG and wildflowers in section 3, site 3
	Plant shrubs on site 3 and around site 4
Summer-Fall:	Prepare site 7 for planting
	Mow hayfield between July 15 and August 31
	Apply selective herbicide to NWSG if necessary to remove competition
	Check nest boxes and repair any damage
Year Four	
Spring:	Plant NWSG and wildflowers in section 1, site 7
	Plant CSG in section 2, site 7
	Plant switchgrass in section 3, site 7
	Plant remaining shrubs
	Burn NWSG on 1/4 to 1/3 annual rotation
Summer-Fall:	Mow CSG in section 1 on ¼ to 1/3 annual rotation
	Check nest boxes and repair any damage
	Evaluate management plan and consider alternatives if necessary

the land or attraction of unwanted species, and additional actions will need to be planned. Not every project will be successful, of course, and if the changes are unwanted you may have to start the process over and determine a new goal. However, often your goal is obtained, and monitoring your success is a way to keep in touch with your land after the planning process is complete. Keeping a journal is a good way to keep track of your progress, and will help you to see the differences you have made on the land. This may also help you determine potential problems and possibly catch them before they occur.

Monitoring your results is often the most rewarding part of the planning process. You will be able to see what you have accomplished through your hard work and careful planning. The landscape developments that occur and the new sightings of wildlife you observe will bring much satisfaction. Simply writing down the day you saw the first pair of bluebirds setting up a household in the nesting box you installed is a memorable event that is fun to record. You will realize the same enjoyment when the purple coneflowers you planted in the butterfly garden begin to bloom, or that spring morning you heard a cock pheasant crow.



WRITING A MANAGEMENT PLAN

Wildlife Management Plan
Final Draft

Goals: To attract pheasants and other grassland birds

Acres: 40 acres

Site 1
Nesting, brood rearing, winter cover, and food producing areas will be developed on this site at locations identified on the project map. This site will be divided into three sections. Each section should be planted in north to south strips, and should be at least 60 ft wide. Travel corridors will also be established.

The first section will be planted to native warm season grasses and forbs. This includes a mixture of big bluestem, little bluestem, indian grass, and a variety of native wildflowers. This area will be used as winter cover and as a food source.

The second section will be planted to cool season grasses and clovers which consists of a mixture of timothy at 2 lbs / acre, orchard grass at 2 lbs / acre, white sweet clover at 2 lbs / acre, and medium red clover at 2 lbs / acre. This area will be used for nesting, brood rearing, and as a source of food.

The third area will be planted to switchgrass at a rate of 4-6 lbs / acre. This will be used as a wintering area.

Chemical and mechanical methods should be used to control competing grasses and weeds within the planting areas. This site will be prepared in the fall of the first year, and planted in the spring of the second year. The cool season grasses will be mowed on a one third annual rotation starting the third year after planting between July 15 and Aug 31. The warm season grasses will be burned on an annual rotation starting the third year after planting. Prescribed burns will be conducted in the spring before the new growth is 1-3 inches tall and before bird nesting begins. This stand will be burned every 3-5 years. Remember to notify local fire department before burning.

To provide travel corridors and an additional source of food, fruit producing shrubs such as highbush cranberry, dogwood, and crabapple will be planted along the south perimeter of the site, and around the home site. Two rows of shrubs will be planted 8 feet apart and 8 feet between rows, with the trees staggered between rows.

Nest boxes will be installed and maintained as indicated on the project map the fall of the first year. They will be checked and maintained annually.

Site 2
This area provides valuable wildlife habitat and will be left undisturbed. However, a mowing rotation will be established at year four and mowed on a one quarter rotation.

Site 3
Nesting, brood rearing, winter cover, and food producing areas will be developed on this site at locations identified on the project map. The site will be divided into three sections and planted to warm season grasses, cool season grasses and clovers, and switchgrass. This area will be prepared the fall of the second year, and planted in the spring of the third year. It will be planted and maintained as described in site 1. Fruit producing shrubs will also be planted on the north border of the site to provide a travel corridor and a food source.

Site 4
The oak trees found on this site provide valuable wildlife habitat. This area will be left undisturbed. Fruit producing shrubs will be planted along the perimeter of this site to lessen the impact of predators in the grassy areas by reducing the existing harsh edge created by the forest.

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WORKING TOGETHER FOR WILDLIFE

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WORKING WITH NEIGHBORS

To meet the needs of wildlife species it may be necessary for neighbors to work together to improve habitat on adjoining properties. Although Michigan has more public land than any state east of the Mississippi River, millions of acres also belong to thousands of private landowners. If wildlife populations survive in Michigan, it will be largely due to habitat management on private lands. Especially in southern Michigan where more than 95 percent of Michigan's land is privately owned.

Many of these private properties include small parcels of one to 20 acres each, and many more are backyards less than an acre in size. As more and more land is converted to houses, highways, and shopping centers, wildlife habitats become fragmented and isolated. This fragmentation makes it difficult for wildlife to find the right combination of habitat components necessary for their survival. Even in northern Michigan, where large blocks of public forest occur, fragmentation and human development of land continues to increase.

Landowners can make a difference for wildlife, and lessen the impact of this fragmentation, by creating habitat on their land. However, landowners working together can make an even bigger difference by providing larger tracts of land for wildlife. No matter what size your lot is, you can still improve your plan by working with your neighbors. This chapter explains how to work with your neighbors to develop a better habitat management plan.

Begin a Dialogue with Your Neighbors

The habitat, animal, and plant inventories you made on your land (described in the chapter on **Evaluating the Land** in this section) have helped you to understand the habitats that wildlife use, and to identify what habitats you have and do not have to offer them. Animals do not understand human boundaries such as fences, roads, drainage ditches, and rights of way (although they may be attracted to them if key components of habitat are provided). They readily respond to natural habitat--wetlands, woodlands, and grasslands. Unless you own a large amount of land that is diverse in habitat types, you may not be able to manage for some species. Hummingbirds, for example, won't be attracted to your sugar-water feeder unless there is a wooded area nearby where they can nest and find shelter. Deer might be attracted to the clover in your lawn but only if there is brushland shelter nearby in which to escape and raise their young. In addition, some species require larger blocks of one type of habitat, such as some grassland and woodland birds.

Opening a dialogue with property owners near you is an important part of your overall management plan. Your neighbors' goals may be the same as yours or altogether different. Either way, it is good policy to find out as soon as possible. Working with your neighbors can make your goals more attainable. Your neighbors may have one or more important components of habitat that you do not have. If you plan together, you may be able to provide all of the necessary components needed to obtain your goal.

It is always best to make your contacts long before your decisions have the potential to impact property that is not your own. If you think that your plan will directly affect someone else's property, seek their approval before you take any action. Your plan to restore a wetland, for example, may alter hydrology on adjacent lands. The water you impound

may spread to another's property and create a problem. Your neighbors may take any mishaps that might occur a lot better if they were involved in, and agreed to, your plans.

Your goals could also threaten a neighbor's plan for their land. If your neighbor earns income from farming, the deer population you have attracted to your property may eat the crops the farmer has planted. If you had taken the farm into consideration when planning, you could have planted preferred foods on your land to reduce your neighbor's crop damage. Other decisions you make could alter property values, make access difficult, or be in direct conflict with your neighbors' goals. The gains you make could cancel out your neighbors' improvements and vice versa.

Sharing Ideas and Combining Efforts

Sitting down with your neighbors to discuss short-term and long-term goals is the best way to avoid these problems. As you share plans, you may learn how much you have in common. The woodlands or wetlands you own may be connected to the woodlands or wetlands owned by your neighbor. Perhaps together you can manage shared habitats for the common good. You may discover that the idled farm field you own and the cattail marsh your neighbor owns can be managed as a single unit. The grassland can provide nesting and brood-rearing cover, and the wetland can provide secure protection from storms and predators for mallards, pheasants, red-winged blackbirds, and bluebirds.

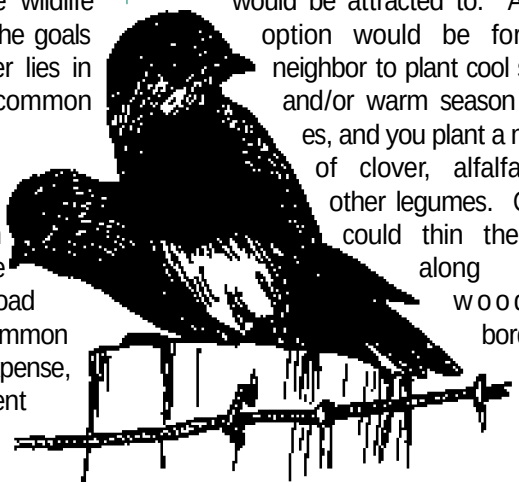
There are many advantages to communicating your ideas and goals with neighbors. One or more local property owners may be able to furnish valuable information about your land and its history. What grew there, how the property was used, what birds and mammals lived there at one time, when the timber was last harvested, and what farming practices were carried out are examples of useful information that will help you to set goals and objectives that could be mutually beneficial. Cropping patterns, pesticide and herbicide use, tiling and drainage programs, and fertilizing and grazing are all important things to know as you write your overall Management Plan.

Sharing your plans with your neighbors and asking for their ideas in return opens the door for good relations and may lead to complementary agreements. Although there is no guarantee that subsequent owners will share your mutual interests, it is the best assurance you can expect for long-term management goals. The reality is that if either of you sells your land, there is no way to know if future owners will be wildlife friendly. What happens when the goals are contradictory? The answer lies in negotiating to find some common ground.

Creating, enhancing, and maintaining wildlife habitat can be hard work that costs time and money. Sharing the workload with neighbors who have common interests can save time and expense, and add to the overall enjoyment that comes from making a difference for wildlife. Two people can create a brushpile for rabbits in half the time it takes one person to do the job. The work of cutting trees for firewood while thinning a woodlot is not so difficult if you have a partner to help. Also, sharing tools and specialty equipment like chain saws, mowing machines, tractors, and farming implements is a good way to save money.

You might even find ways to cost-share certain projects such as creating food plots, windbreaks, wetland or prairie restorations, pruning wild-apple trees, planting fruit-bearing shrubs, timber cutting for commercial sale, building nesting platforms for ducks, and houses for birds and bats. Perhaps you will manage the sharp edge between grass and tall trees by each person planting a row or two of fruiting shrubs like elderberry or highbush cranberry. Besides benefiting wildlife that live in the diverse habitats you and your neighbor are managing, the shared plantings reduced costs.

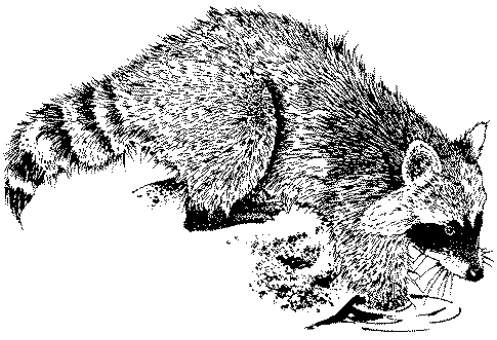
Boundary lines offer a great opportunity to work together for wildlife. Fencerows, for example, can be widened through the joint planting of trees, shrubs, and grasses. If each of you planted one row of evergreens and one row of fruit-producing shrubs, you would create a living fencerow that many species of birds and mammals would be attracted to. Another option would be for your neighbor to plant cool season and/or warm season grasses, and you plant a mixture of clover, alfalfa, and other legumes. Or, you could thin the trees along your woodland border to



WORKING WITH NEIGHBORS

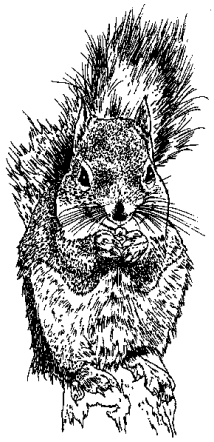
provide more sun for your neighbor's wildflowers.

If you do not know who your neighbors are, you can find out by consulting a county plat book, available through your local library, county courthouse, township government office, or Michigan State University Extension office. Sometimes landowners may have little or no interest in wildlife. Yet other neighbors may be public land managers who are keenly interested in helping you develop plans that support their interests. If your property borders a township park, state wildlife or recreation area, or state or federal forest, a management plan for wildlife may exist. In that event, you might be able to tailor your goals to complement a plan already in effect.



In summary, few landowners are able to improve wildlife habitat without in some way affecting nearby property owners. Sharing information and ideas may be mutually rewarding and create partnerships that can last a lifetime. Whenever you combine efforts with neighbors, you increase the benefits to wildlife.

WORKING WITH NEIGHBORS



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PRE-SETTLEMENT/ PAST VEGETATION TYPES

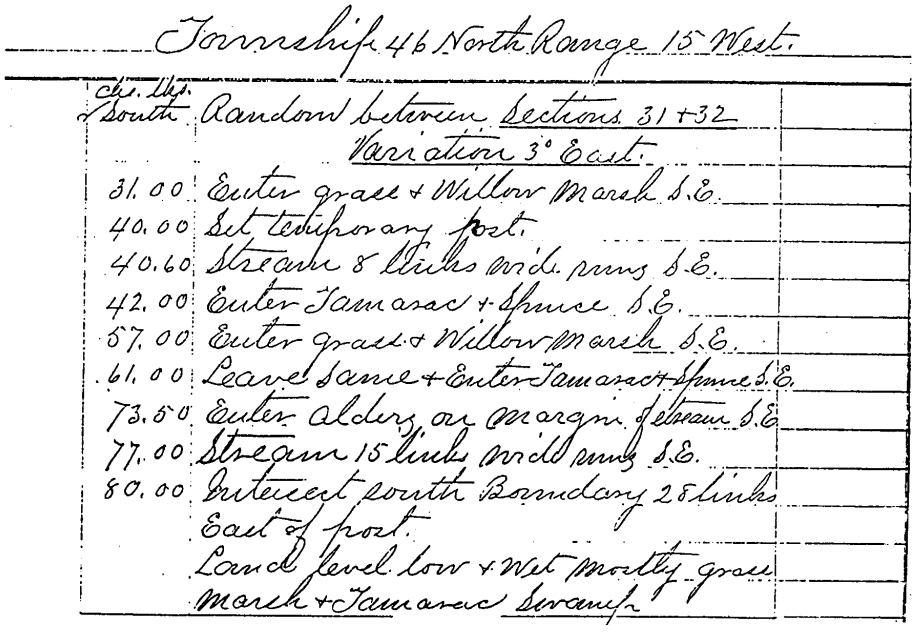
Pre-settlement vegetation is the vegetation that occurred across Michigan's diverse landscapes at the time of European settlement. Before settlement, elk, bison, wolf, moose, and woodland caribou were abundant and Native Americans inhabited Michigan. Imagine the county or township where you live without roads, supermarkets, power lines, retention ponds, industrial parks, subdivisions, strip malls, golf courses, or large monocultures of corn or soybeans. Picture having only the sun to guide you through a sea of grasses that stretched to scattered pockets of large, wide-spreading oaks and bison grazing in the distance. Imagine your backyard filled with 500-year-old white pines that seemed to touch the sky, trees so wide that even two people could not put their arms around them. In your mind's eye, see wetlands that stretched as far as sight allows, living marshlands filled with the sounds of thousands of waterfowl as they settle in for the evening. It is likely that this is what early settlers saw when they first arrived in Michigan.

Knowing where such landscapes occurred historically helps in habitat planning today. A pre-settlement vegetation map allows us to see this. It describes the landscape when Michigan was first surveyed, and it shows where distinct plant communities occurred. This map is a tool that improves our understanding of patterns and processes across landscapes. This information offers insights for managing lands as large as state forests or as small as your backyard. Knowledge of the type, location, and ecological context of Michigan's native vegetation helps landowners choose effective land management goals. Today's patterns of land-use, wildlife distribution, wetland water levels, and ecosystem functions are far more meaningful when placed in a historical context.

This historical information becomes very important when you begin writing a management plan for your property. What you can learn about the land's history will help you develop management goals, decide specific habitat projects, and plan for stewardship now and in the future.

How Are Pre-settlement Vegetation Maps Made?

Before land in Michigan could be sold for the first time to settlers, the federal government required that it be surveyed. Deputy surveyors from the General Land Office visited Michigan prior to the logging era between 1816 and 1856. These surveyors' township plat maps and transcribed field notes provide the best available record about Michigan's native landscape. The General Land Office required surveyors to note the loca-



Township 46 North Range 15 West.

ch. lks.	
South	Random between Sections 31 + 32
	Variation 3° East.
31.00	Enter grass + Willow Marsh S.E.
40.00	Set temporary post.
40.60	Streams 8 links mid. runs S.E.
42.00	Enter Tamarac + Spruce S.E.
57.00	Enter grass + Willow Marsh S.E.
61.00	Leave same + Enter Tamarac + Spruce S.E.
73.50	Enter Alders on margin of stream S.E.
77.00	Stream 15 links mid runs S.E.
80.00	Intersect south Boundary 28 links East of post.
	Land level low + Wet mostly grass marsh + Tamarac Swamp

Actual field notes from when Michigan was first surveyed.

tion of wetlands, lakes, and streams; to comment on the agricultural potential of soils; and to note the quantity and quality of timber resources. The surveyors recorded recently burned areas, beaver floodings, windthrows from storms, and Native American settlements. At each section corner and half-mile point they pounded a wooden post into the ground. These markers would later be used to establish legal property boundaries. The measuring tools they used were a compass and a "chain." A chain contained 100 links and was 66 feet long. A total of 80 chains marked a mile. The surveyors left markers to indicate township and section borders for the first private property owners. They also recorded enough land resource information for the settlers to make sight-unseen purchases, and to help them find the parcels they bought.

Recently, ecologists from the Michigan Natural Features Inventory (MNFI) used information from these original field notes and plat maps to compile pre-settlement vegetation maps for Michigan's 83 counties. Because the surveyors took information only along section lines and because small plant communities such as 20-acre wetlands were not included, the MNFI ecologists also relied on other references. They studied surface geology maps, soil maps, and other technical data to make the pre-settlement maps as accurate as possible.

From these and other resources they determined that more than 80 different native plant communities historically occurred in Michigan. These communities ranged from pockets of unique wetlands that depended on fluctuating water levels, to tracts of hardwood-conifer forests that stretched over several counties. Ecologists combined all 83 counties into a statewide pre-settlement vegetation map.

Regions

There are four major regions that differ in Michigan: the southern Lower Peninsula, northern Lower Peninsula, eastern Upper Peninsula, and western Upper Peninsula. These regions are primarily based on climate and geology, which in turn determines the types of vegetation present. Understanding these areas will help you to determine what has historically grown in your area, and what may feasibly grow there now.

Southern Lower Peninsula

The southern Lower Peninsula was a diverse landscape of oak-hickory forest, beech-sugar maple forest, oak-grassland areas called savannas, and hardwood swamps. Beech, sugar maple, walnut, hickory, and tulip trees grew on well-drained soils and dominated the landscape. Areas with well-drained sandy soils supported mosaics of oak-hickory forest and oak-savannas. These drier sites allowed periodic wildfires to occur which promoted the establishment of oaks, hickories, prairie grasses, and wildflowers. These fires were often started by lightning strikes and Native Americans.

Hardwood swamps of red maple, ash, swamp white oak, and elm grew in lowland depressions and poorly-drained areas. Along the eastern edge of southern Michigan near the Great Lakes, large areas of wet prairies and oak openings prevailed and were greatly influenced by water-level fluctuations and fire. The vast area around Saginaw Bay and its wet clay plain were covered with lowland hardwoods, hemlock, and white pine. The shoreline supported wet prairies and Great Lakes marshes, as it did along Lake Erie and Lake St. Clair.

Today, the landscape looks dramatically different. Major losses to forests and wetlands have occurred due to agriculture and urbanization. Large portions of marshlands on the Great Lakes were destroyed by development of ports and marinas, as well as by farming activities. Native grasslands, both prairies and oak-savannas, were among the first areas to be plowed because they contained few trees. Dry conditions and poor soils later caused some of these farmlands to be abandoned. Many converted to forests of oak and, if fire was suppressed, eventually to stands of beech-maple. Only a few small remnants of native grasslands remain.

Northern Lower Peninsula

Northern hardwoods, oak-pine grasslands, pine forests, and conifer swamps originally covered the northern lower peninsula. There were more conifers as you went north due to the colder climate. However, northern hardwoods, which were comprised of sugar maple, beech, white pine, hemlock, basswood, and yellow birch dominated. Pockets of aspen and birch occurred in this system where local disturbance such as wind or fire opened the forest canopy to allow regeneration of these early-successional trees.

In the central portion, a mix of pine forests and barrens developed

because of the sandy, dry soils and the high frequency of fire. Jack pine prospered on the driest sites, and forests of white and red pine grew in other places. Some of the poorest quality sites burned often enough to support communities called barrens, which are grasslands that contain a few oaks, pines or a mixture of both. Northern white cedar, black spruce, and tamarack grew in poorly drained areas.

When loggers removed the red pine and white pine forests in the late 1800s, much of the region converted to stands of aspen and oak. Although previously logged northern hardwoods have regenerated, the composition today favors red oak, red maple, and paper birch, and thus fewer hemlock and white pine. Past and present timber harvest methods have increased aspen coverage from 100,000 acres originally to more than 1.5 million acres today. Large amounts of conifer swamps that once held cedar, tamarack, and spruce have converted to hardwood swamps and swamp brushlands of dogwood and alder. The loss of conifer swamps is a very significant change since pre-settlement and should be taken into account when managing these areas. Furthermore, due to the suppression of fire during the last century many of the historical barrens and dry-sand prairies have been lost.

Eastern Upper Peninsula

When the first settlers arrived, the eastern Upper Peninsula appeared similar to the northern Lower Peninsula. Northern hardwoods dominated the landscape, and conifer and conifer-hardwood swamps also occurred. Aspen-birch forests were more prevalent than in the northern Lower Peninsula due to the shallow, poorly drained, sandy soils. Compared to the rest of Michigan, however, this area contained large expanses of peatland, muskegs, and boreal (northern conifer) forests of fir, spruce, and cedar. Vast marshes fronted Lakes Huron and Michigan. A unique grassland community called alvar occurred on Drummond Island, the Garden Peninsula, and along the north shore of Lake Huron where flat, limestone bedrock lay close to the surface.

Since settlement, one of the biggest changes has been the loss of the Great Lakes marshes. This was caused by habitat alterations and fluctuations in water levels from timber harvest, roads, highways, and quarries. Though boreal forests and northern hardwood forests still cover a large part of the region, these too have been impacted. In many cases drainage and logging have allowed some landowners to convert forests to farmland. Even in areas allowed to regenerate to northern hardwoods, there is a lack of hemlock and white pine. Other property owners have converted areas that once supported red pine-white pine and red pine-jack pine forests, among others, to red pine plantations.

Western Upper Peninsula

Originally the western Upper Peninsula was dominated by northern hardwood forests of sugar and red maple, hemlock, yellow birch, and beech. Jack pine and red pine-jack pine forests dominated dry areas, and shrub swamps, bogs, and conifer swamps containing balsam fir, spruces, tamarack, and white cedar occurred in poorly drained depressions. Heavy logging and out-of-control fires that raged through harvested areas have greatly reduced the regeneration of hemlock and white and red pine.

Although the area remains largely wooded, current harvest activities have tended to reduce forest species diversity and have increased the relative abundance of sugar maple. Also, early-successional species such as aspen and birch are more abundant today.

How To Use Pre-settlement Maps

The native plant communities shown on your county pre-settlement map were the ones best adapted to the soils, land forms, and climate. Because the vegetation existed for thousands of years before European settlement, ecologists point out that managing for original cover types should be low maintenance and cost-effective. Further, it should provide a wide diversity of habitat for wildlife. However, many things have changed since Michigan was settled, and these changes sometimes make such management goals difficult, if not impossible, to achieve. Also, such goals may not be part of the landowner's plan.

Even if your goal is not to attain pre-settlement conditions, pre-settlement vegetation maps can help with any goal by answering questions like:

- "Is restoration of this wetland or this prairie a good idea?"
- "How do the management plans for my property fit in with what grew here 200 years ago?
- "What kinds of changes have occurred and over how long a period?"
- “What plants and animals naturally occurred here?”
- “Are there any rare plants or animals historically present

that should be looked for?"
•"What disturbances were most likely required (i.e. fire) to sustain the types of vegetation historically present?"

Answering these questions will help you to understand the changes that occurred in your area, and help you to fit your property in with the surrounding landscape. The more you learn about your property's history, the more you will understand its limitations and its potential.

Consider, for example, how natural disturbances of fire, wind, and erosion played important roles in creating and altering the patterns of Michigan's native landscape. The ability to clarify the type, location, and impact of a wildfire, or a wind storm hundreds of years ago helps wildlife researchers to develop ecological models. These models can then be used to plan management strategies that will mimic the natural processes, with the goal of restoring former habitats or creating new ones.

Learning as much as we can about the past also helps us to better understand present uses of the land. The reason, for example, that celery grows so well on the neighbor's black soil is because the land was originally a muck-bottom wetland that a former owner drained. The soil type and the presence of moisture dictated what grew there then and what grows there now. Another example of a lost landscape is the prairie. If you live on a sandy, relatively flat area in west-central Michigan, you may own a remnant prairie. By studying pre-settlement vegetation maps and present-day soils maps, you might find areas that historically harbored grassland species such as big bluestem, Indiangrass, butterflyweed, or black-eyed Susan. You could even discover a rare species or two that may still persist and that could benefit from a prairie restoration.

To use the pre-settlement map in your management plan, start by studying the map and making a list of the native plant communities that were historically found on and near your property. Check with your local library, area historical society, older neighbors, or former landowners as they may also have helpful information. Use reference books and information in this guide to make a list of plants and soils that are associated with each plant community you can identify. Then search your property to see if any pre-settlement plants or communities are still growing there.

Pre-settlement vegetation maps help guide landowners to search for things they might not have known existed. This newfound knowledge can be added to other pieces of information to write a dynamic management plan that considers soils, surface water, ground water, current land cover, surrounding land use and habitats, and wildlife present.

County pre-settlement maps are currently available through the Michigan Department of Natural Resources for a nominal fee. Ask for the Michigan Resource Information System (MIRIS) unit. In addition, the Natural Resource Conservation Service (NRCS) or Conservation District (CD) office located in most counties will have a full-color county pre-settlement map for reference use only.

In summary, everything you can learn about your land, past and present, is a valuable asset toward writing a management plan aimed at improving wildlife habitat. The Michigan pre-settlement vegetation maps offer important clues to what you can and can not expect to accomplish on your property.

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KNOWING YOUR SOILS

What does your property's soil have to do with wildlife? In a word -- everything. Life on land begins with soil. The type of soil, along with climate, determine what plant communities will grow in an area. Together the soils and plant communities provide the habitats that give animals the requirements they need to survive: food, shelter, space, and water. All plants and animals need minerals and nutrients to survive, and wildlife obtain them from food. Plants absorb minerals and nutrients from the soil, which then pass through the food chain to plant eaters and eventually to meat eaters.

Michigan's diverse landscapes are the result of many different kinds of soil. The Natural Resources Conservation Service (NRCS) has categorized in wetlands alone about 2,000 different soils within the United States, and these wetland soils support some 5,000 different kinds of plants. This chapter will help you to identify three major soil types that may occur on your property. Included are suggestions for creating wildlife habitats based on soil characteristics.

Soil Systems

The reason that the supply of minerals in nature never runs out is because they are constantly being recycled. When plants and animals die they decompose. Organisms like mushrooms and other fungi, as well as bacteria, feed on the dead material and help to break it down until it is released to the atmosphere and soil. This decomposition process eventually creates topsoil, which is the richest in minerals and nutrients. The process takes a long time, creating only an inch of topsoil every one hundred years. The minerals and nutrients in the topsoil are leached into the subsoil where the roots of long-lived plants find them and store them into their tissues providing the base of the food chain.

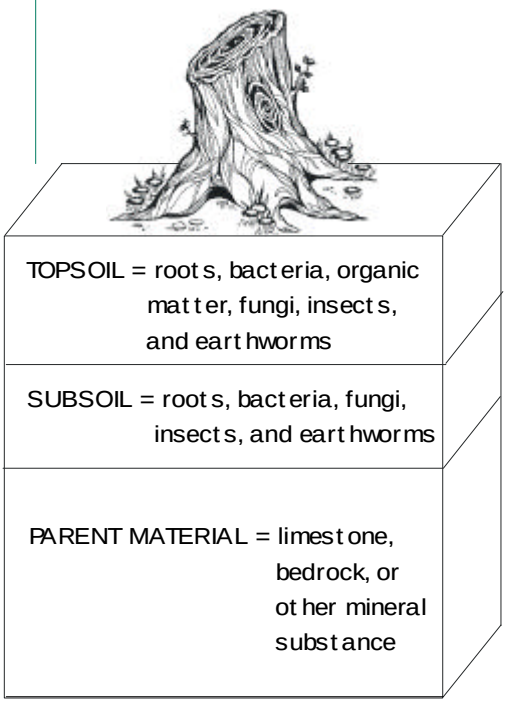
This natural process sustains ecosystems and the well-being of all wildlife. Therefore, soil is much more than dirt. It is a living ecosystem. The soil of a typical acre of grassland habitat, for example, will include 15,000 pounds of plant roots, 400 to 4,000 pounds of bacteria, 500 to 5,000 pounds of fungi, 250 to 1000 pounds of earthworms, and 10 pounds of insects, all of which interact to sustain life.

However, soils and plant communities are easily abused through careless management that allows erosion to occur. The natural process may also be upset by the improper use of herbicides that destroy plants, and insecticides that may kill certain soil organisms that act as decomposers which provides a key part of the food chain.

Soil Textures

The soils that comprise your property developed slowly over a long period of time. The physical and chemical composition of the parent material played a major role in what kind of soils developed. The the effect of climate and the plants and animals that lived and died there are other contributing factors.

Although soil contains many living things, it is also composed of non-living matter such as minerals, water, and air. How much water and air found in soil depends upon weather, water uptake by plants growing there, the lay of the land, texture of the topsoil and subsoil, and groundwater levels. As weather, seasons, and land-use change, the level of the groundwater and soil moisture fluctuates. Wet sand in spring, for example, may be dried out in fall. Moisture content of topsoil also depends on the type of subsoil.



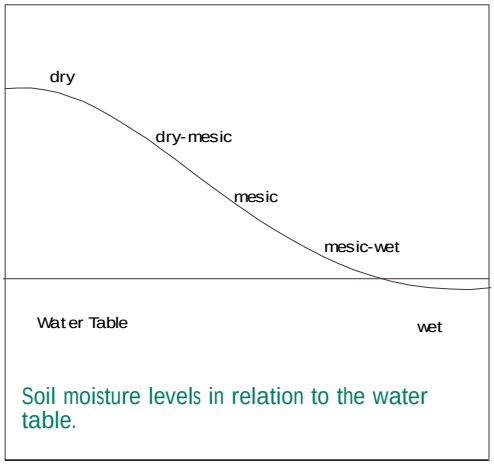
soil profile

A rich loam topsoil, for instance, may not be especially productive if the subsoil is moisture-leaching gravel.

Texture is also a common way to classify soils. It is determined by the amount of sand, silt, and clay found in the soil. Sand particles are the largest, and clay particles are the smallest. Silt particles fall between sand and clay for size. As you might expect, clay is capable of holding much more water than sand because the clay particles are so much smaller and do not leave as many spaces for the water to leach through.

Sandy soils are loose, light soils that are easy to work with. They usually drain water readily and are low in nutrients. Sandy soils dry out quickly as they do not hold water. Instead they absorb it, at a rate of more than two inches of water per hour, and it leaches through to lower layers. Therefore, sandy soils support drought-resistant vegetation such as that found in Jack pine barrens, savannas, and dry prairies. They are also generally well suited for planting wildflowers, native grasses, and pine trees in open-land or woodland habitats.

Clay soils are heavy soils rich in nutrients but difficult to work with. They absorb less than a quarter-inch of water per hour, and therefore are capable of holding a lot of water. Therefore clay soils are associated with vegetation communties that tolerate high water content in the soil such as swamps and floodplain forests, and plant species such as bulrushes, smartweed, duck potato, and pondweed.



Soil moisture levels in relation to the water table.

Loamy soils are intermediate between sands and clays. Composed of many different-sized soil particles, they combine fertility with moisture-holding capacity (a quarter-inch to two inches of water absorption per hour). Therefore, these soils are able to support a wide variety of vegetation, especially hardwood forests and, in a few favored sites, prairies. Areas with these soils offer many management possibilities.

Here's a simple test to determine soil texture on your property: Squeeze a moist (but not muddy) ball of soil in your hand. Then rub the soil between your fingers. Sandy soil feels gritty and loose. It won't form a ball and it falls apart. Clay soil, on the other hand, is smooth and sticky and has a somewhat plastic feeling. It forms ribbons when pressed between fingers. Loamy soil is a combination of clay and sand particles. It is smooth, slick, partially gritty and sticky, and forms a ball that crumbles easily.

For most soils, the amount of organic matter comprises less than five percent of its total weight. Exceptions are peats and mucks, which are special classifications of soil that contain more than 80 percent organic matter. Although high in nitrogen, such wet soils are often low in other nutrients. Frequently drained for growing vegetables or mining peat, these organic soils at one time supported wetland habitats, including bogs and fens. Unfortunately, these communities may be very difficult to restore and should be protected whenever possible.

Most of Michigan's counties now have a published Soil Survey which is available from your local Conservation District office. The survey contains maps that describe soil types on your property along with potential uses including food and cover needs for wildlife.

Soil Fertility

What the maps won't tell you, however, is how fertile your soil is. This information is obtained by taking soil samples from your property. Information about your soil fertility is important if you want to improve soil that has been degraded to produce wildlife habitat. First, though, it helps to know what you are looking for.

Soil pH is a measurement of relative acidity. In the soil pH scale, each number represents a ten-fold increase or decrease in acidity from the number before or after it. For example, a soil with a pH of 5 is 10 times more acid than a soil having a pH of 6. The pH range for most Michigan soils is 4 (acid) to 9 (alkaline), with 7 being neutral. It is important to know the pH of your soil because too much acidity or alkalinity in the soil prevents plants from absorbing nutrients. Maximum availability of most nutrients for plants occurs when the pH falls within the neutral range (6 to 7). Soil pH can be raised or lowered to desired levels by applying either lime or specific fertilizers. These applications, when applied to degraded soils, will increase the activity of microbes, improve nutrient availability, and improve overall soil structure. The pH of acidic soils can be raised by apply-

ing lime. The pH of alkaline soils can be lowered by adding specific fertilizers. Therefore, it is important to know the pH of your soil before applying anything to improve it. For example, adding fertilizer to soil with a pH of 5 won't help most plants to grow any better.

Soil fertility is measured by the amount of nitrogen, phosphorus, and potassium present. If the soil needs them, adding these nutrients as fertilizer at the correct rates helps plants to grow to their maximum potential. Commercial fertilizers are labeled according to the content of elemental nitrogen, available phosphorus, and soluble potash (potassium). The analysis of a blended fertilizer, for example, might read 12-12-12. The figures refer to the percent of nitrogen, phosphorus, and potash (in that order), which is contained in the fertilizer. In the above example, each 100-pound bag contains 12 pounds each. If a soil analysis calls for 24 pounds of nitrogen per acre for the crop or vegetative cover you intend to plant, you would need to apply 200 pounds at the rate in the example. Secondary nutrients of calcium, magnesium, and sulfur are supplied naturally in soil or may be added to soil as needed. Plants also need small amounts of boron, iron, zinc, manganese, copper, molybdenum and chlorine, all of which usually occur naturally. The only way to know what your soil needs is to do a soil test.

In addition to this, it is helpful to know the requirements of the plants you are trying to grow. Clover, for example, grows best in soils with a pH of 6.5 to 7.0. Prairie grasses and wildflowers are not as restrictive--

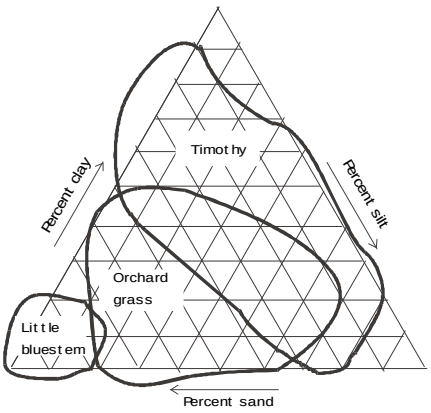


Chart showing the optimal soil texture for three common Michigan grasses.

they will grow in a pH range of 5.0 to 7.5.

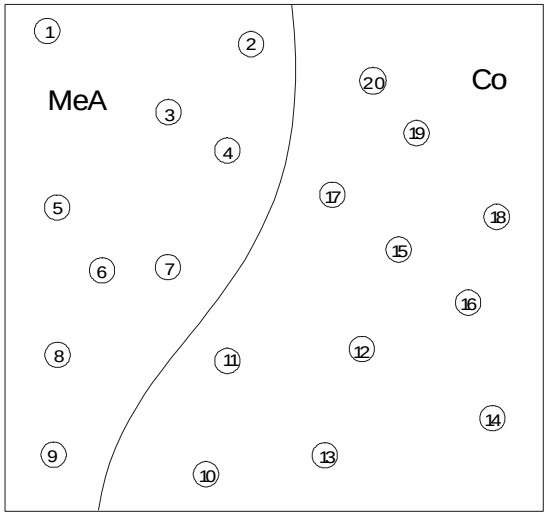
Soil ph

pH ranges for some Michigan plants (1-6.9 is acidic, 7 is neutral , 7.1-14 is basic)		
Type of vegetation	Species	pH
Grasses & legumes	Big bluestem	5.5-7.0
	Little bluestem	5.5-7.0
	Switchgrass	5.5-7.0
	Indian grass	5.5-7.0
	Alfalfa	>7.0
	Red Clover	6.0-7.0
	Orchard grass	5.5-7.0
Shrubs	Chokecherry	6.5-7.5
	Crabapple	5.0-6.5
	Nannyberry	6.1-7.5
	Red-osier Dogwood	<7.5
Hardwoods	Aspen	7.5-8.0
	White Ash	5.0-7.5
	Green Ash	6.1-7.5
	Red Maple	6.5-7.0
	Sugar Maple	3.7-7.3
	White Oak	5.5-7.5
	Red Oak	4.8-6.5
Conifers	Hemlock	6.0-8.0
	Jack Pine	4.6-6.5
	White Pine	4.5-6.5
	White Spruce	4.5-7.5
	White Cedar	<7.0

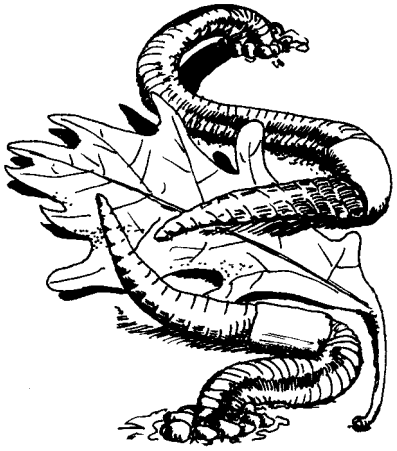
Testing Your Soil

Planting anything on your land without first getting a soil test is like trying to create a new meal without a recipe. It is impossible to know, for example, why a certain site will not grow grass or sunflowers without first sampling the soil for nutrients and pH. Depending on the size of your management site, be sure to collect several samples because different locations may be the same soil type but vary widely as to fertility.

Before testing your soil for fertility, consider its recent past history. For example, the use of pesticides may have greatly reduced the amount of micro-organisms. Nutrient value of the soil may be somewhat depleted if the land was used to produce row crops for many years. If the property was a long-time pasture, the soil structure might be tightly impacted due to animals walking over it. These considerations will help to explain why the test results come back the way they do, and they will also help you to understand the range of your management options.



Sample soil survey map of a 10 acre backyard with soil test sites.



On the Soil Survey map of your property, or on a sketch you've prepared yourself, divide your land into soil types. Plan to take twenty to thirty samples for each 10-acre site. If your property is an acre or less, two to four samples might be sufficient. Backyards and other small parcels might require a single sample. Number all site samples and record them on the map or sketch.

Use a soil probe, spade or trowel, and a clean plastic pail to take from each site soil samples 6 to 8 inches deep (no grass, sod or other plants are needed). Mix the sample thoroughly in the pail and collect one pint for testing and take it to your county Michigan State University Extension office, which will charge a nominal fee for analysis. Furnish site information on any history of cropping, liming and fertilizing, and include the soil type listed in the Soil Survey. You should also explain what you want to plant because recommended fertilizer rates vary widely for different food plots and habitats.

Soil test results can be interpreted by knowledgeable people at the Michigan State University Extension office, Conservation District office, or farm supply dealer. Keep the results with your wildlife management plan and refer to it before future plantings. The success of your overall plan depends greatly on how well you know your soils and what they can and cannot do for wildlife habitat.

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EDGES AND FRAGMENTS

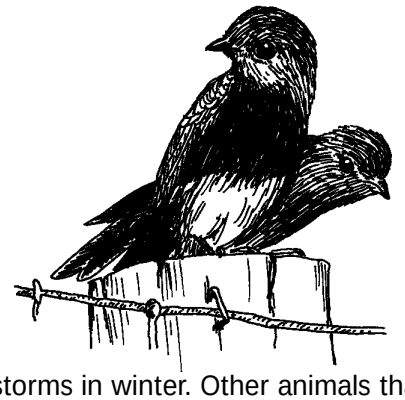
Edges and fragments are key pieces of the habitat puzzle. In order to properly manage for wildlife, it is important to understand edges and habitat fragments and their potential impacts on wildlife. Edges are places where two cover types come together, such as a wetland next to a field or a young stand of aspens next to an older stand of aspens. Edges benefit a large variety of wildlife but can also harm other species. Habitat fragments are remaining pieces of larger habitats that have been broken up, either by natural causes such as wildfire or storms, or by human disturbance such as roads, housing developments, and pipelines. Habitat fragments often contain a lot of edge, and may be too small to provide quality habitat for certain kinds of wildlife.

Before European settlement, Michigan's historical ecosystems included edges and fragments. However, today there is a large amount of habitat fragmentation, especially in the Lower Peninsula, due to the addition of nearly 10 million people to the state. As a result of habitat fragmentation, many edge-loving species have become abundant, while edge-sensitive species have reduced in numbers.

Knowing the positive and negative impacts that edges and fragments have on wildlife will help you decide on the best management options for your land. Options can range from doing nothing to intensive manipulation of habitats. Because of the large amount of habitat fragmentation in Michigan, one of the best management goals for wildlife is to enhance existing edges and minimize fragmentation. This chapter discusses such options to managing edges and fragments on your property.

Edges - Pros and Cons

Edge is important to wildlife that require plants from two kinds of habitat to provide their food and cover needs. Many species will nest in one habitat, and feed or find shelter in another. For example, a grassland and a wetland next to each other can provide year-round habitat for pheasants. The grassland provides nesting and brood-rearing cover in spring and summer, while the wetland provides security from predators and



storms in winter. Other animals that thrive along habitat edges include ruffed grouse, bobwhite quail, wild turkeys, deer, rabbits, raccoons, and foxes. Song sparrows, brown thrashers, gray catbirds, flickers, indigo buntings, bluebirds, cardinals, and red-tailed hawks are also active along edges. Because of the large amount of edge in Michigan, many of these species are now abundant. However, edges can often become too narrow to benefit these species. With the proper edge enhancements, they may be relatively easy to attract to your land.

Other species shun edges, and prefer the interior of one type of habitat to provide their food and cover needs. They rely on larger tracts of habitat and, due to large amounts of habitat fragmentation, they are becoming less abundant in Michigan. Woodland birds that are sensitive to edges are wood thrushes, ovenbirds, broad-winged hawks, pileated woodpeckers, yellow-throated vireos, American redstarts, veeries, and Blackburnian, yellow-throated, cerulean, mourn-

ing, and hooded warblers. Grassland birds that shun edges include northern harriers, sharp-tailed grouse, upland sandpipers, bobolinks, and savannah and Henslow's sparrows. Certain species of salamanders, frogs, and butterflies also thrive best away from edges. One reason that these species can not survive along edges is that they do not posess defenses against edge-roaming predators such as snakes, foxes, raccoons, opossums, skunks, blue jays, and feral housecats. These predators pose serious threats to these edge-sensitive species as habitat fragmentation increases.

Another serious threat to these edge-sensitive species is the brown-headed cowbird, which is a nest parasite that thrives along the edges of woodlands. The cowbird does not build its own nest, but instead lays its brown-speckled eggs in another bird's nest, leaving them for the host bird to hatch and raise. The cowbird chicks, which are larger and more voracious than the host's chicks, hatch earlier than most host species do and are able to out-compete the host's chicks for food and space. This bird has grown abundant in Michigan because of habitat fragmentation,

cowbird chick in host nest

and is becoming a large problem for woodland birds. In some fragemented forests of the central United States, 60 percent of all bird nests in those forests contained cowbird eggs. Other species that are feeling the impact of cowbird parasitism are Kirtland's warblers, wood thrushes, yellow-throated warblers, chipping sparrows, scarlet tanagers, red-eyed vireos, and eastern phoebes.

Managing Edges

Many people think of edges as wasted areas. However, the shrubs and grasses found there provide good food and nesting cover for many species of wildlife. Bobwhite quail, for example, relish giant ragweed seeds and poison ivy berries, American goldfinches savor bull thistle seeds, monarch butterflies rely on milkweeds, black-capped chickadees peck out insect larvae from the swollen stems of goldenrod, and meadowlarks and bobolinks nest in the herbaceous cover. Small, permanent openings in forests are edges that provide good sources of food, nesting sites, and escape cover for ruby-throated hummingbirds, broad-winged hawks, deer, black bears, red foxes, chipmunks, and other wildlife.

Michigan has an abundance of edge, which is mostly associated with farming, timber harvesting, and urban development. Much of these edges can be improved to benefit edge-loving wildlife, as well as lessen the impact of predation on edge-sensitive species. When edges are narrow, they do not provide enough habitat for many species as they contain little escape cover and make it easy for predators to find nests. Woodland openings, fencerows, hedgerows, and roadsides are also examples of edges that are often too narrow and can be enhanced to benefit wildlife. In addition to this, broad fields of row crops have forced many species to nest along field edges, windbreaks, ditches, travel lanes, and anywhere else they can find suitable shelter. These areas, when enhanced can provide essential food and cover for nesting and travel.

The first step to managing edge is to identify any edges that already exist on your property. Then, you must decide if these edges can be improved. As you walk along the edge, determine if the transition between the two habitats is abrupt. Generally, the wider and more subtle and blended the edge is, the better it will be for wildlife habitat. You can therefore

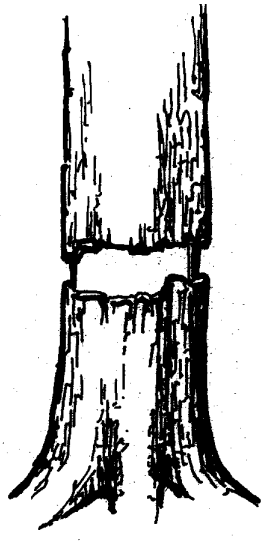
improve habitat by creating a more gradual transition between cover types.

There are two ways to do this. Either option will provide habitat for edge-loving species, as well as lessen the impact of predators on edge-sensitive species. One option is to let nature take its course and allow vegetation to grow. If the edge on your property is 30 feet or wider, doing nothing may be the best option. A 30-foot-wide strip of field next to your woods will slowly revegetate on its own.

Another option, if you have time and are willing to invest a little money, is to create a gradual transition by planting shrubs along the edge. Wildlife friendly shrubs include dogwood, highbush cranberry, nannyberry, ninebark, serviceberry, hazelnut, wild plum, and crab apples. They provide berries, seeds, fruit, browse, and insects for wildlife. To protect the shrubs from hungry deer and rabbits, you may have to place chicken wire, hardware cloth cages, or plastic tree guards around the new plantings. This option can be costly, but it will provide enhanced habitat relatively quickly.

If you farm and are concerned about taking valuable field space out of crop production, consider that crops planted to within 20 feet or more of an abrupt woodland edge often grow poorly because adjacent tree roots compete with crops for moisture. By creating a gradual edge, you can produce good wildlife habitat without much, if any, crop loss.

When removing field acreage from crop production is not an option, consider widening the edge into adjoining woodlots by removing some trees. Try to not remove more trees than is needed to create an edge that totals 30 feet wide. To encourage stumps to resprout into a lush tangle of branches, cut some of the trees off at ground level. To prevent regrowth of less desirable trees such as box elder, carefully spot- treat cut ends with brush killer. If you are conducting a commercial timber sale, always put your wildlife plans in writing before signing a contract. Mark those trees you want preserved for wildlife and relay this information to the logger. It is also important to leave wildlife shrubs and native vines, such as grape, bittersweet, and Virginia creeper, that may be clinging to trees.



You can also create a more gradual transition between forest and field by girdling some of the trees within a 30-foot-wide span from the forest edge. To girdle a tree, which will eventually kill it creating a snag, remove a three- to four-inch strip of bark completely around the tree, making certain to penetrate the first layers of wood. Creating snags will open the canopy allowing shrubs and groundcover to develop. Besides cavity-type homes, these snags yield insects for chickadees, nuthatches, and many kinds of woodpeckers. They also provide perches for hawks and owls.

As mentioned, fencerows can leave wildlife vulnerable to predation if they are narrow and contain little protective cover. Widening them to increase the amount of cover and diversity of plants growing there will have an immediate positive impact on many species. For example, to improve a fencerow separating a crop field from a pasture, widen it to 25 to 50 feet by planting the area on either side of the fence with mixed native grasses and wildlife trees and shrubs. To increase diversity, leave occasional gaps in the tree and shrub plantings, plant vines to grow on the fence, and possibly build brush piles.

To enhance roadsides, which can serve as travel corridors and cover for many species, plant them to grasses, or allow existing grasses to grow. Mow between July 15 and August 31 when ground-nesting birds are no longer sitting on eggs. Mow between 8 to 12 inches in height to provide nesting habitat for the following spring. If you must apply herbicides, spot-treat problem weeds instead of spraying the whole area.

You can create edge by planting hedgerows of shrubs or a mixture of shrubs and evergreens. Planting windbreaks around your home and outbuildings is often a wise energy-conservation activity, which has the added benefit of providing nesting, rearing, roosting and escape cover for wildlife. When creating these living screens to make your home or property less conspicuous, consider mixing in conifers (evergreens). Neighbors can work together to create valu-

EDGES & FRAGMENTS

Image not yet available.

Depending on your goals and the surrounding landscapes, it may be beneficial to wildlife to close gaps or connect fragmented habitats. Above are illustrations of this. In Case 1, the surrounding landscape is predominantly fragmented forests. Therefore, it may be beneficial to close the grassy opening with trees or shrubs. In Case 2, the surrounding landscape is predominatly fragmented grasslands. Therefore, it may be beneficial to connect the two fragments by removing the trees and shrubs separating them.

able wildlife habitat by creating dynamic edges between properties. For example, if each neighbor plants two rows of shrubs, the edge effect will have doubled in width and be much more attractive to many animals.

Creating or enhancing the best edge habitat usually requires some work. Before you decide to take on such a project, determine if you have the time, money, and energy to routinely maintain it. If you do not manage the edge you have created, natural succession will proceed and the habitat will change. Therefore, if you wish to keep the edge on your property, plan to occasionally mow or disk woodland openings and trails to keep the forest from filling in. Expect to mow, disk, burn, or otherwise treat grasslands to keep trees and shrubs from taking over.

Your property may already be fragmented to the point that creating edge is counter-productive to wildlife. Consider the areas surrounding your property to determine what management options may best reduce fragmentation. Connecting two fragmented habitats often best benefits wildlife, and should be considered whenever possible. One way to enhance fragmented areas is to connect forest openings by planting grasses, shrubs, and trees. Trails and roadsides often fragment wildlife habitat and can be improved by planting to grasses or shrubs. If there is an overabundance of fencerows in your area, you may want to consider removing them. However, be aware that this may impact other species that may use fencerows for travel or cover. For instance, a fencerow may join two fragmented forests, while at the same time fragmenting a grassland. To decide which option is best for your property you must determine which habitat needs enhancing more than the other. This can be done by examining the areas surrounding your property. In this instance, if the grassland is surrounded by forest, then it may be best to keep the fencerow and allow the grassland to convert to a forest, thus connecting the forest fragments.

In summary, identifying edges and fragments on your property and understanding their importance to wildlife should be part of your management plan. There are many ways to enhance the existing edges on your property to benefit wildlife. Always examine your surrounding landscape before making any management decisions and, whenever possible, connect fragmented habitats.

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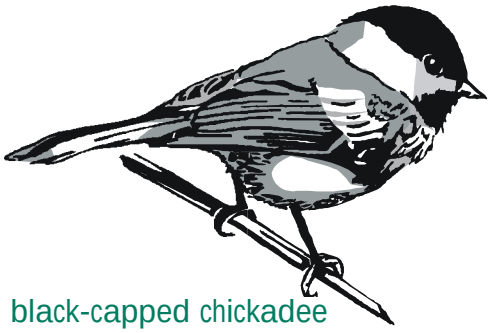
LAND STEWARDSHIP

Land stewardship is the conservation of your property's natural resources and features over a long period of time. The motives of good land stewardship seem to be paradoxical as they are essentially both selfish and altruistic. They are selfish because as a landowner, you want to continue to reap the rewards of your land for many years to come. These rewards may mean quality farm products, high-value timber, songbirds throughout the year, successful wild turkey hunts, large bags of morel mushrooms, peace and solitude, or a great view just to name a few. However, stewardship motives are also altruistic, as you also want to be a good neighbor, one who shares concern for the lands that surround yours and the water that travels downstream from your property. You also want to ensure that the opportunities you enjoy now will continue to be there when your great grandchildren are old enough to appreciate your hard work and dedication.

Many consider the late Aldo Leopold to be the father of modern conservation theory and practice. Leopold believed that land stewardship was not only rooted in conservation but also involved ethics, or the search for a higher meaning. He wrote that all ethics rest upon the single premise "...that the individual is a member of a community of interdependent parts. The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, animals, or collectively: the land." This is to say that once we understand that humans are not separate from, but are part of and depend on the natural community, we will develop an ethic to care for the community as a whole.



black-capped chickadee

Stewardship of your land is the greatest gift you can give to present and future generations. This chapter explains what healthy ecosystems are, and what you can do to help restore and maintain them for the future.

Focus on the Building Blocks

Natural resources refer to all the things that are naturally produced, and include water, air, soils, minerals, plants, and animals. The key to good land stewardship is to ensure that the basic building blocks for healthy ecosystems are taken care of. These basic building blocks are healthy soil, clean water and air, and biological diversity. Soil is the foundation of our plants, whether they are natural communities, tree farms, or food crops. Clean water and air are essential for all living organisms.

Biological diversity is simply the variety or diversity of living organisms. Over the last 500 years many organisms have become extinct or extirpated because of human activities, and many more are currently declining in population. Some of these species play a critical role in our ecosystems, and others offer medicinal, economic, nutritional, and aesthetic values.

For most species we do not have enough knowledge to fully understand what roles they play in our ecosystems or what values they offer. As a good steward, though, making sure that the native plant and animal communities found in your area continue to live is a priority as important as maintaining healthy soils and clean water and air. This is especially true for rare species such as the Karner blue butterfly, which has a hard time recolonizing within other sites.

Stewardship and the Planning Process

Stewardship is not just about getting outside and appreciating your land, it is also closely linked with creating and carrying out of a good habitat management plan. Stewardship includes everything from sitting on a hillside observing which wildlife species visit your property to getting on your tractor and brushhogging the shrubs and trees that are invading your prairie. The key elements to good land stewardship are very similar to the steps in writing the management plan. First you must identify the soils, topography, plants, animals, habitats, and waterways that occur on your property. In addition to this you should try to understand the relationships between these natural features. You can do this

and talking to neighbors or experts. You can then begin developing a plan. Your plan should focus on maintaining the long-term health of your land, and should be done within the context of surrounding lands. After your management plan is implemented, while enjoying your results, you should monitor your progress and identify any problems. If you have thought out your management plan thouroughly, future generations will be able to enjoy the same opportunities that you have.

Understanding What's There

Good land stewardship is built day by day while spending time on your land observing the various events in the natural world. To obtain the most knowledge from your land you must be very observant. Listen to frogs calling in the wooded swamp in spring, watch the brood of wild turkeys hunt for insects in the grassy meadow, view the songbirds in May as they migrate to places farther north, notice trails created by various animals, look for tracks, nests, or other signs of animal activities. Ask yourself questions about your land. Are there any decaying logs or dead trees in the woods that may be potential homes for wildlife? What flowers bloom in early spring, late summer, and early fall? What types of soils occur on your land? Is the stream next to your property still cool and clear, or is it warmer than usual and filling with sediment?

These informative activities should serve as guideposts for future management decisions. What you observe on your land now can teach you about your land's limitations as well as the opportunities that exist. For example, if you live in an area where the soil is predominantly coarse, nutrient-poor sand with very little topsoil, growing a forest of hardwoods will be difficult and costly. On the other hand, this location might be ideal for restoring a mosaic of prairies and savannas. Diligent observation, therefore, is a key toward building good land stewardship. Refer to the chapter on **Evaluating the Land** in this section for more information.

Managing Long-Term Health

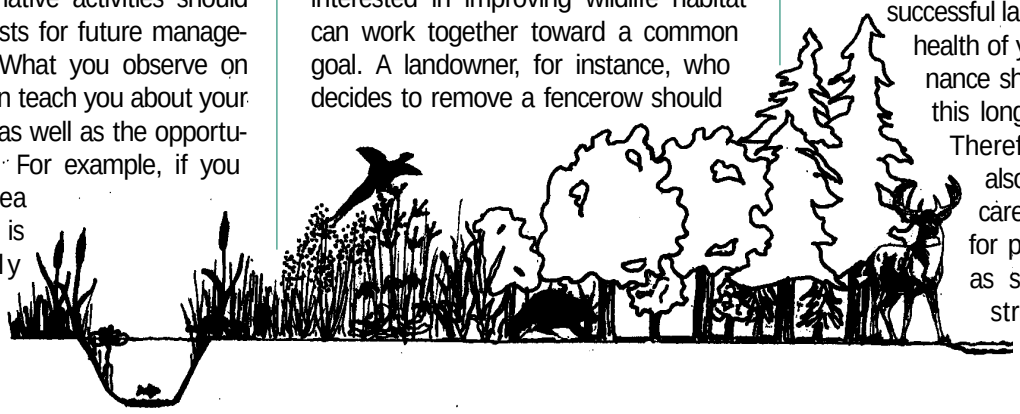
Taking into account the long-term health of your land helps ensure that today's options will exist several generations from now. Health, according to Aldo Leopold, is "the capacity of the land for self-renewal." What you do with your land today will determine the land's future health. Therefore, whether you manage for specific species, manage for diversity, or take a hands-off approach, it will effect the opportunties that will be available on your land in the future. For this reason, it is important to be very careful in making mangement decisions. It is always important to take a critical look at surroundiing landscapes when developing a management plan. For example, if you live in a largely forested area with few scattered old fields, it may be more beneficial to manage for a forest on your land, rather than a prairie which will require more maintenance and have less benefit to wildlife in this setting.

Also, it is important to discuss your plans with neighbors so that everyone interested in improving wildlife habitat can work together toward a common goal. A landowner, for instance, who decides to remove a fencerow should consider the potential impact on the adjacent forests, wetlands, rivers and lakes, and the plants and animals that live there. Perhaps, impacts could be minimized by creating a buffer strip of shrubs, planting a hedgerow, or seeding the area with native grass and wildflowers. Refer to the chapter on **Working with Neighbors** for more information.

Maintenance of Management Goals

Maintaining the habitat you have restored or enhanced will ensure long-term fulfillment of your management goals. Without some maintenance, most habitat plans are doomed to failure. Suppose you own 20 acres of native prairie, which you would like to maintain as such. You will have to do more than merely allow nature to take its course. Historically, prairies were maintained by periodic fires, which were set by lightning or Native Americans. If you want your prairie to be there 10, 20, and even 50 years from now, you will have to take some course of action such as mowing, cutting, grazing, prescribed burning, or applying a selective herbicide. Maintenance also includes smaller-scale activities such as cleaning out bluebird boxes, replacing livestock fencing in disrepair, repairing bird houses and feeders, pruning wild apple trees, and replacing damaged saplings. Maintenance often requires substantial manual labor, but it offers the biggest reward of all--being a good steward.

Because the most important part of successful land stewardship is the health of your land, all maintenance should be crafted with this long-term goal in mind. Therefore, maintenance also means keeping a careful eye on your land for potential threats such as sedimentation in the stream, soil erosion,



pest and disease outbreaks, overbrowsing, overgrazing, ORV damage, and the invasion of non-native species such as purple loosestrife, glossy buckthorn, autumn olive, or multiflora rose.

Landowners should also consider long-term maintenance to ensure that the lands they are managing remain good wildlife habitat far into the future. Unfortunately, land frequently changes due to development and land sales. However, this need can be addressed partially through legalized tools such as conservation easements, donations, and deed restrictions. These tools can prohibit or restrict future development of the property for parking lots, subdivisions, strip malls, or other projects detrimental to wildlife. A conservation easement, for example, is most commonly used because it can be tailored to suit the property's unique characteristics. It can be flexible, and the landowner typically retains ownership and access. For more information about conservation easements, contact the Michigan United Conservation Clubs office or your local Conservation District office.

Monitoring

Monitoring the changes that result from your efforts at improving wildlife habitat brings the stewardship cycle full circle. Now when you go back to observing the wildlife and plants on your property you can see what differences have occurred. Are the management strategies for eliminating an exotic plant in your wetlands working? Are you seeing more of the species that you managed for? How many new species of animals are visiting your property? Is there sufficient water in spring and summer in the marsh you restored for waterfowl habitat? Do ducks use the marsh for feeding, nesting, or simply for resting during migration?

Keeping track of your progress provides the opportunity to make adjustments before too much time, energy, and money have been invested in the management plan. Monitoring is a great chance to become an even better steward of your land because it helps you become more familiar with its ecosystems, the needs of the plants and animals that live within them, and how your actions directly affect their welfare.

Summary

Responsible land stewardship is essential to improving wildlife habitat in Michigan. It is the foundation of a successful wildlife management plan and the cornerstone to its success. Because of the fragmented nature of today's landscape, the need for holistic management plans has never been more important. Stewardship is more than controlling competing vegetation, managing deer populations, restoring overgrazed areas, and putting up fencing to keep out unwelcome ORV traffic. It is also about being a careful observer of your land and surrounding areas, and understanding what is needed to maintain its long-term health. Without good land stewardship, most habitat plans are destined to fail, no matter how well-written they are.

In many ways stewardship is the most rewarding part of doing something positive for wildlife because it requires becoming involved with your land, as well as understanding it. Getting your hands in the soil and your feet in the water often helps in appreciating the fact that it is there. Land stewardship is a journey that lasts as long as you own the property, regardless of whether you make a living off the property, live there, or only visit it occasionally. Stewardship is one of the most rewarding things you will ever do, and it is something that your grandchildren and their children will appreciate and thank you for long after you are gone.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

INTRODUCTION TO FOREST MANAGEMENT

In the early 1800s, forests covered most of Michigan's more than 36 million acres of land. Today, nearly all of the state's landscape has been disturbed by human activity. This disturbance has decreased our forests by 50 percent. A long period of heavy logging and fires, which began about 1840 and ended about 1930, substantially contributed to this loss. Currently, the largest threat to our remaining forests is fragmentation, which occurs when larger properties are divided into smaller parcels. Also, the lack of old growth forests, which provides structural diversity, is a threat to our landscape ecosystems. Current logging practices favor certain tree species over others causing forests to become “over simplified” and altering natural processes. Other threats to Michigan forests include over browsing by deer, hydrologic alterations, and the timber harvesting process of “high grading” which is a profit motivated technique that has no value for wildlife.

Importance as a Natural Resource

Michigan's more than 19.3 million acres of forest provide ecological, economic, recreational, and aesthetic benefits to the state's citizens. One of Michigan's important natural resources, these forests range in size from small, privately owned woodlots to larger areas owned by the public, industry, or timber companies. Trees help to hold the soil in place and prevent erosion. They remove carbon dioxide from the air and replace it with oxygen, furnish shade, and help cool rivers and streams. In addition, they furnish homes, food, and shelter for wildlife and provide wood for the production of lumber, paper, and various other products.

Forest Types

Michigan forests form a broad transition zone between the conifer forests (evergreens that bear needle leaves) of Canada and the deciduous forests (those broadleaf-bearing trees) of the eastern United States. For example, Michigan is in the southern range of the jack pine and white spruce and in the northern range of the Kentucky coffeetree, shagbark hickory, and tuliptree. As a result of this transition, there are many kinds of trees found throughout the state.

Forest types reflect changes in climate and soil texture. Within the Lower Peninsula, an imaginary line called the “tension zone” (that runs from Muskegon to Saginaw Bay) demonstrates such changes. South of the tension line the presettlement forests were primarily deciduous on all but the wettest sites. Black oak, white oak, red maple, and shagbark hickory grew on dry, well-drained uplands. Sugar maple, beech, basswood, and red oak flourished on moist, somewhat fine soils. Lowland areas, river bottoms, and lake plain soils supported forests of ash, silver, and red maple, swamp white oak, American elm, and cottonwood. White pine and hemlock grew along dunes.

North of the tension zone the soils tend to be coarser, the growing season is shorter, and the climate is cooler. As a result, beech and sugar maple, mixed with hemlock, white pine, and yellow birch grew on all but the driest uplands and wettest wetlands. Pines and mixed-pine communities were prevalent as they prospered on drier soils. In the Upper Peninsula, similar patterns developed with pines growing on sandy, acidic soils. Cooler summers promoted the growth of hemlock, yellow birch, balsam fir, and white spruce. Poorly drained sites contained black spruce and larch (tamarack), which tended to grow in bog communities.

Knowing what type of forest historically grew on your land will help you understand what is there today. It is important to know what kind of forest is on your property before you can make any management decisions. Although you can identify individual tree species with the help of field guides, it is more difficult to recognize forest types. One reason is because your property may contain more than one soil condition. Another reason is because individual trees don't always grow in only one type of soil. A professional forester or wildlife expert can help you identify the kind of forest you own.

This section contains chapters that explain eight different types of forest. These types are categorized by soil moisture content. The term "mesic" refers to soil that is moderately moist. Listed below are the classifications and their respective importance to wildlife. Keep in mind that just as a tree species may occur in more than one kind of forest, a species of wildlife may also use more than one kind of forest.

DRY CONIFERS are northern Michigan forests containing stands of jack pine and red pine as well as mixtures of these species with northern pin oak, white pine, and aspen. They grow on very dry, sandy plains and ridges that are acidic and low in nutrients. Today, about 800,000 acres occur mainly in the high plains region from Mio to Vanderbilt and in flat, sandy areas of the Upper Peninsula. Historically, dry conifer forests were found in a mosaic of pine "barrens" and-prairies. Only 100 acres of high quality pine barrens exist today. If presettlement maps show that historically there was a pine barren on your land, chances are it can be restored.


jack pine

Common mammals found in dry conifer forests are the badger, coyote, snowshoe hare, and black bear. Birds include the upland sandpiper, northern harrier, red crossbill, hermit thrush, bluebird, red-tailed hawk, American kestrel, and raven. The Kirtland's warbler is the best known of the rare species, which include the prairie warbler, black-backed woodpecker, sharp-tailed, and spruce grouse. The frosted elfin butterfly and secretive locust are two other rare creatures that inhabit dry conifer forests. A large number of rare plant species are also found here.

DRY MESIC CONIFERS are evergreens that grow on dry, sandy soils. The key tree species of this type is white pine. Because white pine was favored by loggers it no longer dominates dry mesic sites. Historically, white pine grew with red pine, white oak, beech, maple, and hemlock. These mixed stands include white pine-red pine forests in the high plains and rolling hills of the northern Lower Peninsula and white pine-white oak forests on the dry hills of west-central lower Michigan. White and red pine also mixed at times with combinations of red, black, and white oak. Mixed hardwoods of beech, red maple, and red oak grew with white pine and hemlock. Today, mature stands of white pine dominated forest are very uncommon.


white pine

The wild turkey, white-tailed deer, porcupine, red and gray squirrel, chipmunk, and black bear favor white pine dominated forests. Bird species include woodpeckers, crossbill, redpoll, scarlet tanager, red-breasted nuthatch, black-throated green warbler, black-capped chickadee, great-crested flycatcher, and pine warbler. The blue racer, a snake, lives there, and the rare Karner blue butterfly is sometimes attracted to the forest edge of open oak-pine forests.

MESIC CONIFERS are upland forests of evergreens that grow in moderately moist soils. There are two major types of mesic conifer forests. One type is dominated by eastern hemlock, while white spruce, balsam fir, and northern white cedar dominate the other type. These forests typically occur in northern Michigan along Great Lakes shorelines, along peatland edges, in narrow zones between wetlands and uplands, or in areas with seasonally wet soils. Historically, about 15 percent of Michigan's forests contained mesic conifers. Today, only a few small pockets of hemlock dominated forests still exist in Michigan, and very little hemlock can be found growing in northern hardwoods or other forest types.


northern white cedar

Mesic conifer forests provide winter cover, thick branches for nesting, and seed food sources for many wildlife species. Such species include the Canada warbler, ruffed grouse, brown creeper, junco, veery, pine siskin, red crossbill, redpoll, black-capped chickadee, white-tailed deer, bobcat, red squir-

rel, and spotted and blue-spotted salamanders. Also, many species of birds migrating along the Great Lakes rely on early spring insect production from shallow bays bordering mesic conifer forests.

LOWLAND CONIFERS comprise about 4.4 million acres of Michigan forest. These evergreen forests of black spruce, white cedar, and tamarack grow in muck- or peat-bottomed swamps and other poorly drained depressions mostly in the northern Lower and Upper Peninsulas. Sometimes these conifers mix with hemlock, white pine, and some hardwoods such as black ash. These forests often appear as a transition between wetland and upland habitats. Today, white cedar swamps have dramatically declined due to development, hydrologic alterations, roads, and over browsing by deer.


tamarack

Spruce-tamarack bogs attract white-tailed deer, spruce grouse, snowshoe hare, bobcat, black bear, white-throated sparrow, ovenbird, red-eyed vireo, Nashville warbler, and common yellow-throat. Additional species that favor white cedar swamps include the Swainson's thrush, Tennessee warbler, and yellow-bellied flycatcher.

DRY HARDWOODS are dominated by several species of oak and hickory and comprise six percent of Michigan forests. These forests were historically found mostly in the southern Lower Peninsula. Today, they are mostly found in the northern Lower Peninsula. These forests, which thrive best after fire, typically contain white, black, or red oak, along with pignut hickory. Other components may include white ash, red maple, black cherry, beech, and shagbark hickory. White and black oak with smaller amounts of black cherry, pignut hickory, and sassafras dominate mixed-oak forests.


oak

Dry hardwoods attract the great-crested flycatcher, Eastern wood pewee, rose-breasted grosbeak, scarlet tanager, ruffed grouse, wood duck, ovenbird, white-breasted nuthatch, red-bellied woodpecker, downy woodpecker, northern flicker, wild turkey, and black-capped chickadee. White-tailed deer, squirrels, chipmunks, deer mice, and voles are common mammals.

MESIC HARDWOODS are Michigan's most common forest type because they grow in cool, moist soils that fall between drylands and wetlands. About 19 percent of the state's forest community are mesic hardwoods consisting mainly of beech and sugar maple. In southern Michigan, these forests occasionally include a component of conifers along with basswood, red oak, white ash, American and red elm, shagbark hickory, black walnut, bitternut hickory, and tuliptree. North of the tension zone, hemlock, white pine, and yellow birch replace tuliptree, bitternut hickory, and other more southern species. In the western Upper Peninsula, beech is rare and white pine, yellow birch, basswood, and hemlock become major components.


beech

These forests are home to the ruffed grouse, woodcock, cottontail rabbit, snowshoe hare, elk, fox and Eastern gray squirrel, wild turkey, white-tailed deer, bobcat, fox, coyote, raccoon, black bear, American marten, fisher, gray wolf, barred owl, broad-winged hawk, wood frog, chorus frog, and vole. Uncommon animals include the northern goshawk, red-shouldered hawk, and black-throated blue and Blackburnian warbler.

LOWLAND HARDWOODS are hardwood swamps and floodplain forests that comprise about five percent of Michigan and provide some of the state's largest remaining natural forest habitats. Red maple, black and red ash, and swamp white oak dominate in mixed hardwood swamps, and may include pin and black oak, and black gum. Black ash swamps also occur on flat, sandy plains in southern Michigan. In northern Michigan, black ash sometimes mixes with northern white cedar or tamarack. Canopies are typically dense in hardwood swamps as well as in floodplain forests whose rich soils tend to flood in spring and sometimes fall. Southern Michigan floodplain forests support silver and red maple, red ash, and cottonwood with minor components of swamp white oak, black willow, and black walnut also occurring. Several southern trees reach their northern ranges in these forests.


swamp white oak

Songbirds that inhabit these forests include the warbling and red-eyed vireo, northern oriole, indigo bunting, gray catbird, and eastern wood pewee. Other

species include the wood duck, raccoon, woodcock, white-tailed deer, wild turkey, bats, salamanders, frogs, snakes, and many species of migrant waterfowl. Uncommon species include the red-shouldered hawk, Indiana bat, smallmouth salamander, spotted turtle, Blanchard's cricket frog, several species of mussels, and the cerulean, prothonotary, and yellow-throated warbler.

ASPEN-BIRCH forests comprise about 3 million acres, or roughly 10 percent, of the state's land base. Not truly a forest type, it is an early growth stage within a variety of forests. Historically, less than 270,000 acres of aspen-birch forests were present in Michigan. These sun-loving, fast-growing, relatively short-lived forests often grow with smaller components of balsam fir, pin cherry, red maple, white and red oak, and white and red pine. Aspen, often called poplar, regenerates best after it is clearcut by sending thousands of sprouts above the ground soon after the forest is harvested. Aspen and birch form open forests that allow many species of ground covers and fruiting shrubs to grow beneath the forest canopy, and these in turn attract a wide variety of wildlife.


aspen

At varying stages of growth, aspen-birch forests attract the chestnut-sided and mourning warbler, indigo bunting, least flycatcher, yellow-bellied sapsucker, ruby-throated hummingbird, red-eyed vireo, ovenbird, and pileated woodpecker. Other species include the black bear, white-tailed deer, woodcock, snowshoe hare, cottontail rabbit, ruffed grouse, woodland jumping mouse, porcupine, white-footed deer mouse, flying squirrel and, where evergreens are present, the American marten and fisher.

Management Options

Managing these forest types begins with defining what your goals are. Refer to the **Habitat Planning** section for more information. Perhaps more than any other type of natural resource you may own, forests require the skills of a professional to help you sort through the many options available. Your goals may or may not include a timber harvest. If you decide to harvest your forest, a forester or wildlife biologist can help you receive its full economic value. Also, they may be able to supervise timber removal in a way that minimizes impact to the environment, and to help you achieve your goals for improving or creating wildlife habitat.

Not cutting your forest is a management option that has both positive and negative consequences for wildlife. Harvest strategies of shelterwood cutting, clearcutting, and seed-tree management also have far-reaching implications. An example of when to cut occurs with a closed-canopy oak forest that you might want to manage for wild turkey habitat as well as generate income. An example of when not to cut involves a conifer swamp of white cedar or hemlock that you want to maintain for thermal cover for wintering wildlife.

In summary, Michigan's considerable forest resources are characterized into eight different communities keyed to soil moisture and conditions of climate. Over the years many of these forests have been dramatically altered, and may require some type of manipulation in order to provide optimal wildlife habitat for some species of wildlife. Although several million forested acres are owned by the public or by timber industries, about half of Michigan's forests are owned by more than 350,000 private property holders. On these private lands lies the future for improving or creating wildlife habitats. The type of management style a landowner chooses to conduct on their land will effect the kind of wildlife that are supported on the property.

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PRIVATE LAND PARTNERSHIPS
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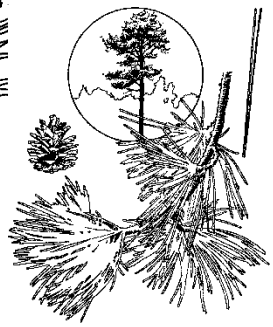
DRY CONIFERS
(JACK & RED PINE)

Dry pine forests include pure stands of jack pine and mixtures of jack, white, and red pine, northern pin oak, and aspen. These communities, which foresters collectively call dry conifers (evergreens) because pine is the key component, occur on dry, sandy soil that is acidic and nutrient-poor. Landscapes here are typically high and flat. These forests also occur on sandy ridges within large wetland complexes and on steep, cobblestone ridges next to large sandy plains.

Historically, this landscape was a shifting mosaic of forest and open grasslands, or "barrens," that was primarily maintained by wildfires of varying frequency and intensity. In the 1800's, there were approximately 1.3 million acres of dry conifer forest in Michigan, with about 80 percent of the total found in the northern Lower Peninsula. Today, about 800,000 acres remain. They occur mostly in the high plains region from Mio to Vanderbilt east of I-75 and in flat, sandy areas of the Upper Peninsula. Perhaps more than any other single influence, the timber-cutting operations that occurred between the eraly 1800's and early 1900's changed the way these forests look today.

jack pine



red pine

Before the loggers arrived, red and white pine were often mixed within dry conifer forests. Large-diameter trees that had survived wildfires helped to form a complex forest that varied from young seedlings and saplings to large canopy trees. Other typical trees, shrubs, and groundcovers included balsam fir, black cherry, paper birch, sweetfern, blueberry, huckleberry, sand cherry, and bearberry. Bracken fern, poverty grass, Pennsylvania sedge, and hairgrass were other common plants. Loggers removed much of the favored red and white pine, and the fires that followed helped jack pine to regenerate over many more acres than before.

These "slash" fires of a hundred years ago, so-called because they burned the logging debris, left charred stumps throughout the northern Michigan landscape. They also contributed to the rapid spread of bracken fern and many exotic species such as spotted knapweed. Were the timber cutters to return, they would not recognize the landscape that was originally a shifting mosaic of dry-pine forest and open grasslands or "barrens" containing some pines.

spotted knapweed -
an exotic species

Areas with frequent fires, such as portions of Lake, Crawford, Iosco, and Oscoda counties, were dominated by jack pine barrens. The barrens were not wastelands, as the name suggests, but rather a unique grass-dominated ecosystem with only a few jack pine trees per acre. Because this system was so open, it admitted sunlight to reach the forest floor allowing a diverse understory of shrubs, grasses, and wildflowers to flourish. Shrubs found here include those from the adjacent forest, along with prairie willow and hazelnut. Today, fire suppression and the establishment of pine plantations have reduced the number of high-quality jack pine barrens to only a few hundred acres. Inappropriate off-road-vehicle (ORV) use, a boom in second-home development in northern Michigan, and the invasion of invasive plants are other reasons why this unusual ecosystem is losing ground. Today, only 100 acres of high quality barrens remain.

hoary puccoon

birdfoot violet

Prairie species that may be found in a remnant pine barren.

Species Present

If you own a jack pine forest that is a fragmented patchwork of grassy openings and woods, look for prairie-associated shrubs, grasses, and wildflowers growing in the openings and along the forest edges. Plants to look for include rough blazing star, prairie cinquefoil, birdfoot violet, butterfly weed, harebell, and hoary puccoon. In addition, hill's thistle, rough fescue, Alleghany plum, and pale agosersis are rare plants that live in jack pine barrens. Grasses include big bluestem, little bluestem, poverty grass, hair grass, June grass, and needle grass. The presence of these species suggests that a seed bank exists beneath the maturing forest canopy. These rare communities are an important part of Michigan's heritage. Through prescribed burning and possibly planting, you might be able to restore what was originally a special kind of prairie. See the section on **Grassland Management** for more information.

Common animals found throughout the dry conifer mosaic include the red crossbill, hermit thrush, bluebird, red-tailed hawk, raven, American kestrel, coyote, snowshoe hare, and black bear. Also, badgers, upland sandpipers, and northern harriers are uncommon wildlife species that live in these areas. Unique to Michigan, the federally endangered Kirtland's warbler heads the list of rare species in this area. This songbird builds its nest on the ground under young jack pines between eight and 20 years old. Other rare birds found here include the prairie warbler, black-backed woodpecker, and sharp-tailed and spruce grouse. Prairie chickens, now extirpated from Michigan, were found in jack pine barrens that were at least several square miles in size. The frosted elfin butterfly is an uncommon species, and the secretive locust, which lives in shallow wetlands among the pine barrens, is also considered rare.

Management Considerations

Some type of disturbance, such as fire or timber harvest, is needed to maintain a jack pine forest. However, fire as a management technique has its perils. As a result, timber harvesting, often followed by artificial seeding or planting, is more commonly used in forest management. Professionals recommend either or both management techniques, especially for those property owners with 200 or more acres of dry conifer forest. The following are options to consider when managing dry conifers.

Prescribed Burning

If used safely, fire is the most effective management tool, particularly if a composite of forest, barrens, and grassy openings is your objective. Also, fire is the common means by which jack pine forests are rejuvinated. Jack pine is unusually adapted to fire because their pine cones are coated with a resin that melts at 112 degrees F., a temperature normally reached only through fire. Once the resin melts, the cones open and thousands of seeds are released. Fire also decreases competition, reduces leaf litter on the forest floor, prepares a good seed bed for regeneration, and releases nutrients into the soil. Besides the positive influence on jack pines, fire maintains the variety of prairie grasses and flowers that are also dependent on fire for their survival.

Consider conducting a controlled burn on any complex of forest, grasslands, and barrens that is

black bear

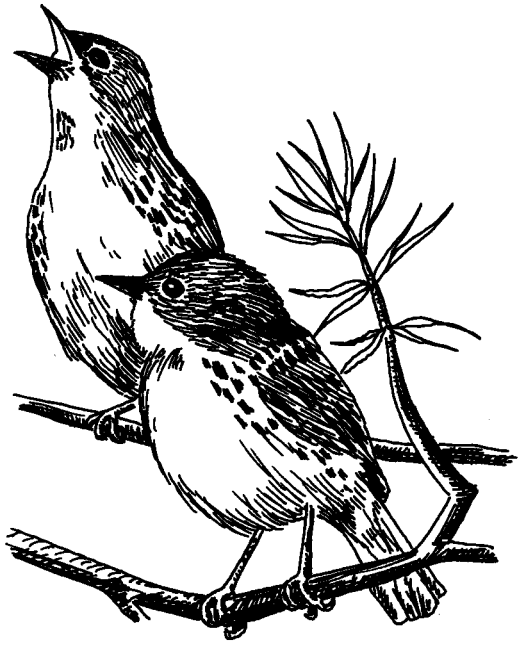
at least 20 acres in size. Such areas should be burned at 10 to 20 year intervals. You may also want to consider burning after your forest is clearcut and then follow with seeding or planting with trees. Because of economies of scale, bigger burns are more appropriate and cheaper.

Fire, as a tool, can be complex and dangerous. Rightly so, it is best left in the hands of a trained resource professional. Also, whenever prescribed fire is used as a management tool, you must work with your local fire officials to obtain permits and regulations. In many instances, the use of prescribed burning of jack pine forest is very limited on private lands, especially on smaller tracts. For more information, see the chapter on **Prescribed Burning** in the Grassland Management section.

Timber Harvesting

Timer harvesting produces many but not all of the same positive effects as fire. The **Timber Harvest** chapter, located in the Forest Management section, explains several options to consider. Clearcutting is the preferred way for managing jack pine stands from 20 to 200 acres in size. In this scenario, young pine is promoted soon after the mature trees are cut.

Professionals that manage for Kirtland's warblers use prescribed burning and jack pine planting or seeding to produce the dense, young thickets these birds demand for nesting. Jack pines from eight to 20 years old offer the abundance of low branches the birds require.



Kirtland's warbler

Jack pine and Kirtland warbler management plans commonly call for a complete harvest of jack pine every 40 to 60 years. Kirtland's warbler management blocks are usually several hundred acres in size.

To manage for other species of wildlife, it is best to cut in smaller blocks to produce a variety of age classes and densities. Such a system can be used to manage stands of jack pines as small as 80 acres by cutting 20 percent of the total (about 16 acres) every 10 years to give the entire stand as much diversity as possible. Make the cuts at least 100 yards wide and 300 yards long in a north-to-south direction whenever possible. Larger cuts are, of course, more economical when profitability is the goal. If you own 20 acres or less, cut all the jack pine at one time.

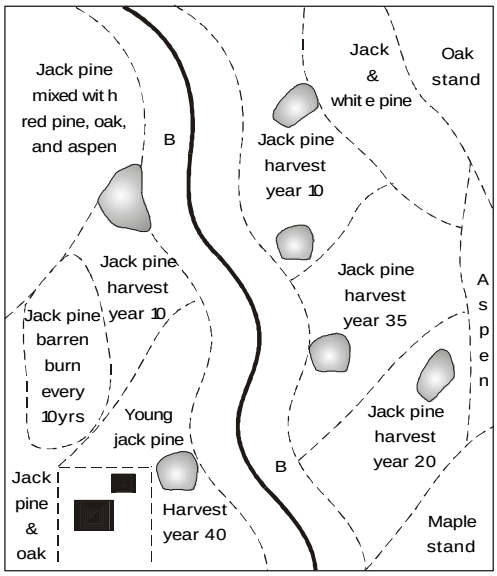
Clearcuts that follow the topography of the land are preferred, as are irregularly-shaped cuttings instead of straight-sided block cuts. Leaving 20- to 40-foot-wide strips of mature trees between the harvests will minimize short-term disturbances to the site. Avoid trying to manage frost pockets(low areas that experience late spring frosts) because these low-lying areas do not respond well to clearcutting. Also, within each cutting area consider leaving small clumps of 10 to 20 white pines, oaks, or shrubs such as serviceberry and hazelnut because these species provide food and cover for wildlife.

You can also increase cover for rabbits and other wildlife by making brush piles of at least 15 feet in diameter and five feet high from slash and other harvest debris. It is preferable in these areas to maintain only one brushpile for every five acres as too many rabbits will consume jack pine seedlings. Leave standing snags for cavity-nesting birds like woodpeckers and bluebirds, or put out nesting boxes. For more information, see the **Homes for Wildlife** chapter in the Backyard section.

Remember, pine barrens are very rare and are home to several rare plants and insects. If you own a jack pine forest that is currently a highly fragmented patchwork of grassy openings and forest where prairie-associated shrubs, grasses, and forbs are found, you may have a former pine barren. You should consider restoring it through prescribed burning and selective timber harvest.

In summary, dry conifer forests are a valuable part of Michigan's

40 acres



Existing features
- Road
- House
- Stream

Habitat projects
- B — Buffer zone
- Areas left uncut

All cuts are 20% of entire stand with intervals as stated on map. Cuts are made in N-S strips.

This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

natural landscape. Pine barrens are a unique and uncommon ecosystem within the dry conifer spectrum. If you have a dry conifer forest on your property, you may have the opportunity to manage for many wildlife species, including several rare ones.

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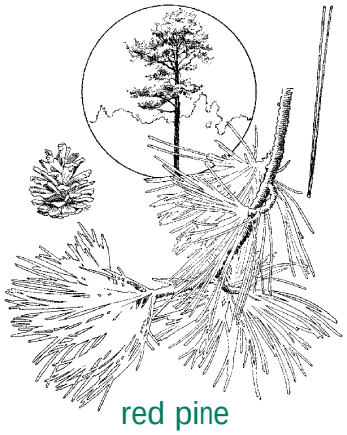
DRY MESIC CONIFERS
(WHITE PINE)

Dry mesic conifers are evergreen species that grow on dry, mostly sandy soils, although they can also tolerate a variety of conditions including drier mounded areas in wet depressions. White pine is the dominant species in this forest type. Michigan was once known as the king of white pine, and today this majestic evergreen is the official state tree. Before the logging era of 1840 to 1930, white pines dominated these forests and were found along Lake Michigan and throughout the northern Lower Peninsula and the Upper Peninsula. By far, the northern Lower Peninsula contained the largest tracts of white pine forest. From 1850 to 1900, Michigan delivered more board feet of this prized, long-lived tree to the lumber mills than did any other state. Two of the most productive regions in Michigan for white pine during that time period were the Muskegon River and Saginaw River watersheds.

white pine

Unfortunately, most of the white pine forests never recovered from this logging. Today, many former white pine sites have converted to a variety of forests including oak, aspen-birch, and red pine plantations. The white pine forests were also converted to farmland, especially along the Saginaw watershed. Although heavily logged, white pine is still found in mixed forests. These mixed communities include white pine-red pine forests in the high plains and rolling hills of the northern Lower Peninsula and white pine-white oak forests on the dry, rolling hills of west-central Lower Peninsula. White pine and red pine grow in combination with red, black, and white oak. White pine may also grow with eastern hemlock in mixed hardwoods of beech, red maple, and red oak.

White pine regenerates well following fire on a variety of sites. Fire is beneficial to the regeneration of white pine because it exposes the soil, releases nutrients from the leaf litter, and kills hardwoods such as sugar maple and beech that compete with white pine for space. However, white pine is also able to regenerate without the aid of fire because it is able to tolerate a variety of sun-shade conditions, except for extremely dense shade. For this reason it can be found growing in the understory of young stands of red and jack pine, and red, white, and black oak. If managed correctly, white pine can



red pine

again increase in numbers within these forests. Current locations of forests with white pine include the west central Lower Peninsula from the Allegan State Game Area in Allegan County to Evart in Osceola County to Hartwick Pines area near Grayling. White pine forests are also found in the Upper Peninsula. This tree is restricted in ornamental plantings due to its susceptibility to the white pine blister rust fungus and the white pine weevil.

Wildlife Value

White pine forests provide roost trees for wild turkeys, browse for deer in winter, dens for porcupines, and nesting cavities for woodpeckers, flickers, and flying squirrels. Crossbills, red squirrels, chipmunks, and gray squirrels eat the pine cone seeds in winter. Common plants that grow in the understory include bracken fern, blueberry, bush honeysuckle, wintergreen, and hazelnut. These food-producing shrubs attract

porcupine

ruffed grouse, rabbits, and many other species of wildlife. Black bears make dens under the roots of uprooted trees. The forest provides thermal protection in winter for many wildlife species. Also, the majority of eagle nests found in Michigan are in tall white pines near lakes and rivers. Other birds that frequent white pine habitats include scarlet tanagers, black-throated green warblers, black-capped chickadees, great-crested flycatchers, and pine warblers. The blue racer is a species of snake that likes the coolness of the white pine forest floor. The uncommon Karner blue butterfly is attracted to the edges of open dry white pine-white oak forests in limited areas in the Lower Peninsula.

Management Considerations

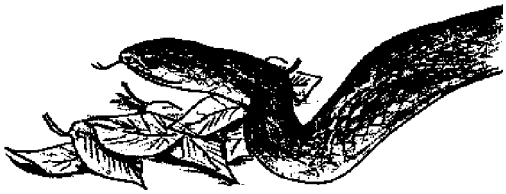
If you own a stand of white pine mixed with some hardwoods in a multiple-aged forest of seedlings, saplings, mature trees, and dead trees, then your forest is high-quality habitat and little further management may be needed at this time. However, in most cases you will probably need further management to successfully reestablish white pine in your forest. If your forest consists of a majority of red pine, jack pine, or oak with white pine growing in the understory, a timber harvest strategy could reestablish white pine as a dominant species and also produce income.

Preferred management for a variety of white pine forest systems are timber harvesting methods that can include group selection, shelterwood, strip clearcut, or seed tree techniques. The openings that result from these cuts allow the regeneration of a diverse stand of pines, hardwoods, and herbaceous cover. These harvest methods leave mature trees in or adjacent to the cut to provide a seed source and/or shelter for the regenerating seedlings. For more information refer to the **Timber Harvesting** chapter in this section.

Of these methods, the group selection method creates the least amount of disturbance to the existing forest. It involves cutting small patches in the stand up to 1/2 acre in size. Trees adjacent to these patches will provide both the seed source and shelter for the regerating trees. This cut should be no wider than 150 feet. If possible, plan the harvest across a diversity of forest types with a mixture of pines and hardwoods preferred. Although some hardwood regeneration is good because it adds to new-stand diversity, you may need to apply a selective herbicide to keep maples and other shade-loving hardwoods from completely taking over.

A shelterwood harvest involves a two-cut strategy where 40 to 60 percent of the trees are removed in the first cut, and the remaining trees are taken out 10 to 20 years later. This can be done in uniform, group, or strip formations. The trees left in the first cut provide shelter for the regenerating trees. They also provide shade that helps the young white pines to compete with more aggressive, sun-loving plants. Again, if regeneration is mostly hardwoods, then treatment with herbicides may be needed. Once the new pines are well established in the overall mix, then the remaining mature trees can be harvested. Most shelterwood cuts are from two to 20 acres in size. Be sure to make the first cut areas small enough to provide some shade for the regenerating white pines.

The clearcutting method involves removing all trees greater than one inch in diameter in one cut. This method can be used when there are many young white pines found in the understory as it allows them to grow without competition from larger trees. Plan cuts that are two to 10 acres in size, and provide for at least 100 feet of buffer forest between cuts. Smaller clearcuts scattered over an area produce the greatest amount of edge, while one large cut produces the least amount of edge. In areas with high deer numbers, cuts may have to be larger to overcome the impact of browsing on the regenerating trees. Clearcutting can also be done in strips. The exact size of the strips depends on the size of your property, the mix of forest species, and your overall goals.



blue racer

The seed tree harvest method is a type of clearcut that leaves specific mature trees or groups of trees within the cut itself to provide seeds for regeneration. These trees are chosen to dominate the stand. In this case, you would leave any white pine existing in the stand, young or mature, as well as some mature red pine and/or hardwoods to provide diversity. The remaining trees also decrease the environmental and visual impact of the clearcut.

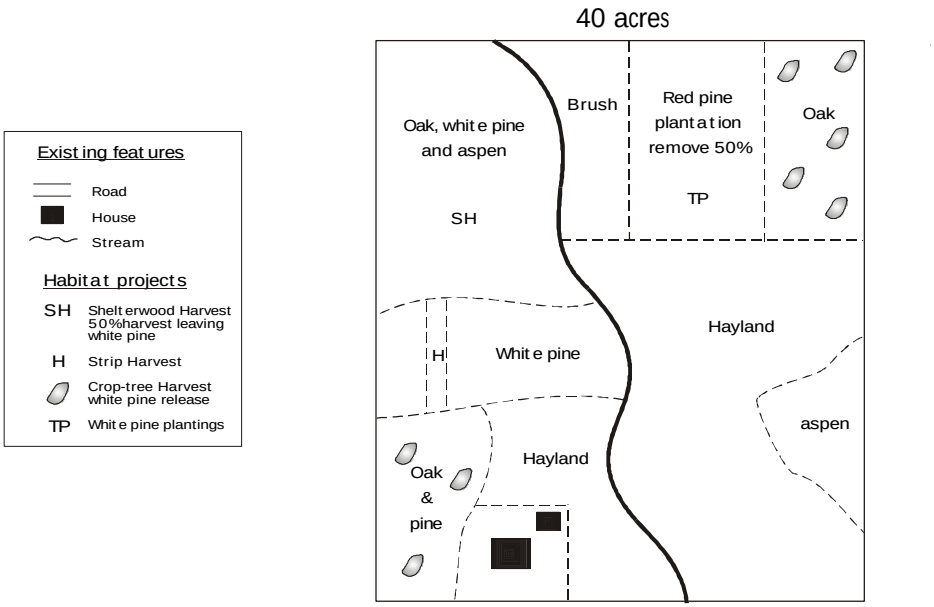
Thinning, followed by planting, is another management option to consider. This method is used when you do not want to change the dominant tree species in your forest, but want to establish some white pine. For example, if you own a large, red-pine plantation which you want to keep but also wish to establish some white pine, you can accomplish this by thinning the red pine by 30 percent or more and planting white pine seedlings in the created openings. This is a good option to consider in these plantations as straight-growing red pines begin to lose their lower branches and their food and cover value to wildlife at about 20 years of age. Underplanting the red pines with white pine or oak will increase the wildlife value of the stand.

In many black oak-white oak forests, white pine often grows in the understory. Thinning around the young pines in these forests will decrease competition for food, water, and light and encourage them to grow. You can also help to establish more white pine in these forests by planting. If you are planting white pine within a mixed-species forest, try to plant up to 20 percent white pine.

oak

Following these timber harvests with fire will also help in establishing white pine. Burning the openings created by the harvests will discourage the establishment of hardwoods such as sugar maple and beech that compete heavily with white pine. It will also encourage the establishment of oaks which will increase the wildlife value of the white pine forest. Further, burning the stand will increase the amount of groundcover diversity which is also beneficial to many species of wildlife. If prescribed burning is part of your overall management plan, be sure to contact local fire authorities for permits and advice. For more information refer to the **Prescribed Burning** chapter in the Grassland Management section.

In summary, if white pine is found in your forest, you have the potential to create valuable habitat for wildlife, especially if it is mixed with other tree species. Consult with a forester or wildlife biologist to consider the options that are best for your forest.



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MESIC CONIFERS
(HEMLOCK, WHITE SPRUCE, BALSAM FIR)

Mesic conifer forests are upland forests of evergreens (conifers) growing in moderately moist (mesic) soils. There are two major groups of trees that occur in this type of forest: 1) Eastern hemlock often mixed with yellow birch, red maple, or white pine, and 2) white spruce, balsam fir, and northern white cedar. Mesic conifer forests are typically found in northern parts of the state along shorelines of the Great Lakes, along peatland edges, in narrow ribbons between lowlands and uplands, along ravines and river corridors, or in areas with seasonally wet soils. It is estimated that about 15 percent of Michigan's overall land base historically supported mesic conifer forests.

At one time hemlock was the dominant tree species along transition zones from lowlands to uplands. Here, it often grew with northern hardwoods such as beech, sugar maple, and yellow birch, and occasionally with white pine and northern white cedar. Historically, hemlock-yellow birch forests existed along lake margins in the western Upper Peninsula. Forests of hemlock and white pine occurred on flat, sandy areas throughout the northern Lower Peninsula of the Saginaw Bay region. Hemlock can live to be 600 years old. Good places to see old stands of hemlock include the Porcupine and Huron mountains of the Upper Peninsula, high spots along old floodplains of the lower Manistee River in west-central Lower Michigan, and in the Black River gorge of the Port Huron State Game Area.

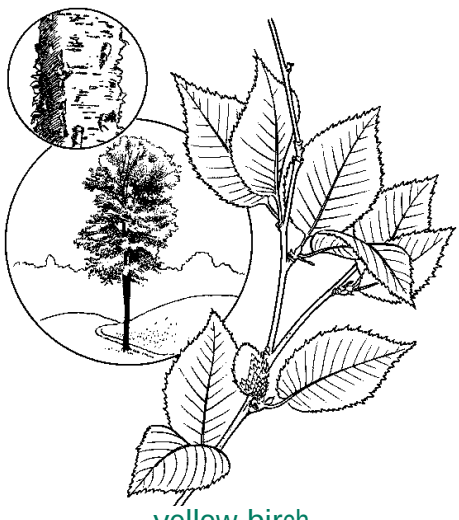

eastern hemlock

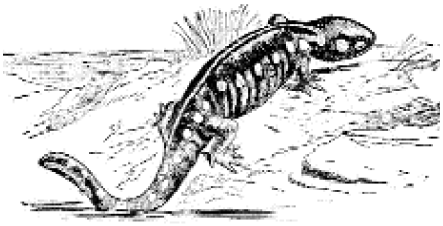
Today, hemlock is an uncommon component in most Michigan forests for several reasons. During northern Michigan's logging era from about 1840 to 1930, the tannin in hemlock bark was highly prized for tanning leather. Thus, hemlock became a targeted species. Since it is a shade-tolerant, slow-growing tree that needs rotting nurse logs or moist, acidic soils with very little leaf litter in order to grow, it is hard to regenerate. Also, hemlock is a favorite winter food of deer and elk, which cause damage by heavily browsing on seedlings and young trees.

The other kind of mesic conifer forest is often referred to as boreal forest. Those sites are dominated by white spruce, balsam fir, and northern white cedar and are typically too cold, humid, wet, or nutrient-poor for other trees to survive. These areas include sandy soils, rocky shorelines, and thin soils over bedrock. Here windthrow from storms occurs frequently because root growth is usually shallow. Paper birch and aspen often grow in these naturally created openings. Ground cover in the boreal forest includes sedges, mosses, lichens, twin flower, star flower, wild sarsaparilla, bunchberry, and mayflower.

Wildlife Value

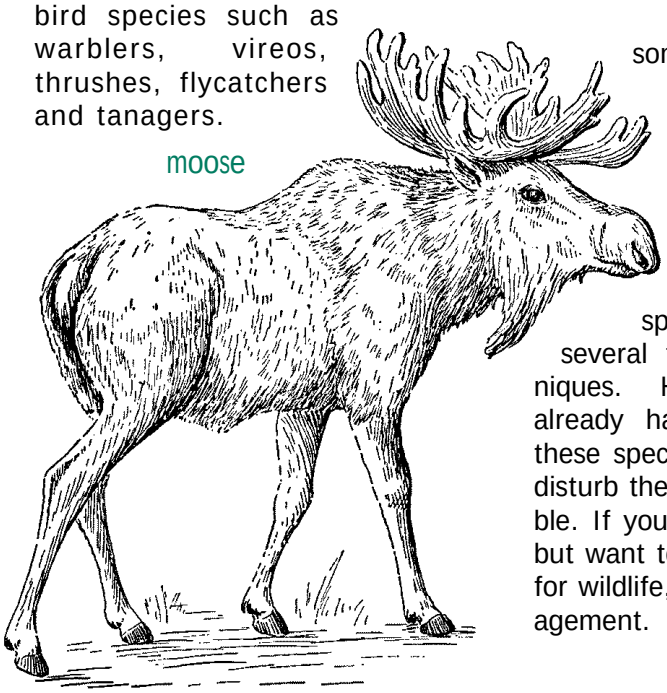
Mesic conifer forests provide good habitat for a variety of wildlife species. Bald eagles and ospreys perch and sometimes nest in the tall evergreens. This is especially seen along the northern Great Lakes. Uncommon plants that grow in these forests include the ram's head orchid and dwarf lake iris. The dwarf lake iris is found only along


yellow birch



spotted salamander

northern shorelines of Lake Michigan and Lake Huron, and is the official state wildflower. Mesic conifers offer thermal protection for deer, ravens, sharp-shinned hawks, and other wildlife species during cold weather. Moose, fishers, and American martens also live in these forests, as well as Blackburnian warblers, winter wrens, Canada warblers, ruffed grouse, brown creepers, white-tailed deer, bobcats, and spotted and blue-spotted salamanders. The veery and junco in particular like to nest in thick hemlock groves. The seeds from hemlock cones provide food for red crossbills, pine siskins, black-capped chickadees, and red squirrels. Shrubs and ground cover attract insects that provide food for migrating bird species such as warblers, vireos, thrushes, flycatchers and tanagers.



moose

Management Considerations

There are two management options to consider: protection or timber harvesting.

Protection

In forests with a large amount of hemlock and yellow birch, or white spruce, balsam fir, and northern white cedar, little or no timber harvest may be necessary to increase habitat value to wildlife. Therefore, healthy mesic conifer forests and their adjacent uplands should be disturbed as little as possible. In fact, because wet or seasonally wet soils are typical of this forest type, logging operations if done poorly can have a negative impact because they often disturb the soil and impound water. Mature hemlock are especially susceptible to disturbance. Therefore, avoid creating roads, trails, or openings as much as possible. If you must make roads, maintain a gradual edge, and reseed and block access when they are no longer needed.

However, without some type of disturbance, establishment of a younger hemlock stand may occur once every 50 to 200 years because of the slow rate of regeneration. Landowners can help speed up this process with several timber harvesting techniques. However, if your forest already has a large amount of these species present it is best to disturb the forest as little as possible. If you wish to remove timber but want to retain maximum value for wildlife, use uneven-aged management. This practice, which is best performed near the forest edge, will mimic natural disturbances as it limits your cuts to single trees or small clumps of five to ten trees. If you have pure stands of hemlock, it is best to leave uncut groves that are several acres in size. You can also use this practice for managing mesic conifer forests of mostly white spruce and balsam fir. However, be sure to spare any northern white cedar as it is very hard to regenerate, especially in areas that support moderate to high deer numbers.

Timber Harvesting

In mixed hardwood forests with hemlock present in the understory, timber harvesting of the overstory hardwood trees may help hemlock to grow and become a dominant species. Hemlock regenerates in moist soils beneath the shade of more sun-loving trees. Seedlings often establish themselves on large fallen rotting logs or on moist exposed soils. However, if these shady conditions remain, the hemlock can remain stunted for 25 to 200 years. When some type of disturbance, such as windthrow or fire, opens the canopy and lets sunlight in hemlock begins to grow very rapidly. The following are timber harvesting methods to be used in forests where hemlock is found in the understories of other species, and needs help becoming more quickly established. Please refer to the **Timber Harvesting** chapter in this section for more detailed information on these techniques.

Uneven-aged management causes the least amount of disturbance and comes closest to providing the greatest diversity of tree ages and heights, which are of the greatest benefit to wildlife. Single

tree or small group selections of five to ten trees promotes a diverse stand. Locate hemlock seedlings in the understory and remove competing trees around them. Creating these small openings will allow hemlock to receive enough sunlight to grow. Follow-up with group selection treatments every three to five years to thin out competing hardwoods.

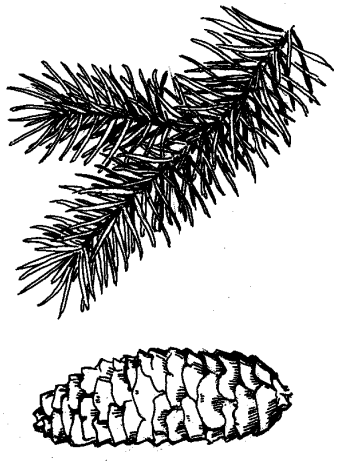
Even-aged management using shelterwood cuts is the preferred method when conducting a large scale harvest. This method removes 40 to 60 percent of the mature trees but leaves the healthiest and largest trees to provide shelter for the growing seedlings. Because the tree species in a mesic conifer forest prefer shade or partial sun, cut small areas of 60 feet to a side and leave these tree species as well as others to ensure a diverse regeneration. This first cut will allow sunlight to reach the forest floor and prompt tree seedlings to sprout and grow beneath the protection of the shelterwood trees. When seedling and sapling development has reached four to six feet in height, and shelter is no longer necessary, the remaining mature trees can be cut. This technique can be done in uniform, group, or strip formations.

bald eagle

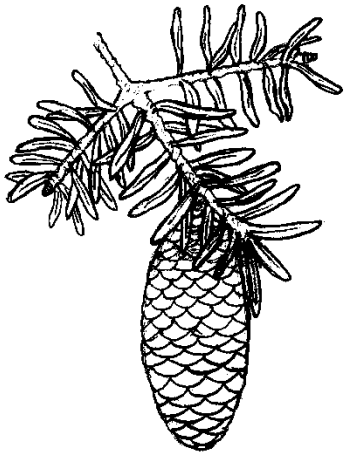
Even-aged management using clearcutting followed by planting can also be used when managing areas with few hemlock, spruce, fir, or cedar. However, it may be difficult to regenerate a diverse stand of tree species with this method. Small patch cuts of five to 10 acres in size and narrow strips are preferred. Strips should be no wider than 150 feet in areas with mild winds and no wider than 50 feet in areas with strong winds that are prone to windthrow. Desired species can then be planted in the cut areas. Adjacent uncut areas should be at least 100 feet wide. These cut areas will progress from open ground to saplings and finally to mature trees over a period of 50 to 80 years. The different stages of growth and diversity of tree species will provide varying habitats that will attract different species of wildlife over a long period of time.

If you choose to harvest your mesic conifer forest, all cutting activities should be conducted after the ground is frozen to minimize disturbance to the soil. In clearcuts, consider leaving clumps of 20 plus trees to provide nesting habitat and thermal cover for wildlife. Wherever needed, add culverts to maintain normal water flow.

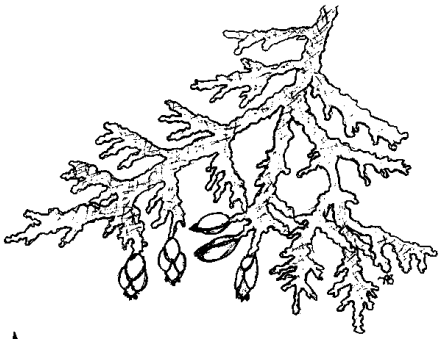
A clear forest is not beneficial to wildlife. Leaving large branches on the forest floor is beneficial to many species of wildlife. Creating brushpiles provides essential cover, especially for rabbits and snowshoe hares. However, be aware that attracting these species to the area can lead to over-browsing of regenerating seedlings. Leaving dead standing trees (snags) and fallen logs, provides valuable habitat for invertebrates, amphibians, woodpeckers and cavity-nesting birds. Also, leaving logs on the forest floor aids with the regeneration of hemlock and yellow birch.



white spruce

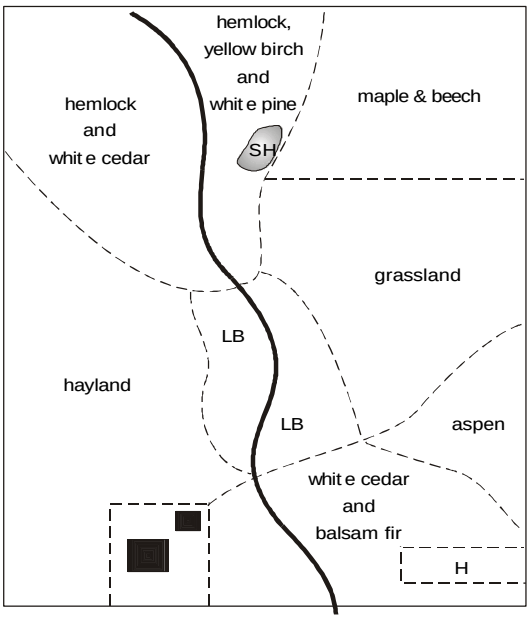


balsam fir



northern white cedar

40 acres



Existing features

- Road
- House & yard
- Stream
- LB — Lowland brush

Habitat projects

- SH — Selection Harvest single trees or small groups (0.5-1acre)
- H — Strip Harvest cut all trees in an east to west strip

This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

Exotic Mesic Conifers

Norway, Austrian, and blue spruce are not native to Michigan. However, some landowners add them to their property where they provide aesthetic value as landscape screens and have some benefit for wildlife--mostly in the form of travel lanes and corridors as well as winter cover.

Blue spruce and Scotch pine (Scots pine) have economic value when they are grown in Christmas tree plantations. Rabbits, mice, and other small mammals may find shelter and nesting sites under the spreading limbs of trees under 20 years old, if they are periodically thinned. Mourning doves often nest in the crotched branches of blue spruce. However, these exotic species lose their limited wildlife value the older they grow, and Scotch pine in particular is susceptible to insects and diseases.

In summary, wherever mesic conifer forests grow in Michigan, they have high value for wildlife. If you have healthy mesic conifer forest you should protect it if possible. If your forest has the potential to contain more of these species there are timber harvesting techniques that can help them become established. Knowing how different wildlife species are impacted by your decisions should help guide you in the management choices you make.

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LOWLAND CONIFERS (TAMARACK, BLACK SPRUCE & WHITE CEDAR)

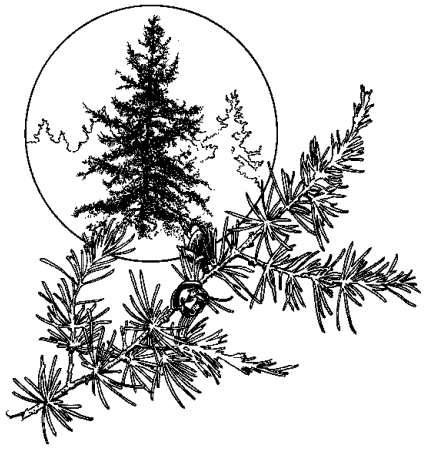
Lowland conifers are forests of evergreens that grow in association with swamps, in areas adjacent to streams, or other poorly drained depressions where peat or muck accumulates. These forests are found in the transition between aquatic environments and uplands. There are two groups of tree species associated with these areas: 1) tamarack (larch), black spruce, and northern white cedar are the most common and 2) white pine, balsam fir, eastern hemlock, and some hardwoods such as black ash. These forests of lowland conifers are primarily found in the northern Lower Peninsula and Upper Peninsula although they also grow in southern Michigan. Foresters estimate there are about 4.4 million acres throughout the state.

In general, black spruce is the dominant tree in the lowlands of the western Upper Peninsula. Northern white cedar is the dominant species in lowlands of the northern lower and eastern Upper Peninsula, and tamarack tends to dominate in southern Michigan lowlands. However, conifer swamps vary throughout the state, and what grows on your property depends upon soils, climate, drainage, and past disturbances.

For example, in areas where there is significant water flow through calcium-rich bedrock or soil, northern white cedar is the most common species. Cedar will be the first of these species to colonize in very alkaline, high flowing groundwater conditions. In swamps, cedar is often accompanied by black ash, balsam poplar, speckled alder, aspen, and red maple. In lowland stream borders, cedar is found with balsam fir, black spruce, eastern hemlock, white spruce, and other hardwoods. Many swamps of white cedar have an underlying layer of peat that is shallower than that found in bogs. Cedar swamps are common throughout Presque Isle county, the eastern Upper Peninsula within the Seney National Wildlife Refuge, and within Lake Skegemog Natural Area near Traverse City in the northern Lower Peninsula. Cedar swamps are also found in southern Michigan lowlands within the Highland Recreation Area and Horseshoe Lake State Game Area, which have significant cooler temperatures than surrounding uplands. Although white cedar is the dominant tree, there are also some balsam fir, eastern hemlock, white spruce, red maple, and paper birch.

Black spruce is dominant in acidic areas with cold, stagnant water. This includes very slow moving swamps and the edges of sphagnum bogs. In these areas, tamarack, balsam fir, red maple,

northern white cedar



tamarack

black spruce

and yellow birch are also found. Tamarack grows in most wet lowlands that receive full sunlight and have acidic soils. Spruce-tamarack bogs, which are basically peatlands, are common in the Upper Peninsula and in northern Lower Michigan. They occur as scattered trees over an open area containing a surface layer of deep peat, sphagnum moss, and sedges. The trees, seldom taller than 60 feet, give way to red maple around the edges, and these in turn progress to white pine and white cedar on adjacent areas. Sphagnum moss often blankets the ground of these conifer peatlands and is interspersed with a variety of ferns, orchids, and acid-loving shrubs such as Labrador tea, bog rosemary, and leatherleaf. Cranberries frequently grow in black spruce swamps and are typical inhabitants of open sphagnum bogs.

Many white cedar forests of the Upper Peninsula are 200 years old or older, are in healthy condition, and in no danger of being lost except for their timber value. However, these areas were historically not harvested for timber as much as other species on drier sites. Therefore, healthy lowland conifer forests can still be found throughout Michigan.

snowshoe hare

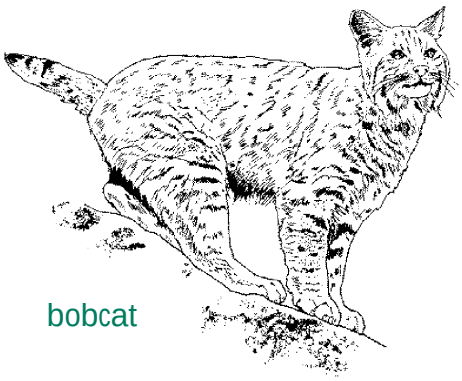
Wildlife Value

Those conifer swamps especially rich with white cedar provide habitat for many types of amphibians, songbirds, reptiles and mammals seeking water, insects and dense cover. Wood frogs breed in pools within these forests. White-tailed deer, elk, snowshoe hares, Swainson's thrush, American redstart, black-throated green warblers, and black and white warblers are also species that use cedar swamps. Uncommon birds include the palm warbler, boreal chickadee, and yellow-bellied flycatcher. Uncommon mammals include the moose, spruce grouse, and wood turtle. Examples of rare plants are the Michigan monkey-flower, round-leaved orchid, ram's head orchid, Calypso orchid, and marsh grass-of-parnassus.

Common wildlife species that inhabit spruce-tamarack bogs include white-tailed deer, spruce grouse, snowshoe hares, bobcats, black bears, mink frog, bog turtles, white-throated sparrows, ovenbirds, red-eyed vireos, Nashville warblers, and common yellowthroats.

Management Considerations

Forests of lowland conifers are susceptible to windthrow, fire, insect damage, and water level fluctuations. Small-scale disturbances from insects and fire open up the canopy, allowing sunlight to reach the forest floor and develop a diverse understory of shrubs and other plants. Larger scale disturbances such as logging, road building, or intense beaver activity can have vast negative effects on lowland conifers. Often after these disturbances aspen and birch, or in wetter sites cattail and sedges, move in and dominate the area.



bobcat

Most lowland conifer stands in Michigan are in good condition, and there is no need to regenerate them over the next 20 to 40 years. Further, researchers and other professionals have experienced limited success in duplicating the natural conditions that created these forests. Therefore, unless there is an economic need to harvest your lowland timber, you are best advised to leave these forests alone.

Protection

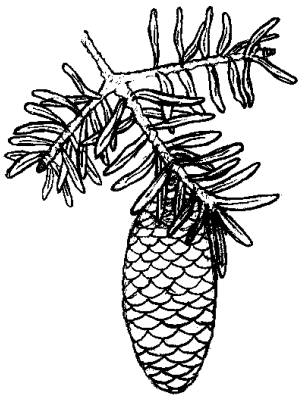
Lowland conifers provide thermal protection for several species of birds and mammals. The dense evergreen branches furnish escape cover from predators and offer secure nesting sites. Maintaining the hydrology (water level) of these forests is important because severe flooding or years of drought can have a major impact on the health of the stand. Draining adjacent uplands can lead to a higher water table which will flood lowland conifers. Flooding can eventually convert the forest to a stand of cattails or a thicket of alders and willows. Conversely, if the soil dries out over a long period of time, an invasion of upland trees and shrubs will likely occur.

For these reasons, plan for minimum disturbance to both lowland conifers and nearby uplands. Maintain a buffer strip of at least 100 feet wide around the site. Do not plan a major tree harvest or build roads or trails within the lowland stand or the buffer strip because little or no timber harvest is needed to increase the value of the stand to wildlife. If timber is removed, it should be done by removing single trees, preferably along the stand's edge. Small cuts that harvest one to four trees at a time is the closest method to imitating natural disturbance. To minimize impacts to the soil surface and water table, any cutting should be done after the ground is frozen.

A clear forest is not helpful to wildlife. Building brushpiles and leaving large branches on the forest floor are beneficial to wildlife. Leave dead standing trees (snags) and fallen logs because they provide valuable habitat for invertebrates, amphibians, woodpeckers, and other cavity-nesting birds. Avoid making roads, adding buildings, or opening up clearings.

Timber Harvesting

The low success rate of regenerating lowland conifers should preclude a major timber harvest.



balsam fir

Therefore, the financial return-should be highly justified if you decide to harvest the forest. White cedar, tamarack, and black spruce reproduce best in full sunlight. Although some professionals encourage the harvest of cedar as part of an overall deer management plan, only in limited cases will cedar regenerate. Typically, only white spruce and balsam fir will grow because deer will browse on their preferred food-- young cedar sprouts.

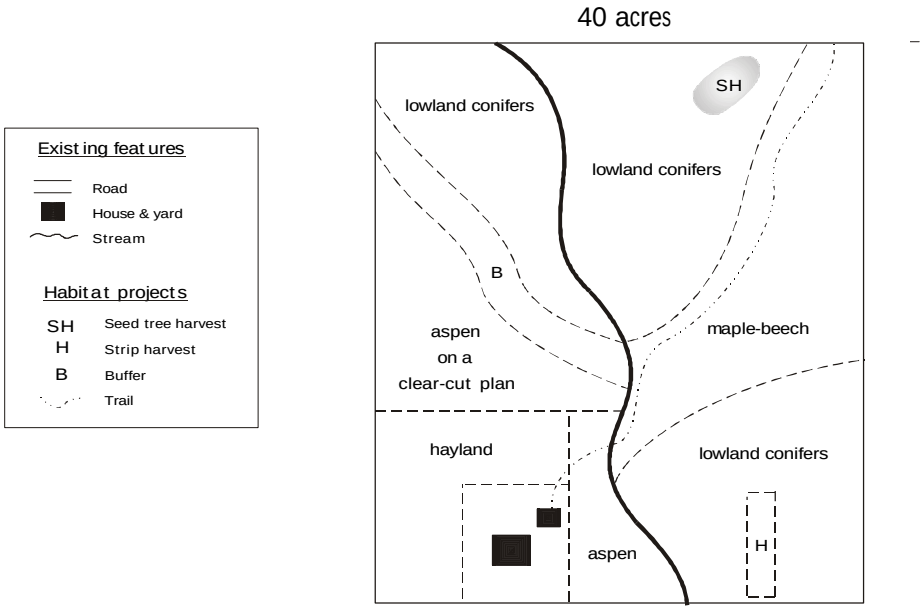
If you want to harvest your stand of lowland conifers, consult with a professional forester who will consider the potential for regeneration. Sites with productive organic soils, slow-flowing groundwater, high soil pH, and low deer populations have the best chance at cedar regeneration. An example of this is seen in the northern Upper Peninsula and the north-central Lower Peninsula where areas receive at least 100 inches of snowfall each year. They have a good potential for regrowth because seedlings are somewhat protected from browsing deer in winter. Because young cedar grows slowly--about six inches per year--it may take 20 years for trees to grow tall enough to escape being damaged by deer browsing.

If it is determined by a professional that the area has a high chance of successful regeneration, lowland stands can be harvested using seed tree, shelterwood, or clear-cut methods, all of which are described in detail in the chapter on **Timber Harvest** in this section. Cutting is often done as clear-cuts in strips and blocks. They should be 150 to 250 feet wide and at least two acres in size. Cuts from two to 10 acres on the correct site will often result in regeneration.

eastern hemlock

Management of a large cedar swamp that may be several square miles in size will likely require the cooperation of several landowners. The overall goal should be to identify harvest blocks of 40 to 60 acres in size and then cut the block over a 10-year period by removing two to 10 acres of cedar each year. Stands dominated by black spruce and tamarack may need clearcutting as large as 40 acres in order to ensure regeneration. If you or your fellow landowners are not able to follow this plan or can not get professional help, you should delay or cancel your cutting plans.

Of critical importance with any harvest of lowland conifers is to avoid disturbing the peat layer and avoid creating logging roads that will alter the flow of water. Locate main skid trails and any roads on the upland edge of the cut to minimize soil disturbance and soil compaction. Log only when the ground is frozen, and leave clumps of scattered trees as seed sources for regeneration. After the harvest, close any roads or trails against further use and reseed them if neces-



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

sary. Leftover branches and other slash should be evenly distributed over the harvest area or stacked in brushpiles along the edge of the cut. For instructions on making brushpiles, see the chapter on **Rabbits** in the Species Management section. However, be aware that attracting too many rabbits may be detrimental to the regeneration of lowland conifers due to over browsing. Also, do not harvest white cedar where deer browsing is moderate to severe.

Burning the site may also help in the regeneration process. If you choose to burn, however, be sure to develop fire lanes around the area and consult with local officials for permits and assistance. For more information refer to the chapter on **Prescribed Burning** in the Grassland Management section.

As you can see, lowland conifers are among the hardest of all forest types to regenerate. For this reason, and because of their great value to wildlife, lowland conifers are generally best left alone and protected. If you have a swamp of black spruce, white cedar, or tamarack on your property, it is probably already very beneficial wildlife habitat. You will be able to enjoy a variety of wildlife on your property with a very small amount of work.

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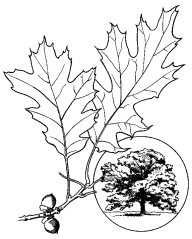
DRY HARDWOODS
(OAK-HICKORY)

Dry hardwood forests are those dominated by several species of oak and hickory. Before settlement, mixed oak/oak-hickory forests covered approximately six percent of Michigan's landscape and about 16 percent of the southern Lower Peninsula where they were primarily found. Even though more than nine million people now live in Michigan, the amount of dry hardwood forest has remained surprisingly stable. Today, it is estimated that five percent of the state still supports this type of habitat.

Although there is presently almost an equal amount of dry hardwood forests in the state as there was in the 1800's, the distribution of these forests has changed. The northern Lower Peninsula has greatly increased from only a small scattering of dry hardwood forests to approximately nine percent of the landscape, while southern Michigan has lost two-thirds of the dry hardwood forests. This increase of dry hardwoods in northern Michigan is a result of the logging and slash fires that took place 70 to 150 years ago. Loggers removed the favored red and white pine, and because dry hardwoods regenerate with fire, the fires that followed helped dry hardwoods to become dominant in some of these areas. The loss of dry hardwood forests in southern Michigan is due to the increase in human developments and the suppression of fire, which caused dry hardwood forests to convert to beech-maple forests.


red oak


black oak


white oak


pignut hickory

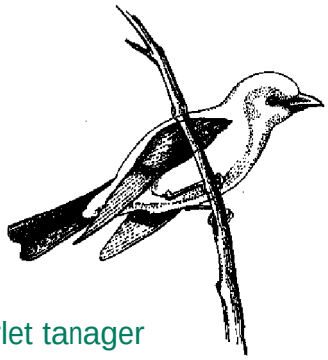

shagbark hickory

Most dry hardwood forests are dominated by white, black, and northern red oak, and pignut hickory with minor components of white ash, red maple, white and red elm, black cherry, beech, and shagbark hickory. Mixed-oak forests are dominated by black and white oak with smaller amounts of black cherry, pignut hickory, and sassafras. The understory of dry hardwood forests often contains witch hazel, hazelnut, arrow-leaved viburnum, blueberry, and black huckleberry. Common ground-layer plants include May apple, clustered-leaved tick-trefoil, naked tick-trefoil, white snakeroot, black snakeroot, whorled loosestrife, fragrant bedstraw, wild strawberry, and sweet cicely.

Wildlife Value

Wildlife prefer white oak acorns, which are produced in abundance every two to six years. However, since they are susceptible to frost damage they are often unpredictable as a food source. Red oak acorns, which are produced in abundance every two to three years, are less prone to frost damage. Hickory trees produce an annual crop of nuts, which are eaten by a variety of small mammals but seldom eaten by birds as the nut is too big, and hard to crack.

Bird species that live in oak forests include the great-crested flycatcher, Eastern wood pewee, rose-breasted grosbeak, scarlet tanager, ruffed grouse, wood duck, blue jay, ovenbird, white-breasted nuthatch, red-bellied woodpecker, downy woodpecker, northern flicker, wild turkey, and black-capped chickadee. White-tailed deer, squirrels, chipmunks, deer mice, and voles are common mammals. Deer, squirrels, wild turkeys, and wood ducks in particular prefer a dry hardwood forest because it produces hard mast (nuts). A properly managed oak-hickory forest contains a mixed stand of white, northern red, and black oaks and hickories.



scarlet tanager

The Importance of Disturbance

Over many centuries, fire played a major role in the perpetuation of the oak-hickory community. Whether started by lightning or native Americans, fires killed competing vegetation and released nutrients in the soil, which promoted the growth of fire-adapted species such as oaks. Historically, oak forests probably burned more frequently than most other forest types. Today, many of these forests have converted to closed-canopy oak forests and beech-maple forests because of fire suppression.

Only about one-third of southern Michigan's original oak forests remain, and many of these are contained in small, fragmented woodlots of 20 to 40 acres. These forests declined because the partially open forest canopy that was created historically by fire closed in and now produces too much shade for oak seedlings to grow. Competition with shade tolerant species is also a factor in this decline. Most downstate oak-hickory forests support seedlings of red maple and beech, both of which are more shade-tolerant than are oak and hickory. Eventually, these shade-tolerant species will dominate the forest. Another factor facing regenerating dry hardwoods is the large numbers of browsing deer in southern Michigan, as they often kill oak and hickory seedlings before they can establish themselves.

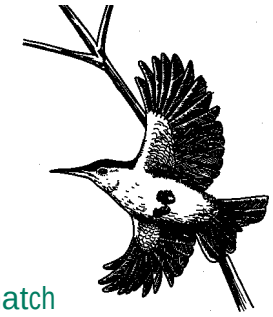
Without some kind of disturbance, such as fire, wind throw, or timber harvest, your dry hardwood forest will convert to maple-beech or some other forest type. In stands with mature oaks and saplings of maple and beech, this conversion may occur over a 20- to 40-year period. For dry hardwood forests that are young and contain many pole-size and sapling oaks, this conversion may take 100 to 200 years. When conversion occurs, both the habitats and the kinds of wildlife that live there slowly change. The result is not necessarily bad, just different. These converted forests have value for wildlife too, as the soft mast of red and sugar maple in spring and the beechnuts in fall provide food. However, if your goal is to maintain your oak-hickory forest, then this conversion needs to be prevented.

Associated Rare Communities

There are several rare communites historically associated with dry hardwood forests that may have the potential to be restored on your property. All of these rare communities are home to several uncommon plants and insects and should be restored whenever possible.

Many of Michigan's current white oak-black oak forests may have historically been dry sand prairies in the southern Lower Peninsula or oak-pine barrens in the northern Lower Peninsula. The presence of prairie-associated vegetation in forest openings or along forest edges may indicate that there is a remnant seed bank under the maturing forest canopy. If you live in west-central Michigan and own a black oak-white oak forest that contains prairie associated shrubs, grasses, and flowers, consider encouraging regeneration of these species through prescribed burning and selective timber harvest. Refer to the chapter on **Prairie Restoration** in the Grassland Management section to learn more.

Another rare community associated with these oaks is the white pine forest. Since white pine is a transitional species it is found mixed with red pine in the northern Lower Peninsula and mixed with oaks in the southern Lower Peninsula. Historically, white pine dominated these mixed forests. Today, white pine is found only as a small component in these forests, and is rarely a dominant species. However, white pine is presently making a comeback and can be found along the tension zone in western Michigan. Oak/white pine forests are present in Newaygo, Mason, Lake, and Manistee counties. If you own a forest of dry hardwoods mixed with some white pine, you may want to restore white pine as a dominant species instead of managing for dry hardwoods entirely. Refer to the chapter on **Dry Mesic Conifers** for more information on managing for white pine.



nuthatch

Another associated community occured on certain flat, sandy lake plains in southeastern Mich-igan. This community most often grew on beach ridges and is a variation of the mixed-oak forest. Black oak, bur oak, white oak, and scarlet oak were the dominant species. These most often occurred in southeast Lower Michigan. However, very few examples of this forest type exist today.

Management Considerations

Landowners have three management options to consider: protection, prescribed burning, and timber harvesting. Protection is most often used in areas that are highly fragmented, or in plans that wish to maintain mature forests. Prescribed burning and timber harvesting are both tools that are used to maintain dry hardwood forests and to restore former communities. The management option you choose will depend on your goals and the condition and location of your land.

Protection

If you own a high-quality stand of oaks supporting a mixed-age stand of seedlings, saplings, mature trees, and snags, then your forest may be in great shape. You may opt for no action as your management decision. Another example of areas that need protection are forests that have been severely fragmented through road building, property divisions, house construction and other human disturbances. These sites should not be made smaller by creating openings. Certain birds that require deep-forest interior habitats are easily threatened by fragmentation that pushes them closer and closer to the habitat edges. As a general rule, creating large openings is discouraged in oak-hickory forests smaller than 100 acres in size. Selective cutting that allows sunlight to penetrate the forest floor for regeneration of oaks will not highly impact the health of a forest of this size.

The best way to increase wildlife numbers and diversity across the southern Michigan forest landscape is to increase the size of individual woodlots and reduce their fragmentation. Planting the kinds of trees and shrubs described earlier to connect one or more woodlots and to encourage wide habitat corridors between habitats is one method to consider. However, be aware of surrounding landscapes and do not fragment other, more dominant habitats in the area.

Prescribed Burning

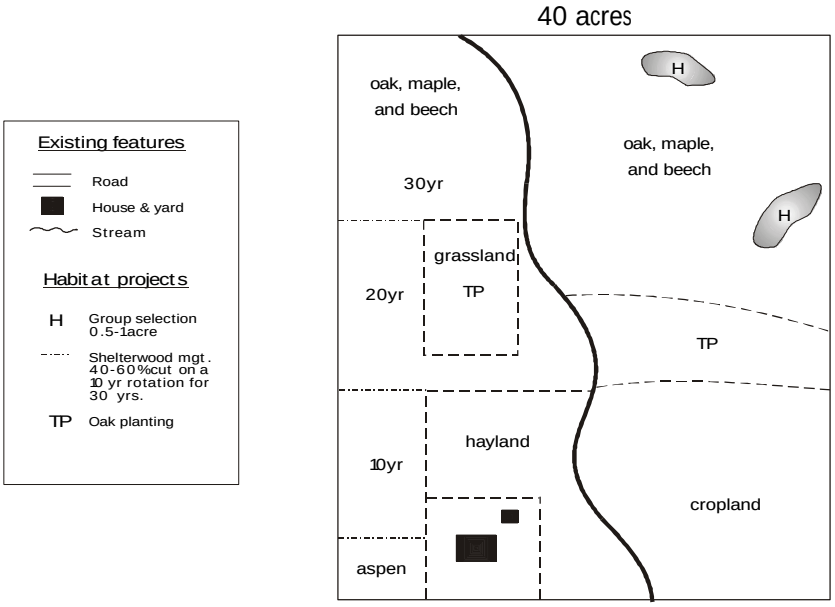
The natural process of maintaining oak-hickory stands is fire. A prescribed burn will decrease competition from shade-tolerant species such as red and sugar maple, and beech. Fire also reduces leaf litter, prepares a good seed bed for oak and hickory seeds, releases nutrients into the soil, and maintains or increases the variety of ground plants. Burning should be done on a 10 to 20 year rotation. The whole stand should not be burned at one time. It is especially useful in restoring prairie and barren landscapes as it regenerates prairie vegetation. Fire is a complex tool that should be managed by a trained resource professional. The use of fire may be limited on small southern Michigan forests. Get assistance from your local forester or wildlife biologist and work with local fire officials to obtain any required permits and to understand regulations. Refer to the chapter on **Prescribed Burning** in the Grassland Management section.

Timber Harvesting

If you have a forest of mature oak trees with an understory of young maple and beech and you wish to maintain the forest as oaks, then a timber harvesting strategy may be needed. Removing a few big-crowned oaks in a closed-canopy forest will allow sunlight to reach the forest floor encouraging oak regeneration. Therefore, to ensure regeneration of the stand, you must use harvest strategies such as group selection cutting, shelterwood cutting, strip cutting, or seed tree cutting.

These timber harvesting techniques, all of which are explained in the **Timber Harvest** chapter in this section, help to promote a diverse forest of mixed ages. Each strategy involves a minimum amount of stand disturbance and can be a low-impact alternative to clearcutting the entire stand.

These timber harvesting techniques focus on the harvest of small to large groups of trees that remove a total of 40 to 70 percent of the stand. Space timber harvests 10 to 20 years apart to minimize disturbance and yet promote diversity. Any harvest should spare a good mix of valued species such as birch, basswood, and ironwood. It should also retain a few large trees that may function as cavity trees, whether these solitary trees are dead (snags) or living (den trees). Do not remove flowering



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

dogwood, witch hazel, arrow wood, serviceberry or other berry-producing shrubs. Remove competing shade-tolerant trees such as sugar and red maple.

Group-selection harvests are usually small cuts of only 1/8 to 1/2 acre in size that mimic natural disturbances from lightning strikes and windthrow. If your stand is larger than 20 acres, you may consider taking out a total of two to five acres at a time (about four to ten groups). The groups should be no wider than 150 feet. The goal is to create a varied stand of mostly oaks and hickories with components of other hardwoods and a few pines.

Shelterwood harvest involves a two-cut plan in stands of two to 20 acres. A total of 40 to 60 percent of the trees are taken during the initial removal, and the remaining mature trees that surround the site are harvested five to 10 years later after they have prompted rapid regrowth. The first cut leaves adjacent trees to provide shelter for regenerating young seedlings. If regeneration is mainly maple, cherry, and sassafras, then treatment with an herbicide may be necessary to ensure the return of oak. However, allowing some maple and pine to grow will help to create a diverse stand.

A seed tree harvest is a clear-cut that spares specific mature trees or groups of mature trees within the cut to provide a seed source for regeneration. Leave five to 10 large nut producing trees, white pine, and black cherry per acre. When the regenerating seedlings are 20 to 30 feet tall the mature trees can then be cut if desired. Follow-up herbicide treatment may also be needed to control maple, cherry, and sassafras.

The shelterwood or seed tree techniques can be cut in circles, squares, or strips. The cuts should not be wider than 150 feet so adjacent trees can provide seed for new growth and protect young trees from wind and sun.

In summary, dry hardwood forests of mixed oak/oak-hickory provide valuable habitat for many species of wildlife. Although slow growing and sometimes difficult to regenerate, they can be managed. Alternatives range from protection to mimicking natural disturbances through prescribed fire and several timber harvest methods. There are also several rare communities associated with these forests that may have the potential to be restored on your property. Be aware of these restoration possibilities before making any management decisions.

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MESIC HARDWOODS
(SUGAR MAPLE & BEECH)

Mesic hardwood forests are areas where hardwoods grow in cool, moist soils that fall between wetlands and drylands. From the sugar maple-beech forests in southern Michigan to the sugar maple-basswood forests of the western Upper Peninsula, mesic hardwood forests are the state's most common forest type. Before European settlement, these forests were the most dominant forest types in Michigan and covered nearly half the state. Today, these forests cover about 19 percent of Michigan's landscape with more than half of the total occurring in the Upper Peninsula.

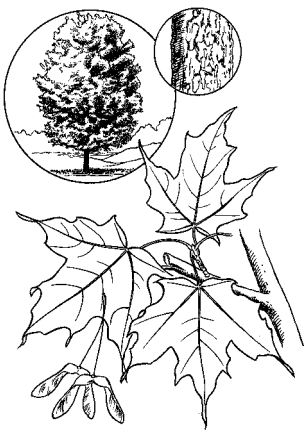
Southern Michigan mesic hardwoods are dominated by beech and sugar maple but also contain basswood, northern red oak, white ash, American and red elm, shagbark hickory, black walnut, bitternut hickory, and tuliptree. Along an maginary line that runs from Bay City to Muskegon, or what is known as the "tension zone," these forests blend into northern hardwood stands. Tuliptree, bitternut hickory, and other more southern species give way to eastern hemlock, white pine, and yellow birch. In the western Upper Peninsula, beech is replaced by white pine, yellow birch, basswood, and hemlock.

Mesic hardwood forests are typically dominated by plant species tolerant of dense shade. For this reason, few shrubs are found in the understory, although Canada yew was an important historical component in northern tracts. Shade tolerant shrubs that sometimes grow under the canopy include maple-leafed viburnum, leatherwood, spicebush, and prickly gooseberry. In spring before leaves emerge to shade the forest floor, an array of wildflowers often carpets the ground. Common species include trout lily, spring beauty, toothwort, Dutchman's breeches, and squirrel corn along with large-flowered trillium, wild ginger, hepatica, bloodroot, and wild geranium. Because of the high levels of shade, morel mushrooms, and ferns also appear in abundance in these forests. Uncommon ferns include green spleenwort, American hart's-tongue fern, expanded fern, and male fern. Rare plants associated with the southern Michigan beech-maple forests are prairie trillium, green trillium, toadshade, nodding pogonia, cranefly orchid, goldenseal, and purple twayblade. Ginseng, which is listed as a state-threatened species, grows in both beech-maple and northern hardwood-conifer forests.


trout lily

A unique microhabitat associat-


beech


sugar maple


basswood

ed with mesic hardwoods is the seasonal wetland. These shallow pools of water occur in the spring within small depressions on the forest floor. Many of these wetlands include a large amount of standing dead or dying trees (snags) that provide homes for many wildlife species. For more information, see the chapter on **Seasonal Wetlands** in the Wetlands Management section.

Mesic forests host a diverse mixture of trees, shrubs, flowers, and other plants. This diversity is maintained by periodic disturbances. For example, lightning strikes kill individual trees and sometimes create fires. Insects and diseases also are responsible for killing trees, and even take out large groups of trees. Windthrow, caused by tornadoes and other severe storms, topple single trees or knock down groups of trees. Historically, these natural forces created a complex forest canopy of many-aged trees with shade-intolerant early successional species, such as aspen and birch, often filling in where large disturbances had taken place.

Depending on location within the state, soil type, moisture gradient, and age of the stand, mesic forests have different compositions. Aspen and birch eventually mature and give way to maple-beech, white pine, or hemlock depending on the site. Today, however, many of these northern Michigan stands, lack the white pine and hemlock that historically were common components. Reasons include fire suppression, intensive timber harvesting over short rotation periods, and intensive deer browsing on young hemlock. After these hardwood sites were cleared, areas that

morels

were allowed to grow back as forests often regenerated into even-aged forests of aspen and birch. This conversion to aspen-birch stands is also seen in southern Michigan where severe disturbance has effected these forests.

Wildlife Value

Diverse mesic hardwood stands offer varied habitats that are used by a wide variety of songbirds, invertebrates, amphibians, and mammals. Deep leaf litter in these stands affords different levels of decomposition. Combined with fallen branches and logs in varying stages of decay, the forest floor is critical habitat for insects, blue-spotted salamanders, white-footed mice, shrews, and chipmunks. Furthermore, certain types of wildlife use the different layers of the forest such as various levels of the overstory, understory, as well as the forest floor.

The red-shouldered hawk, a state-threatened species, prefers to nest in the lower crotches of mature trees in northern hardwood and southern floodplain forests. Other uncommon or declining birds found in mesic hardwood forests include the northern goshawk, black-throated blue warbler, and--especially where hemlock is present--the blackburnian warbler.

The American marten, fisher, elk, and gray wolf live here along with the barred owl, pileated woodpecker, broad-winged hawk, bald eagle, wood frog, chorus frog, and deer mouse. Other species include ruffed grouse, woodcock, cottontail rabbit, snowshoe hare, fox and eastern gray squirrel, wild turkey, white-tailed deer, bobcat, fox, coyote, raccoon, and black bear.

Seasonal wetlands in these forests attract many migrating and nesting birds due to large amounts of insects present at these times. The wetlands within these forests also provide critical habitat for several kinds of frogs--the chorus, wood, and gray tree species.

Management Considerations

Management options for mesic hardwood forests include both protection and timber harvesting. If you own a mature mesic hardwood stand that is diverse in structure and species composition, it may be best to disturb the stand as little as possible. Structural diversity refers to age, tree diameter, crown size, and shape of trees within the stand. Included are microhabitats, such as cavities and crotches, within individual trees. Compositional

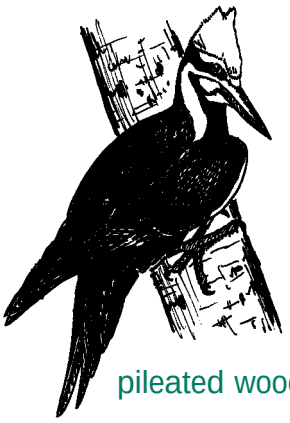
red-shouldered hawk

diversity promotes a mixture of several tree species. In a forest like this, little timber harvest is needed to increase the value to wildlife.

However, like all other forest types, mesic forests change with time, and some type of management may be needed to keep them viable for some species of wildlife. Also, the market value of the forest is sometimes an important consideration to landowners. When conducting timber harvesting, you must take into account the full range of benefits that these forests provide. Such benefits include habitat for wildlife, soil protected from erosion, good water quality in streams and ponds, and a healthy environment for soil organisms. Any cutting program you choose should also take into account local factors--problems with gypsy moth infestation or overbrowsing by deer--and the importance or unique nature of the forest relative to surrounding landscapes.

Protection

If your forest has a diversity of trees along with a variety of understory shrubs and plants, it is probably in good shape to be managed as a mature stand. Many migratory songbirds that nest in these forests are declining due to stand-size reduction, which occurs when property is developed or subdivided. Species that need a large amount of interior forest are jeopardized when large, intact, mature stands of 100 acres or larger are fragmented. Such interior species include the American redstart, ovenbird, wood thrush, and red-eyed vireo. Because there are not many large tracts of mature forest, these forests should not be fragmented if possible. Therefore, do not disturb intact stands by adding roads and clearings, erecting buildings, or allowing livestock to graze. Also, stands that connect waterways or other woodlands offer the greatest benefit to wildlife and should be maintained or restored whenever possible. Please see the chapter on **Edges and Fragments** in the Habitat Planning section for more information.



pileated woodpecker

Timber Harvesting

There are two timber harvesting methods: uneven-aged management and even-aged management. Both methods are discussed in detail in the **Timber Harvesting** chapter in this section.

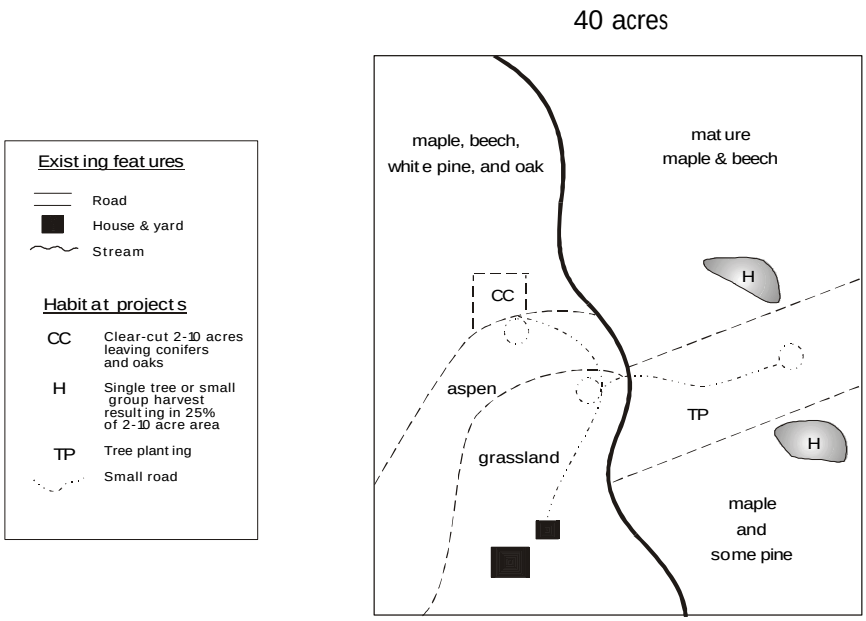
Uneven-aged management promotes a forest of mixed-aged trees of many species and is the best timber harvesting method for wildlife in these forests. It creates the least amount of disturbance and helps to maintain the integrity of the ecosystem. The forest should contain multiple levels from the canopy trees to shrubs to downed logs. This method can include either single tree or group selection cutting techniques. Single tree selection calls for removing single trees, especially along the edge. Group selection calls for small cutting areas that remove two to four trees. These techniques are supposed to mimic natural disturbances.

Single trees or small groups of trees are harvested with no more than 25 percent of the trees in the stand removed at any one time. Space cuttings 10 to 20 years apart and retain a broad mix of species. Spare some basswood, beech, and other large, mature trees that may serve as dens, snags, or wolf trees (mature, large sprawling trees that are still alive). Limit your group cuttings to one-half to one-acre parcels. Because of the overall dominance of sugar maple, remove this species in favor of less-dominant ones such as basswood, oak, yellow birch, white pine, spruce, and hemlock.

Michigan property owners who decide to cut their mesic hardwoods tend to prefer an even-aged management technique such as clear-cutting. However, in the past this strategy has focused on short harvest rotations of 30 to 50 years to promote aspen, which grows in the early successional stage of this ecosystem. By managing in longer rotations, the hardwoods-conifer mix of the original mesic forest can return to provide the habitat diversity that attracts many types of wildlife.

Even-aged management of mesic hardwood forests involves two- to 10-acre cuts using the seed tree or shelterwood techniques. Trees are left within the cutting area to provide shelter or a seed source, which will promote regeneration of that species within the stand. To minimize the amount of edge, plan the cut as a circle or square rather than a rectangle or other shape. This practice will reduce the impact of parasitism by brown-headed cowbirds on nesting interior woodland bird species.

MESIC HARDWOOD FORESTS



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

Seed tree and shelterwood harvests can help maintain the diversity of mesic hardwood forests. In cuttings larger than eight acres, leaving small stands of trees 1/2 to one acre in size within the cut will provide diversity. Even when focusing on conifers, sparing important species such as oak will add diversity. Remove mostly dominant broadleaf bearing trees, such as maple, and leave a variety of other species for regeneration of a diverse forest. If your sugar maple forest is in southern Michigan, leave species such as northern red oak, white ash, black cherry, and tuliptrees. For property in northern Michigan, leave hemlock, white pine, yellow birch, and black cherry. Saving only 10 to 15 percent of these mature trees will add diversity values. About 60 years later, a total of 40 to 70 percent of the forest can again be cut, once more leaving a diversity of species as shelter and future seed sources.

A clear forest is not beneficial to wildlife. Building brush piles and leaving large branches on the forest floor are helpful to wildlife. Also, save any standing dead trees (snags) and fallen logs because they too provide valuable habitat for invertebrates, amphibians, woodpeckers, and other cavity-nesting birds. During the harvest, protect all waterways and seasonal wetlands from logging equipment and vehicles. Leave a vegetative buffer at least 100 feet wide around any ponds, streams, rivers, and lakes, and protect any corridors that connect waterways to the forest interior. In northern Michigan, if no conifers are present in the forest, consider planting a few after the harvest, but realize that cedar and hemlock are hard to establish, especially in areas where deer are plentiful, as they take a relatively long time to grow.

In summary, mesic hardwood forests are Michigan's most widespread forest type. Those stands that offer the most diversity attract the largest number of wildlife species. It is beneficial to protect the integrity of these forests. Landowners have several timber harvesting options to consider that may help to maintain the diversity of these forests. If you decide to harvest your forest, you should consult with a forester or wildlife biologist. They will help you sort through the many options to make the best decision.

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PRIVATE LAND PARTNERSHIPS
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LOWLAND HARDWOODS

(RED &SILVER MAPLE, RED ASH & COTTONWOOD)

Lowland hardwoods are found in areas that hold water at least some part of the year. There are two kinds of lowland hardwood forests: hardwood swamps and floodplain forests. Hardwood swamps are forests that grow in depressions containing standing water at least part of the year. Floodplain forests are found next to rivers along flat, seasonally flooded areas. Lowland hardwoods form a dynamic ecosystem containing many trees and shrubs not commonly found in other forest types. They are one of the state's largest remaining natural habitats because they are not easily farmed or logged.

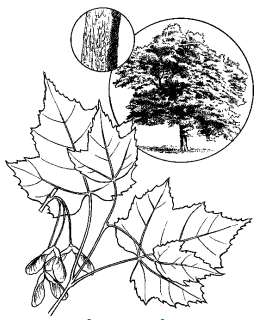
Lowland hardwoods occur mostly in southern Lower Michigan. However, some hardwood swamps can be found in northern Michigan depressions, and there are some occurrences of floodplain forests in the Upper Peninsula. Today about five percent of the entire state is comprised of this forest type.

Mixed hardwood swamps contain red maple, black and red ash, swamp white oak, and American elm. American elm used to be more dominant than it is today, but the elm blight has shortened its life cycle and reduced its dominance. A variation of the mixed hardwood swamp occurs in depressions on southern Michigan sandy plains where the soil is very acidic. Pin oak, black oak, and black gum dominate this rare kind of wetland. Black ash swamps can also occur on flat, sandy plains in southern Michigan, but also mix with northern white cedar or tamarack in scattered regions of northern Michigan. Swamps have dense canopies and are often flooded in spring and fall causing the ground layer to be relatively sparse. However, if there is a drought, or severe windthrow occurs, the groundcover can also be dense. The trees in these swamps are often subject to windthrow during severe storms as they have shallow roots. This disturbance, along with lightning strikes, creates a complex forest of many age classes and tree species.

The southern floodplain forest is one of Michigan's most diverse natural communities as well as one of its most threatened. Damming, dredging, and channelization are all human induced threats to these forests. Seasonally flooded in spring and fall by the wide rivers and streams they flank, these forests grow in loam or silt-loam soils that are rich in minerals. Silver maple, red ash, red maple and cottonwood dominate these forests. Red oak, swamp white oak, black willow, and black walnut also occur as smaller components. Trees that reach their northern limit in these forests are Ohio buckeye, pawpaw, red bud, blue ash, Kentucky coffee tree, honeylocust, sycamore, hackberry, and red mulberry. Shrubs and small trees include spicebush, hawthorn, alternate-leafed dogwood, American hornbeam, American bladdernut, steeplebush, prickly ash, and ninebark. Common ground-layer plants are skunk cabbage, jewelweed, wild geranium, cinnamon fern, sensitive fern, buttercup, jack-in-the-pulpit, and meadow rue. Rare plants include winged stemmed monkey flower, prairie trillium, snow trillium, black cottonwood, and twinleaf.

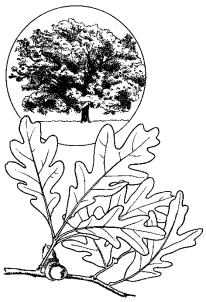
Wildlife Values

Floodplains, swamps, and seasonal pools offer water, food, and cover for many kinds of birds and mammals. The warbling vireo, northern oriole, red-eyed vireo, indigo


red maple


silver maple


cottonwood

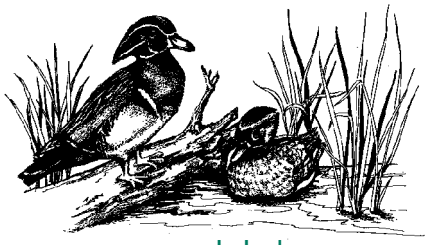

swamp white oak


black ash

bunting, gray catbird, and eastern wood pewee are birds that live in these forests. Other species include the wood duck, cottontail rabbit, raccoon, woodcock, white-tailed deer, wild turkey, and many species of migratory waterfowl. Rare animals include the red-shouldered hawk, Indiana bat, several amphibians (smallmouth salamander, spotted turtle, and Blanchard's cricket frog), and at least three warblers (cerulean, prothonotary and yellow-throated). Streams and rivers, which flow through these forests, are home to numerous rare mussels such as the clubshell, catspaw, northern riffleshell, and round hickory nut.

Floodplains, swamps, and seasonal pools provide many benefits to wildlife. These areas are rich in plants and invertebrates because of their shallow depths and warm temperatures. They provide beneficial food and breeding grounds for many species of wildlife including migratory birds, frogs, toads, and salamanders. Refer to the **Swamps** and **Seasonally Flooded Wetlands** chapters in the Wetland Management section for more information.

Floodplains are also an important aspect in many of these forests. They exist along rivers, lakes, and streams and provide many benefits not only to wildlife, but also to humans. Floodplains provide corridors for wildlife to move from one habitat to another, which is especially important in urban and residential areas where few natural places occur. Without floodplains, the river system would be altered in structure and composition, and the hydrology of the area would be changed. Floodplains benefit humans directly as they provide areas for water overflow, which helps prevent upland flooding. When floodplain forests are developed by humans, there are frequent and often severe flooding occurrences that affect cities and residential areas. Floodplain forests also help to maintain cool waterways in the summer.



wood duck

Management Limitations

Many larger forested lowlands have been broken up into fragments. Reasons include excessive logging, farming and grazing. Fragmentation tends to lessen wildlife values of the forest. Other problems include the invasion of aggressive non-native plants such as glossy buckthorn, purple loosestrife, reed canary grass, and garlic mustard; and Dutch elm disease. These problems have reduced tree species and diversity. As trees die or are removed, the forest canopy changes in structure and composition and loses some of its value for wildlife.

There are several things to consider when weighing your management options. What little information that has been published on how best to manage lowland hardwoods suggests that these stands present special problems when harvesting timber. Because they occur on poorly drained sites, access with equipment is difficult. The quality of wood varies but typically is less valuable than other forest types.

Where stands exist on poorly drained muck soils or in places with high water tables, the regrowth following a timber harvest may not be predictable. Sometimes the makeup of the new stand is not at all like the parent forest, especially if the water table has been greatly affected by the harvest. As stated before, this can reduce the value to wildlife. Fully-crowned lowland hardwoods will release up to a quarter-inch of soil moisture into the air each day. Therefore, if these trees are taken out, there may be more water present on the ground than before. A high water table and seasonal flooding can add to this and completely change the vegetation composition. Instead of trees, sedges and cattails may grow if the area is too wet. However, if the area is too dry shrubby brush may grow. Either way, you have destroyed the lowland hardwood forest. It may be helpful to know the stand's elevation above the local groundwater table before choosing a management option. Agency technicians in your county Conservation District office can help you determine the elevation of the present water table.

Management Condsiderations

Given these limitations, it may be best to manage for protection of your lowland hardwoods instead of harvesting timber. However, there are still several management options to consider if harvesting timber will best achieve your goals.

Protection

In a mature floodplain forest little or no timber harvest is needed to increase wildlife values. The decline of certain migratory songbirds in lowland hardwoods is primarily due to fragmentation of large, intact tracts of mature forest. For more information, see the chapter on **Woodland Birds** in the Species Management section. Many lowland hardwood fragments should simply be protected and allowed to mature. Planting native trees and shrubs to reconnect fragments is also a consideration. Be sure to choose species suited to site

conditions. Connecting other woodlands can greatly benefit wildlife, especially when the forest size exceeds 100 acres. If possible, manage for a mature forest on parcels larger than 100 acres. Be advised, however, that the creation of a full canopy from the crowns of mature trees will produce little ground cover for other species that require this kind of habitat.

Allow seasonal water fluctuation to occur naturally. Leave most cavity trees regardless of age. Eliminate or limit trails and roads to lessen the impact on wildlife species that move back and forth from the water's edge to upland areas. This consideration is especially important during the spring and early summer when birds, amphibians, and reptiles are breeding and laying eggs, and when young of the year disperse.

Large logs play a key role in a stream's health because they help retard bank erosion, provide shelter for fish, sunning sites for turtles, create sandbars and other depositions, encourage channel scouring, and retain nutrients. Therefore, if possible leave trees that fall into the river. Allow the river system to naturally meander, which helps slow the water flow. This reduction in velocity permits the growth of vegetation and stream microorganisms which start the food chain. Major threats to southern Michigan floodplains include water diversion for dams and wells, channelization, and dredging. Another key concern is non-point source pollution from runoff from farms and urban area storm water, construction, and leaky septic systems. For more information refer to the chapter on **Streams and Rivers** in the Wetlands Management section.

Exotic nuisance plant species can also lower the value of lowland hardwoods as they lessen species diversity. Learn to identify purple loosestrife, garlic mustard, reed canary grass, or glossy buckthorn. Cut them back in late winter or early spring, and apply a glycophosphate herbicide, such as Rodeo in wet areas, to the stumps within ten minutes of cutting. Follow all label directions.

Timber Harvesting

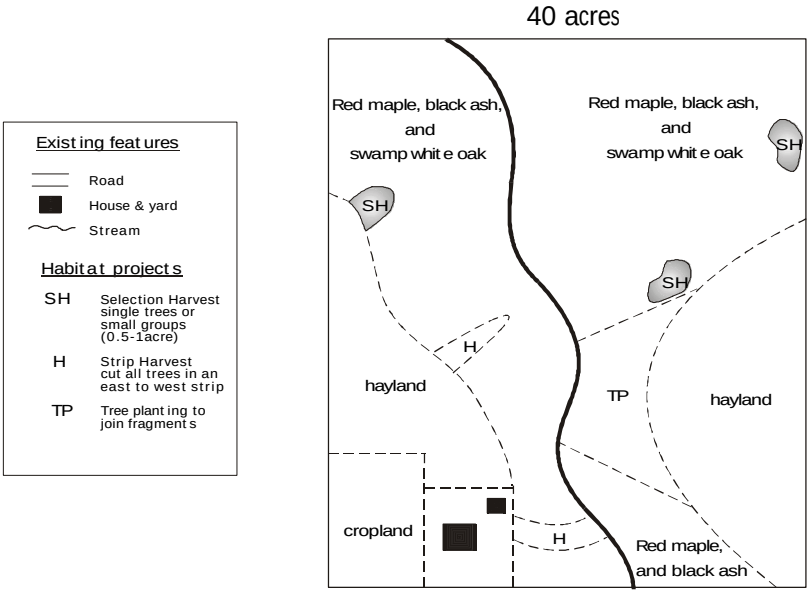
Occasionally, lowland hardwood stands lack the young growth of saplings, shrubs, and ground covers that benefit deer, grouse, woodcock and many other animals. If creating more young growth is part of your management plan, opening the canopy through timber harvest will permit sunlight to reach the forest floor and stimulate the growth of many kinds of plants. There are several timber harvesting methods that can acheive this and still maintain the integrity of the forest. Again, you should check the hydrology of the area before conducting any harvesting to determine the chances of regeneration of the stand. If the regeneration rate is expected to be low, you may want to reevaluate your goals and chose another management option.

One timber harvesting method used in lowland hardwood stands is selection cutting. This method best mimics natural disturbances and is the least detrimental to forest structure and composition. This method focuses on the harvest of single trees or small groups of trees. It is often used to obtain firewood or veneer-grade lumber. In these cases limit the harvest to single trees along the stand's edge or one to four trees within the forest itself. Plan to remove no more than 25 percent of the trees in any one cutting. For group selection cuts concentrate on one-half acre to one-acre openings. To minimize large disruptions to the stand, space harvests by 10 to 20 years. Because of the overall dominance of red maple, plan to remove this species in favor of less-dominant types such as ash and American elm. Retain a good mix of species including swamp white oak, basswood, ironwood, and hackberry. Retain some den trees, snags, and wolf trees (mature, large sprawling trees that are still alive). Plan the harvest for late summer when soils are dry and firm or winter when the ground is frozen.

The selective harvest method promotes a forest of mixed-aged trees of many kinds. Structural (age, diameter, crown size, and shape of tree) and compositional (species of trees) diversity is therefore assured. Also maintained are micro-habitats within individual trees--cavities that attract flying squirrels and northern flickers, and low crotches in large trees that red-shouldered hawks find suitable for nesting. This strategy is a low-impact timber removal alternative that maintains the integrity of the ecosystem. Many landowners prefer it because of its overall value to wildlife although it is not as beneficial for some game species as other harvest techniques.

Another method of timber harvesting conducted in lowland hardwoods is seed tree cutting. In lowland hardwoods seed tree cutting is done in strips, and is a type of clearcutting where all, or most, of the timber is removed. Trees left standing next to the strips will furnish seeds needed for regeneration. Landowners who do not want the stand to convert to marsh grass or shrubs, but who wish to remove more timber than the selective harvest method, often choose seed tree strip cutting. The goal is to cut one-third of the stand, in strips 120 feet wide. If possible, cut the strips in a general east-to-west orientation to reduce the chance for windthrow

LOWLAND HARDWOODS



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

from prevailing west winds. Retain some swamp white oak and pin oak within the strips, because these trees provide important mast (nuts) for wildlife food. Ground cover will most likely increase in the remaining stand because of better light penetration.

After ten years, another 1/3 of the stand can be harvested. The remaining 1/3 can be cut ten years after that. On each cut, save enough oak and den trees to comprise 10 to 15 percent of the remaining stand. The mixture of saplings, pole-sized, and mature trees you will create with the strip harvest method should provide abundant cover for deer, rabbit, raccoon, grouse, wild turkey, cardinals, and many other species. Wood ducks, squirrels, and other cavity nesters will also find den sites. Adding to habitat diversity will be ground covers and fruiting shrubs. To increase diversity even more you can plant some shrubs, such as nannyberry and highbush cranberry, along with a few lowland conifers (evergreens).

Most lowland hardwood forests are odd-shaped because of varying soil types, topography, and old land-use patterns. When cutting strips, follow the land's contours as much as possible, keeping in mind that long stretches of straight-edged cutting blocks are less beneficial to wildlife and may create a wind-tunnel effect during storms.

Cut no closer to waterways than 100 feet. This precaution will avoid problems with erosion and sedimentation. The 100-foot-wide buffer you leave will also shade the stream, and help regulate water levels and temperature. Also, it is best to cut in winter when the ground is frozen to minimize soil distrubance.

A clear forest--one with all downed timber, logs and branches removed--is not beneficial to wildlife. Leave most snags (dead or dying standing trees), logs and fallen branches because they provide valuable habitat for invertebrates, amphibians, woodpeckers, and other cavity-nesting birds. Building brush-piles will create habitat for many small creatures, including rabbits.

In summary, if you have lowland hardwoods on your property you have an opportunity to attract a wide variety of wildlife. Large, unbroken tracts with a variety of trees of different ages provide the diverse habitats that many kinds of wildlife use. Protection may be the best management strategy when harvesting and regrowth may be difficult due to uncertain water tables. Lowland hardwoods that were artificially drained can sometimes be restored to original habitats if present trees are cut and any drains plugged.

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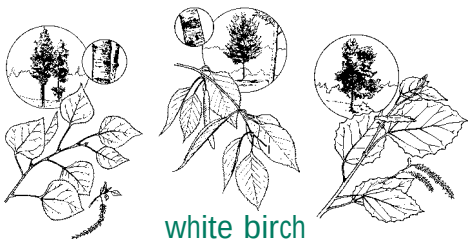
ASPEN & BIRCH

Aspen and birch forests are not truly considered a forest type as they are early growth stages within many different forest types. However, these forests are included here as there are large amounts of them throughout Michigan today. Though forests of aspen and birch were scattered throughout Michigan before the logging period, they covered less than one percent of the state's land base. Today, they comprise about 10 percent of the landscape and occupy some 3 million acres. The majority of these forests are located in northern Michigan.

Aspen-birch forests in northern Michigan and the Upper Peninsula are dominated by white birch, trembling (quaking) aspen, and big-toothed aspen, all of which are shade-intolerant, fast growing and short-lived. In southern Michigan, white birch is not common in these forests. Other trees associated with the aspen-birch community include balsam fir, pin cherry, red maple, and white and red pine. The open forests that aspen and birch create allow sunlight to reach the forest floor where wintergreen, bracken fern, serviceberry, beaked hazel, and many other ground cover and fruiting shrubs are able to grow. For this reason, aspen-birch forests support a wide variety of wildlife.



quaking aspen

white birch

big-toothed aspen

Aspen Regeneration

Aspen and birch are not shade tolerant species and typically grow in sunlit areas unoccupied by other shade-tolerant trees. Therefore, historically aspen grew as minor components in openings of most other forest types. These openings were created by natural disturbances in the forest such as fire, storm windthrow, insects, and disease. Aspen and birch established in these disturbed areas as they received a lot of sunlight. As the aspen and birch grew, they provided shade for regenerating shade tolerant saplings that would eventually replace the aspen and birch and dominate the mature forest.

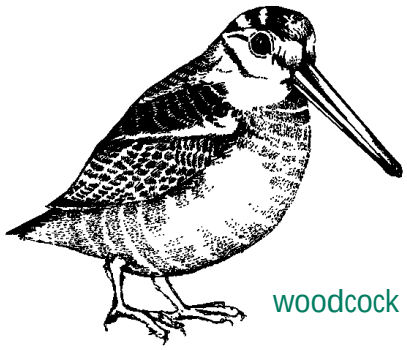
However, upland stands of red and white pine on dry soils, and lowland stands of northern white cedar and white spruce-balsam fir presented a different scenario as aspen had a larger impact on these forests. When natural disturbances produced openings in these forest types, aspen quickly colonized to form solid stands. It was difficult for the original species to regenerate in the presence of these dense aspen stands and many of these forests were reduced because of this competition.

The dramatic increase of this pioneering, sun-loving tree in Michigan occurred as a result of intense cutting and frequent fires that burned during and after the logging period. Since aspen regenerates best when it is cut, logging helped it become established in many more areas than before. Because of fire suppression efforts, fire no longer plays a large role in the regeneration of aspen. Instead, today clearcutting has become the main means of aspen regeneration. Once aspen is cut, its root systems respond with a rapid production of 5,000 to 70,000 root suckers per acre.

If aspen is not cut, it will eventually convert to shade tolerant species of the forest type it is growing in. Left undisturbed on good sites aspen will be replaced by more shade-tolerant species such as oak, maple, beech, balsam fir, or spruce, depending on the forest type. On poor quality sites, aspen may be replaced by grasses and shrubs. This process may take 50 to 70 years. If your goal is to regenerate aspen on your land, you must cut it. On the other hand, if your goal is to convert the forest to its historical condition, you need to let it mature.

The Aspen Controversy

Throughout much of the 20th century, due to its intensive management for pulpwood production and deer and grouse habitat improvement, aspen has increased



woodcock

and is now dominant in many forest types across the state. Through the 1950s, professional foresters managed many public land upland sites for aspen and birch that once hosted white and red pine forests. Almost fifty percent of dry mesic conifer forests were converted to aspen and birch forests. Lowland conifer and hardwood forests were also severely impacted by the increase in aspen-birch forests.

Many people believe there are too many deer in Michigan and that intensive management of aspen is one of the reasons, especially in the northern Lower and western Upper Peninsulas. When possible, these individuals would rather let the aspen mature and manage for the mature forest type to attract other kinds of wildlife. Others would rather manage for aspen, grouse, and deer. Those who understand their options, and what changes will occur with each decision, are likely to make the best choices for wildlife. For this reason, if your property contains aspen forests, you should also consider reading the other chapters in this section.

Wildlife Value

Aspen-birch forests support a wide range of plant diversity over the stand's life span of 50 to 70 years. Different growth stages in aspen forests result in different ground covers, fruiting shrubs, and competing tree species that advance or retreat. It is this plant diversity that attracts so many different species of wildlife.

Young stands of aspen saplings are under three inches in diameter, 10 to 20 feet in height, and less than 10 years old. They attract the chestnut-sided warbler, mourning warbler, indigo bunting, and golden-winged warbler which is a species that is quickly disappearing in Michigan. Other species that use this stage of the aspen forest as habitat include woodcock, deer, cottontail rabbit, snowshoe hare, and ruffed grouse.

When the stand grows to pole size, it will be 10 to 40 years old, 20 to 70 feet high, and contain trunk diameters of four to nine inches. Species that use this stage of the aspen forest as habitat are the least flycatcher, yellow-bellied sapsucker, ruby-throated hummingbird, red-eyed vireo, ovenbird, pileated woodpecker, woodland jumping mouse, porcupine, deer, and ruffed grouse.

When diameters exceed nine inches, foresters classify the stand as a sawlog forest. Tree heights may exceed 70 feet, and the stand will be at least 40 years old. Species attracted to this stage of aspen forests include the black bear, porcupine, flying squirrel, white-footed deer mouse, pileated woodpecker, veery and--where conifers are mixed in--the American and pine marten, and fisher.

Management Considerations

There are two ways to manage your aspen-birch forest stand--let it grow to maturity, or subscribe to a series of planned even-aged timber harvests. If you decide to cut your forest, you must decide between a short rotation period that will produce ruffed grouse and deer habitat, or a long rotation period to grow sawlogs that will produce habitat for bears and porcupines. You may want to allow natural succession to convert your stand to anther forest type beneficial for other wildlife species.

Mature Stand Management

Mature stands of aspen-birch will contain many trees that are dead or dying (mature aspen is vulnerable to hydroxylon cancer disease). These trees host an accumulation of insects, which in turn provide food for many kinds of wildlife, especially black bears. As the forest matures and more trees die, other species will eventually replace the aspen and birch and dominate the stand. On good to high quality sites, shaded areas provided by the maturing aspen have likely helped to increase pines, oak, maple, beech and other shade-tolerant species. On a poor site consisting of dry, sandy soils-the aspen will often be replaced by grasses, forbs, shrubs, and a few scattered oaks or pines. In areas which were historically northern hardwoods, beech-maple forests, white pine-red pine forests, or savanna openings, it may be possible to promote a conversion to the original condition. If this goal is part of your management plan, then do not cut the forest at all.

ruffed grouse

black bear

Letting the forest mature will result in a very diverse array of species composition. With each change of vegetation, the habitat for wildlife will also change. For example, if the aspen is replaced by an oak forest, it will attract the fox squirrel, wild turkey, white-breasted nuthatch, black-capped chickadee, and downy woodpecker. If you continue to let the forest mature, and the oak is replaced by a maple-beech forest it will attract the broad-winged hawk, red-shouldered hawk, black-throated blue warbler, and northern goshawk. If instead, the oak is replaced by a stand of upland pines it will draw pine warblers, black-throated green warblers, crossbills, redpolls, and red squirrels.

If you do not want your aspen to be replaced but wish to maintain a mature aspen stand on your property, instead of a young stand, you will need to do small amounts of clearcutting. Without some type of large disturbance, such as clear-cutting, some successional change will happen. If you cut the stand when at least half the aspen is in healthy condition, then the site will regenerate to aspen-birch. On many sites, this would need to be conducted before the stand is 80 years old. To help maintain the stand as a "mature" aspen-birch forest, make small clear-cuts of one to two acres each scattered within the forest. The regeneration that occurs will provide diversity and give healthy, young aspen a chance to replace older, dying aspen. Also, shelterwood or seed-tree cuttings that promote a mix of conifers, oaks, beech, or maple will add diversity to the stand. For more information on these timber harvesting methods, see the chapters on Timber Harvesting.

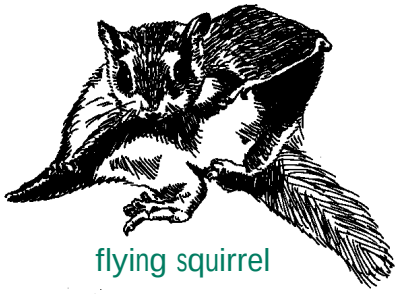
Even-Aged Timber Management

If your goal includes maintaining many ages of aspen on your land, you will need to conduct a timber harvesting rotation. Most professional managers prefer even-aged management for the regeneration of aspen. Besides quick regeneration, this management technique also can lead to increased revenue to the landowner. The goal is to create a mixture of young (sapling), medium-aged (pole) and mature (sawlog) aspen by clear-cutting blocks of one to 10 acres in size at intervals that will establish a 40 to 60 year rotation. This means that the whole stand will have been cut after 40 to 60 years. Cuts should be adjacent to each other to attain the maximum wildlife benefits. This method can be used to manage aspen stands as small as eight acres. For example, cutting two acres of an eight acre stand every 10 years will result in a 40 year rotation.

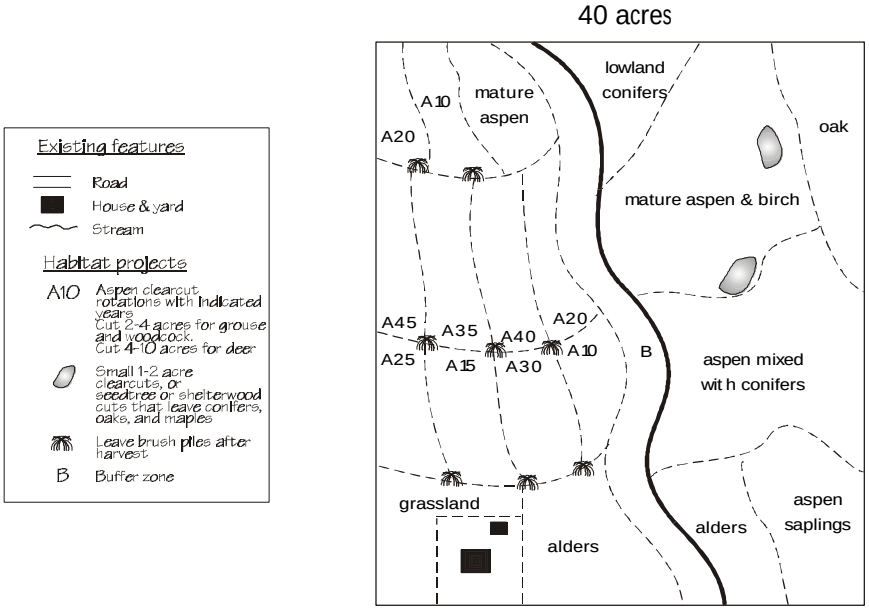
To ensure regeneration, you must cut in winter when the trees will have stored energy in their root systems. The following spring this energy will be released in the form of numerous new sprouts. Each harvest should be at least one-acre in size to minimize shading from trees left standing, which will defeat your purpose. Remove all trees larger than one inch in diameter. A long, linear cut provides more edge than a square, checkerboard harvest, but the best prescription is to follow the topography of the land when possible. Make the cut at least 50 yards wide and 100 yards long in a north/south direction if possible to let sunlight penetrate along the north side.

If managing smaller stands up to 10 acres in size, cut a quarter of the stand every five to 10 years by taking out two to three acres at each harvest. Begin with the southeast quarter, followed by the southwest quarter, then the northeast parcel and finally the remaining northwest piece. The goal is to cut the entire stand over a period of 40 years and then start the cycle again. This same plan can be used to manage smaller stands of only 20 to 30 mature aspens if you shorten the rotation. Simply cut one-fourth of the stand every three years, starting with those in the southeast quarter. Clearcuts that are two to four acres in size benefit ruffed grouse and woodcock. Smaller cuts make more economic sense if they are connected by trails or are relatively close to each other.

If managing larger tracts from 20 to 40 acres in size, make larger cuts more often. On aspen stands larger than 40 acres, manage the forest as several 20- to 40-acre



flying squirrel



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

parcels with cuttings following the above prescription. Larger cuts of up to 10 acres each are most helpful to white-tailed deer. Larger cuts may be necessary to ensure regeneration in areas where deer and elk are numerous, as this will help prevent the browsing and subsequent loss of all or most of the saplings. In areas with moderate to high deer or elk numbers, cuts may have to be 40 acres in size or larger. Larger cuts are also more economical for commercial harvest.

To increase stand diversity, leave several non-aspen trees per acre. Small clumps of two to 10 individual trees and shrubs such as white pine, hemlock, cedars, spruce, oaks, hickory, serviceberry, and hazelnut will all help to provide the habitat mix that favors a variety of wildlife. Leaving 20 to 40 foot strips of mature standing trees between cuts will help to minimize the short-term disturbances after the cut and lessen the denuding appearance of the clear-cut.

Avoid clearcutting trees near streams or seasonal wetlands--the best assurance is a vegetation buffer of at least 100 feet around these sensitive areas. Leave standing snags (dead trees) and occasional wolf trees (large, short-trunked, widely branching trees), which will provide food and homes for wildlife. Remember that a clear forest is not beneficial to wildlife. Many insects, amphibians, reptiles, birds, and small mammals depend upon leaf litter, decaying logs, and fallen branches for food and shelter.

Build brush piles from the harvest slash by incorporating live-lopped trees when possible. These small trees are only partially cut and then bent over the pile, which should be at least 15 feet in diameter and five feet high. Reptiles, amphibians, rabbits, and other small mammals will use them for shelter. Limit brushpiles to one to two piles per acre to reduce over-browsing of saplings by rabbits.

In summary, aspen-birch forests are an early successional stage in many forest types. These forests offer great opportunities for landowners that wish to manage their property for wildlife. The relatively fast-growing trees love sunlight and are fairly easy to regenerate when cut. Aspen-birch forests permit a variety of understory shrubs and ground covers to grow. It is this diversity that attracts many kinds of animals. However, you may choose to let your aspen-birch forest mature and be replaced by other species. This too will attract a variety of wildlife to your property.

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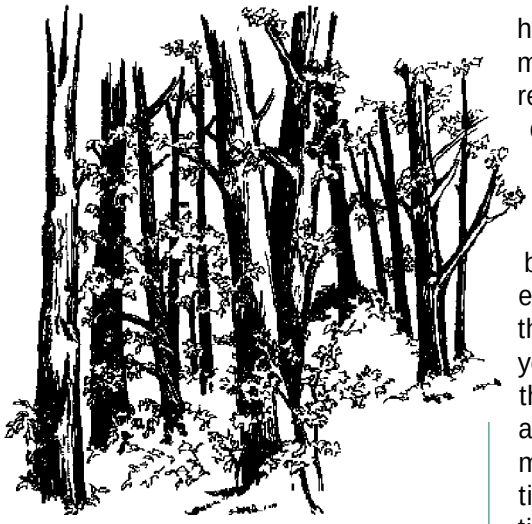
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

TIMBER HARVESTING



Forests of varying composition and successional stage dominate much of Michigan's natural ecosystem. About 38 percent of the state, or nearly 14 million acres, is forest. The plant species (trees, shrubs, and wildflowers) that make up our forests yield food in the form of fruits, berries, and nuts for many species of wildlife. Some examples are browse for rabbits and deer, nectar and pollen production for bees and butterflies, and green matter for caterpillars and other insect larvae. Forests also offer critical cover for wildlife to nest, rest, hide from predators and seek shelter from heat, cold and moisture. Furthermore, forests also recycle nutrients, regulate water flow, and modify our climate locally.

Landowners can manage for a wildlife species or a group of wildlife by managing for the forest type that exists, or can potentially exist, on their land. Managing woodlands on your property, whether small or up to thousands of acres, will provide valuable wildlife habitat. Forest management can involve a combination of timber harvesting and site-preparation practices followed by planting trees or allowing them to regenerate naturally. The type of management that you chose will depend on the forest type present on your land, the forest condition, and your goals. The key is to have both a short-range and long-range management plan that addresses your wildlife management goals. Other chapters in this section describe how to manage for beech-maple, oak-hickory, and aspen-birch as well as lowland hardwoods and upland and lowland conifers. However, this chapter explains how to harvest timber with the primary goal of maintaining or increasing wildlife. It also addresses secondary goals of producing timber for products like firewood or lumber for personal use or commercial sale.

Trees and Shade Tolerance

Trees grow differently in varying soil, moisture, and sunlight conditions. Certain tree species are "shade intolerant," requiring full sunlight to regenerate and grow. Other kinds of trees are "shade tolerant," growing best in the shade of other trees. In making forest management decisions, it is helpful to understand the importance of sun and shade in the forest. To do this, we need to look at a forest's "overstory" and "understory". Overstory is the crown or canopy of branches and leaves that shut out sunlight. These trees receive the most sunlight. Understory is the assortment of plants that grow underneath the canopy as ground covers, forbs, shrubs, and young trees. These plants most often receive little sunlight.

If a forest is left unmanaged, eventually succession will occur and shade tolerant trees will prosper and

Appropriate Shade Tolerance

Very Tolerant	Tolerant	Intermediate	Intolerant	Very Intolerant
Balsam Fir	American Basswood	American Elm	Black Ash	Eastern Cottonwood
E. Hemlock	Black Spruce	Bitternut Hickory	Black Cherry	Jack Pine
Ironwood	N. White Cedar	E. White Pine	Black Walnut	Aspen
Sugar Maple	White Spruce	Green & White Ash	Butternut	Tamarack
	American Beech	Red & White Oaks	Paper Birch	Pin Cherry
	Serviceberry	Red Maple	Red Pine	Willow
		Shagbark Hickory	Silver Maple	
		Pignut Hickory	Black Oak	

replace the intolerant species. Timber harvesting can set back succession of a more mature forest as it removes trees from the forest. However, it can also move forward succession of a new forest by allowing the understory shade intolerant trees to grow as they receive more sunlight. Therefore, when making management decisions, it is important to know which trees are shade tolerant, and which are shade intolerant. The accompanying panel lists species according to their tolerance or intolerance for shade.

Timber Harvesting Techniques

The main purpose of timber harvesting is to create conditions that will allow the forest to renew or reproduce itself. When trees are removed, the canopy is opened and new trees are allowed to regenerate. Also, removing trees creates more space for mast producing trees to grow. Since most seed is produced on exposed portions of tree crowns, fully exposed tree crowns offer potential for the greatest mast production.

There are basically two types of forest regeneration management practices to consider for your property: even-aged management and uneven-aged management. Even-aged management creates stands that consist of trees of the same age, and includes the "clearcutting technique", "seed tree technique", and various types of "shelterwood techniques". Forests with even-aged management will contain mostly shade intolerant trees, where all trees grow at approximately the same height. Uneven-aged management creates stands that consist of at least three different age and size classes, and includes various types of "selection techniques". Forests with uneven-aged management will contain mostly shade tolerant trees, where young trees grow in the shade of older trees. These management practices differ by the age distribution of trees left standing and the amount of sunlight that reaches the forest floor after a harvest. Another practice called "high-grading" is a profit-motivated method, which has little or no value to wildlife. High-grading takes only the most economically valuable trees--regardless of size or quality--and leaves the rest. The undesirable trees left standing are genetically inferior, and it is their progeny that will regenerate the forest. You may want to consult with a professional forester and wildlife biologist before deciding which one of the forest management practices is best suited for your wildlife management goals.

Even-aged Management

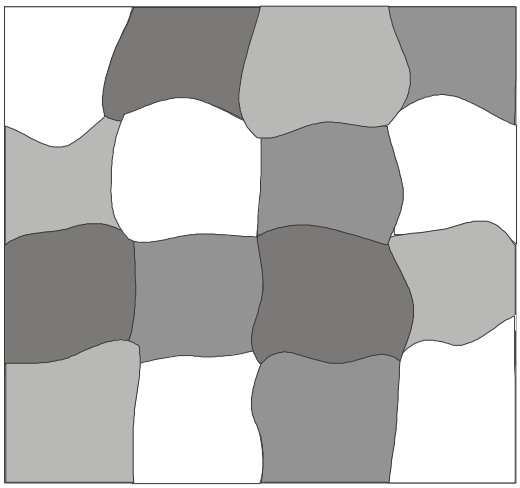
Clearcutting Technique

Clearcutting is the most common method of regeneration among the even-aged management practices. This technique involves one cut, which may remove the entire stand. Clearcutting is for landowners whose goals require a large amount of new growth seedlings, and young shade intolerant trees. These cuts will provide the highest level of forage, shade intolerant tree mast, and woody stem density, and will attract ruffed grouse, snowshoe hares, rabbits, deer, and edge-loving songbirds.

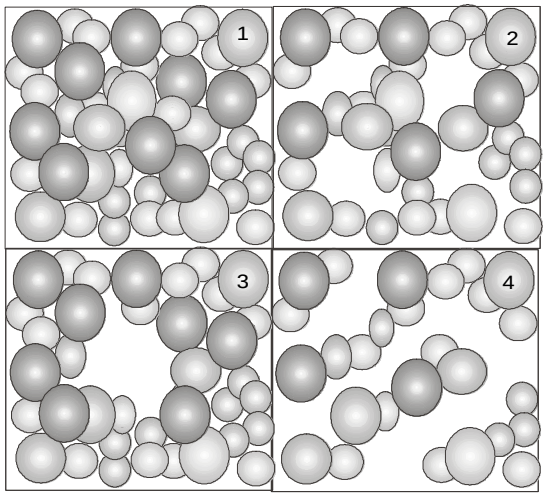
Clearcutting results in the best conditions for regenerating aspen as it responds to cutting with explosive root sprouting that can number 5,000 to 70,000 stems per acre. Aspen forests are early successional stages of many forest types and need clearcutting to regenerate. If they are not cut, they will be replaced by shade tolerant species.

This technique benefits edge-loving wildlife the most when the cuttings are from two to 10 acres in size and a different portion is cut every 10 to 20 years. Cuts of 20 acres or more will result in large proportions of shade intolerant trees such as aspen, pin cherry, black cherry, and red oak. Cutting in patches or narrow strips will produce more intermediately tolerant and tolerant trees. Best regeneration occurs when cuts are made in a north/south orientation to receive full amounts of sunlight.

Landowners that subscribe to this technique should consider leaving a buffer zone of trees of at least



Clearcut management description for a 40 acre tract of land.
Each section represents approximately 2.5 acres



Types of shelterwood management after first year cut
1: Unmanaged stand. 2: Uniform method.
3: Group method. 4: Strip method.

100 feet around wet areas, and saving valuable snags and mast producing trees at the rate of one to five individuals per acre. Leaving small clumps of aspens and/or oaks, white pine, and hemlock in clearcuts larger than 5 acres is also encouraged to maintain diversity of vegetation and wildlife. It is suggested, in any forest management plan, to leave 1/4 to 1/3 of an acre uncut per 10 to 15 acres of timber harvested area to maintain diversity.

Seedtree Technique

The seedtree technique involves removing nearly the entire stand in one cut, while leaving a number of trees, usually shade intolerant species, to provide seed for regeneration. These seedtrees can be left either alone, in small groups, or narrow strips. These trees do not provide enough cover to have any significant sheltering effect on the regeneration. The seed trees are then harvested after regeneration is established. This technique is most often used for conifers.

Shelterwood Management

The shelterwood technique is the most complicated of the even-aged management practices. It is used to provide protection and shade for the regeneration area. This technique results in two to three even-aged classes of trees, and is used to regenerate trees that thrive in partial shade. It involves a series of two or more cuts over 15 to 30 years, in which the first cut removes 50 to 70 percent of the canopy. The rest of the stand, called the shelterwood, is left to provide a partial canopy that protects the regenerating stand. In the first cut, thickets of saplings or poles that are extensive enough to form a stand are left. After 5 to 10 years, when the new growth is well established, a second cut can either remove all or half of the shelterwood stand. If only half of the stand is removed on the second cut, then a third cut is used 10 to 20 years later to remove the last half. The final cut may leave trees that are long survivors such as sugar maple, oaks, white pine and hemlock.

There are three ways to implement the shelterwood technique. The "uniform" method harvests trees that are evenly scattered throughout the stand. The "group" method removes groups of trees at each cut. The "strip" method uses an alternating or progressing pattern that moves through a portion of the stand at each cut.

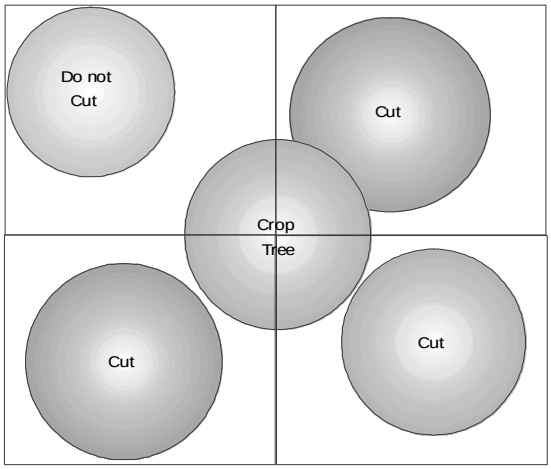
The shelterwood technique is used to regenerate moderately shade tolerant speces. It is especially successful in regenerating oak. Oak rebounds in forests that allow some sunlight to enter, while maintaining some shade and shelter for seedlings to become established. By creating space for large oak trees, acorn production increases and oak regeneration from seed is successful.

Uneven-aged Management
Selection Technique

The selection technique is preferred for landowners who wish to maintain a small amount of edge, and manage a relatively mature, diverse forest with little amounts of disturbance. It is also a good technique to use when a long-term supply of quality sawlogs is an objective. This technique promotes regeneration of shade tolerant trees, such as sugar maple, basswood, beech, and ash. If trees selected for harvest are in groups more than 1/2 acre in size, then oaks, hickories, red maple, and other intermediately shade tolerant species will grow. The selection technique employs light cuts that remove 10 to 30 percent of the trees of all sizes at each cut. Trees are selected based on species, quality, biodiversity, and size. Selection sites should be areas that are too dense for optimum growth. The goal is to provide proper spacing to encourage rapid growth and reproduction. Thin lightly every 10 years or so to prevent severe disturbance and to encourage continuous rapid growth. The result will be a variety of species in many different size and age classes. In other words, the forest will be structurally and compositionally diverse.

The crop-tree method is an example of selection management. The landowner decides what their primary wildlife improvement goal is and then inventories the property to see which trees meet the goal. In other words, trees are selected based on species, size, or age. For example, if you want to increase acorn production for deer and squirrels, you would need to cut trees that are competing with oaks. Cutting com-

TIMBER HARVESTING



Selection management: Trees should be cut that touch or are about to touch the crop tree. Picture is viewed from the ground looking up through the canopy.

peting trees will "release" the best oaks for growth. To determine which competing trees must be cut to release a crop tree, simply look up into the crop-tree crown and picture it divided into four separate sides. Evaluate each side for interference from neighboring crowns. Any crown that touches or is about to touch the crop tree will compete with it for growth and should be cut.

There are two types of selection techniques: single tree selection and group selection. Single tree selections choose individual trees for cutting, and are used in stands dominated by shade tolerant trees such as beech and sugar maple. This method is good for wildlife that do not require openings or shade intolerant mast producing trees as it maintains a relatively continuous forest canopy. Single tree selection is also often used to obtain firewood. Group tree selections choose groups of trees for cutting, and are used to provide wildlife with shade intolerant mast producing trees and shrubs as it permits more sunlight. Another way of providing these trees and shrubs is to plant them along the forest edge, or along logging roads or trails.

Other Considerations

Edge occurs when two different cover types, such as forest and open field, meet. Many species require an abundance of edge, such as rabbits, deer, and ruffed grouse. Be aware, however, that there are also animals that shun the edge and seek the safety of deep woods. Examples include the broad-winged hawk, pileated woodpecker, acadian flycatcher, yellow-throated vireo, American redstart, and cerulean, and hooded warblers. Before choosing a timber harvesting technique, you must be familiar with the species that inhabit your forest. If your forest is largely unfragmented, and there are species present that depend on this type of habitat, it would be wise to choose the technique that produces the least amount of edge.

The management practice you choose is dependent upon your wildlife management goals. However, there are some things you can do, regardless of which management practice you choose, that will benefit wildlife and increase the diversity of the forest. It is best to leave snags and trees containing cavities, along with grapevines, serviceberries, and other wildlife food sources. Large trees with poor form and no commercial value can be girdled rather than harvested, creating snags. To girdle a tree, which will eventually kill it, cut two rings two inches deep completely around the tree. Dead trees do not compete for light, moisture or nutrients. Besides cavity-type homes, they yield insect grubs for chickadees, nuthatches, and many kinds of woodpeckers. Leave harvested treetops and brush for slash that will provide cover. Timber harvests that result in trees left on the ground create opportunities for building brushpiles, and creating shelter for wildlife. Also, leave any logs on the forest floor for decomposition. Logs provide homes for wildlife and help replenish the soil. These few details will increase wildlife quality at little to no cost to the landowner.

In summary, careful planning will help you manage your woodland to create diverse habitats. Each management practice will regenerate a specific group of trees, and should be selected based on the present landscape conditions and your goals. Whichever you select, a wise choice will make the landscape more beneficial for wildlife, and may produce income too.

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PRIVATE LAND PARTNERSHIPS
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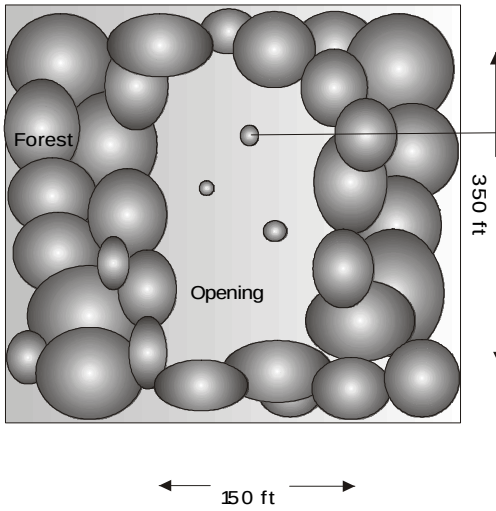
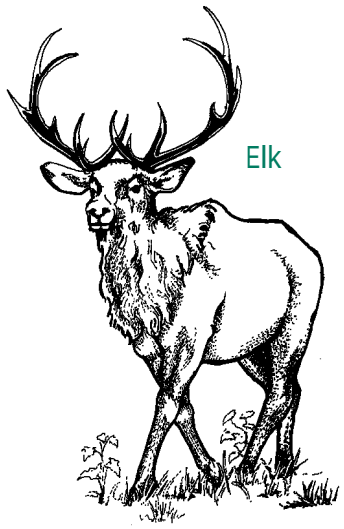
FOREST OPENINGS

Prior to Michigan's settlement millions of acres of pine and hardwood forest covered the landscape. Approximately 150 years ago these expansive tracts of forest contained patches of scattered grass or shrubland openings. These openings were created by natural disturbances such as fire, ice storms, wind, disease, insect outbreaks, drought, and flooding. These disturbances provided more sunlight and moisture to the forest floor, reduced competing vegetation, and generated a suitable seed bed for colonizing grasses, shrubs, and trees. Over time, shrubs and small trees would dominate the site and often in 10 -15 years trees would once again cover the area. These temporary openings provided browse, food, and cover to a variety of wildlife such as ruffed grouse, white-tailed deer, elk, and rabbits. Examples of larger open areas that fit into Michigan's highly forested landscape are native prairies, oak and pine savannas, and wetlands. These areas experienced more frequent disturbances, and thus had fewer trees.



Michigan's forests have greatly changed since the early 1800's. The majority of the vast forests in southern Michigan have been lost to development. However, northern Michigan still remains largely forested. Even so, many of the remaining forests in Michigan are severely fragmented. Fragmentation occurs when roads, trails, homes, agricultural fields, pipeline and powerline corridors, and other forms of development break up a natural area. Fragmentation produces a large amount of edge. Edge is the transition zone between two vegetation types. As a result of fragmentation, many species that have a high sensitiviy to edge have been negatively impacted. These species seek the interior of large forested areas hundreds of acres in size. When edge sensitive woodland birds are forced to nest within 300 yards of large openings or grassland edges, they become vulnerable to predation and nest parasitism by cowbirds. Species of wildlife such as the least flycatcher, redstart, ovenbird, veery, and red-shouldered hawk can all be negatively impacted by the development of forest openings.

A forest with a full canopy does not generally have a lot of understory vegetation. This is because the overstory prevents sunlight from reaching the forest floor. When openings are created, sunlight is able to facilitate the growth of a variety of vegetation. A one acre opening, with full sunlight, will produce significant food for species such as deer, elk, hares, vireos, warblers, and thrushes. Selecting where to place an opening is important because location, size, and slope will determine how the opening gets sunlight. In addition to this, it important to know when creating openings will be beneficial or detrimental to the ecosystem.


Elk

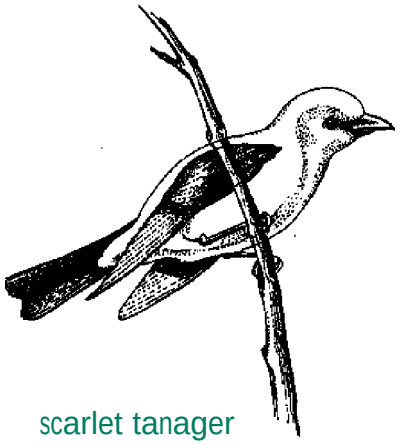
When to Create Openings

Landowners must consider many factors before deciding when creating openings is needed, and how large they should be. The lack of mature, old growth forest, and rarity of many types of forest

should be taken into consideration before any opening is planned. Maintaining and restoring these types of forest may be the best alternative. Whenever trees are harvested, whether the stand is 80 acres or over 200 acres, the kind and number of wildlife will change. Species that require large, undisturbed blocks of forest, may not be able to survive in the area if the disturbance is too large.

Because of the large amount of fragmentation, especially in southern Michigan, you must examine surrounding landscapes before creating openings. In general, forest openings should not be developed in extensively fragmented landscapes. It may be better in these areas to connect existing fragments rather than fragment the forest further by creating openings. If you are not managing for edge dependent species, openings are unnecessary in forest tracts less than 100 acres in size since openings and fields commonly already exist around them.

However, there are instances where creating openings may be beneficial to wildlife or habitat diversity. For example, areas that were historically prairies and savanna's are ideal locations for creating forest openings. Forest openings would mimic these unique grassland communities and would restore them to the area. Edges and openings of forests provide a large variety of vegetation and, consequently, support a variety of wildlife. The management of forest openings has been traditionally conducted for game and edge dependent species such as deer, turkeys, ruffed grouse, elk, rabbits, snowshoe hares, and songbirds such as towhees, indigo buntings, cardinals, and chipping sparrows.



scarlet tanager

Some openings may already exist on your property. You should determine the amount of existing openings in your forest before creating new openings. If your forest already contains the necessary amount of openings, you can enhance them instead of creating more. This will avoid fragmenting your forest, while fulfilling your goals for edge dependent species. Blowdowns from storms and fires from lightning strikes are examples of naturally created openings. Logging trails and log landings (where logs are piled and loaded) are examples of human created openings. These openings can simply be maintained or enhanced to fulfill wildlife needs.

Management Considerations

LOCATION: The best places for creating forest openings are where there are already only a few existing trees. Considerations include frost pockets (areas prone to late spring frosts), sites with shallow soil, and those that are excessively well-drained. If your property is large, you can often find good sites

for openings on soil maps, aerial photographs, or topographic maps. A field examination will confirm whether or not the location is suitable.

To minimize the impact of the opening to area sensitive species you should place openings near other existing openings such as roads and trails or areas prone to windthrow. Enhancement of an existing opening will have less of a negative impact than creating a new opening. Also, openings should be placed near the edge of the forest, versus the middle, to minimize any negative impacts caused by increased fragmentation.

SLOPE: Slope is an important consideration when deciding on an opening location as it determines how much sunlight the opening will receive, and thus the potential for diverse vegetation growth. A south facing slope is the most desirable location because it will provide more ground area exposed to sunlight. However, it will tend to be drier because of summer heat. In early spring many species will use openings with a south-facing slope because green browse will appear there first as the snow melts. Areas

with moderate or low slope should be chosen if the area is to be planted. Areas with steep slopes are harder to plant and may cause erosion problems if not quickly revegetated.

SIZE: Openings are usually created to allow for maximum plant growth and diversity. A 1/2 to 2 acre opening will allow both shade tolerant and intolerant species. Sun-loving species such as grasses, legumes, crabapples, hawthorn, sumac, and gray and silky dogwood will grow in the middle and north side of the clearing as these areas receive the most sunlight. Shade tolerant species such as beaked hazel, serviceberry, flowering dogwood, and highbush cranberry will grow in the shade from adjacent trees on the south end of the clearing. Openings smaller than 1/2 acre will only support shade tolerant species as they are too small to receive much sun. Openings larger than two acres support more shade intolerant species as they have only a small shaded area.

When managing for edge dependent species, about five to 10 percent of your forest should be in openings. If you own more than 100 acres of woods, five to eight acres of openings are ideal. One option is to maintain five to eight one acre openings, while another option is to maintain three or four two acre openings.

Openings should be at least twice as long as they are wide because small animals seldom venture more than 50 feet from escape cover. An opening that is 100 feet wide by 200 feet long will be about 1/2 acre in size. Extending the length to 300 feet will produce an opening of 3/4 acre. An opening of 100 feet by 400 feet is about one acre. Long, rectangular shaped openings will maximize the amount of edge. Square and circular openings will minimize the edge effect. Openings should be about 100 feet wide to provide nearby escape cover and create an even amount of shaded and sunlit areas. The amount of shaded area that will result from a stand can be determined by the height of the trees. A tree will produce shade equal to half of its height. For example, trees that are 70 feet tall will produce 35 feet of shade into the opening.

When the width of the opening is narrow, there will be more time that the opening will be shaded. For example, a half-acre opening that is only 100 feet wide will be in the shade for more than half of the daylight hours. Increasing the width will allow a greater share of the opening to receive full sunlight. But don't always limit yourself to straight-sided rectangular openings. Be creative: Nature seldom creates straight lines, and neither should you.

MAINTENANCE: Once openings have been established, you have several options to maintaining them. You can either leave it alone and let succession reestablish it with trees, manage it as brushland, or manage it as a grassland. Your decision will depend on your management goals.

raspberry

If you allow the site to regrow with trees, the opening's effect on some wildlife species will last less than 15 years. Deer, rabbits, grouse, cardinals, towhees, and certain other songbirds will use the rapidly closing open area, but if you wish to retain high populations of these species, you will need to create another opening every five to eight years. If your goal is to introduce native species of desirable trees (hickory, red oak) and shrubs (serviceberry, beaked hazel) to your forest, this prescription is ideal.

If you wish to establish the opening as a brushland or grassland, you will have to prevent succession from going past these stages. You may have to kill the stumps of the cut trees to prevent their regrowth. This usually requires a specialty herbicide. To find out what herbicide is best for your opening, contact the Michigan State University Extension office in your county. Be sure to read, and follow all container directions. Once stumps are dead, sun loving grasses, broadleaf annuals and perennials will quickly fill the site, along with raspberries, blueberries, and shrubs. Allow the site to progress in natural succession as far as you want. When succession has reached the stage you desire, set it back by disking or mowing every three to five years, depending on soil moisture (moist soils

FOREST OPENINGS

diagram of a brushpile

increase the rate of succession). Mark any trees and shrubs you have planted to avoid damage while disking or mowing.

Removing the stumps with a bulldozer, stump rake, or stump grinder will allow you to plant the opening with grasses or forbs. Mixes of native grasses and forbs such as Canada wild-rye, little bluestem, Indiangrass, and bush clover are preferred. Other alternatives, that are not native to Michigan, include timothy grass, orchard grass, and many clovers. Before planting, determine soil pH through the extension service, and apply fertilizer and lime, at the rates recommended. Adding wildflowers, and fruit bearing trees and shrubs, not only increases the aesthetic value of an opening but will attract a greater variety of wildlife, including bees, moths, and butterflies. Refer to the **Grassland Management** section for more information.

GENERAL: When cutting trees to create openings save some snags (dead trees) and wolf trees (large, wide spreading, short-trunked trees) near edges as many species of wildlife use the cavities often found in them for shelter. Leave clumps of conifers in and around openings because they provide escape cover and shelter for wildlife. In openings greater than two acres in size you can also leave a clump of trees or shrubs in the middle. Leaving some of the slash on the ground provides habitat for amphibians and reptiles. The addition of brush piles along the forest edge gives rabbits, snakes, turtles, grouse, and chipmunks additional high-quality escape cover next to food producing edges. Landowners can enhance fruit production along the edges, as well as reduce a harsh edge by planting sun-loving fruit bearing shrubs along the north side of the opening and shade-tolerant species within the shaded zone of trees along the south side.

In summary, the decision to create openings in your forest depends on your management goals and your surrounding landscape. Forest openings can increase habitat diversity for many species of wildlife. However, they can also have negative impacts on other wildlife species. By carefully developing your goals you can determine if the practice will be beneficial on your property and produce your desired results, or if it will be detrimental to the ecosystem.

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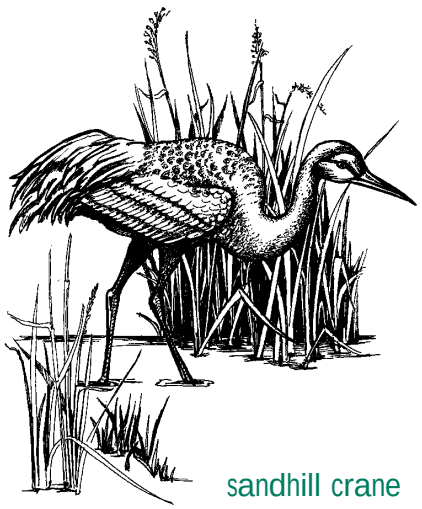
INTRODUCTION TO WETLAND MANAGEMENT

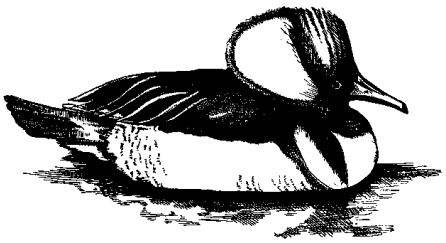
Glaciers, melting nearly 12,000 years ago, left behind raw materials--water, lowlands, and poorly-drained soils--to form up to 11 million acres of wetlands in Michigan. This total was nearly one-third of the state's land mass. In the fewer than 200 years since European settlers first arrived, between 35 to 50 percent of Michigan's wetland acres have been drained, filled, or otherwise altered. Much of the loss occurred through efforts to increase agricultural production on these rich soils, but other wetlands were filled to make room for development. The greatest amount of loss has occurred in southern Michigan where some counties have experienced a loss of more than 75 percent. This loss is not limited to Michigan. It is estimated that in 1780 there were 221 million acres of wetlands in the continental United States. Today, only about 47 percent remain. During the 1980s, wetland loss through draining or filling continued at an annual estimated rate of 290,000 acres. While the rate of loss has decreased in recent years, the goal of "no net loss" is not yet a reality.



sandhill crane

People often think of a wetland as an area that floods, or at least has soggy soils, throughout the growing season. They often picture a specific, isolated area such as a cattail marsh or a wooded swamp. However, there is much more to consider and there are many different types of wetlands. Wetlands are often transitional zones between dry upland sites such as old fields and forests and open-water areas such as lakes and rivers. Most wetlands have three things in common: (1) water at or near the surface some time of the year (2) hydric soils, and (3) wetland vegetation.

The distribution, movement, amount, and seasonal availability of water influences wetland systems. Wetlands have enough water on or near the ground surface to affect the soils and the type of plants that can grow there. Sites with soggy, saturated soils but no standing water can also be wetlands. A wetland does not have to be "wet" all of the time--only during part of the year. The presence of water results in a lack of oxygen in spaces between soil particles. Wetland or "hydric" soils develop under such saturated conditions, and wetland or "hydrophytic" vegetation, grows in the moist soil.

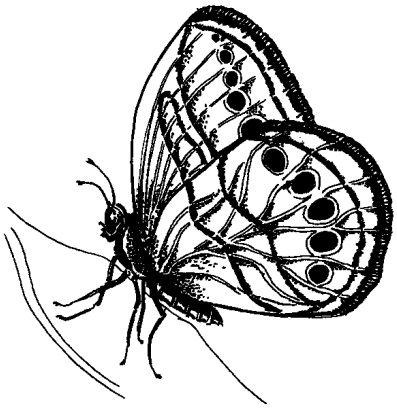


hooded merganser

Wetland Values

Some people view wetlands as wastelands, but this belief is far from true. All Michigan citizens, whether they own land or not, benefit from wetlands, which are some of our most valuable natural resources. Wetlands provide recreational opportunities for birdwatchers, hunters, hikers, photographers, canoeists, anglers, and other outdoor enthusiasts. Wetlands are among the most biologically diverse and productive landscape cover types. Acre for acre, the biomass or living material produced on marshlands is four times that of grasslands and three times that of cropland. Production in marshlands can equal or even exceed that in tropical forests.

Wetlands provide habitat for thousands of species of fish, insects, amphibians, reptiles, birds, and mammals. Nearly 35 percent of the nation's rare wildlife species are located in wetlands or are



Mitchell's satyr

dependent on them. The Mitchell's satyr butterfly, for example, is a rare Michigan butterfly typically only found in prairie fens. Mammals (muskrats, mink, and beavers), waterfowl (ducks and geese), shorebirds (plovers and sandpipers) wading birds (herons and rails), amphibians (salamanders, frogs, and toads), and insects (dragonflies and mayflies) are examples of the host of wild creatures raised in and around wetlands. In addition, muskellunge and northern pike spawn in wetlands. Many species of wildlife use wetlands along with other habitats.

Wetland plants are important as they stabilize soils and reduce erosion. Wetlands act as huge sponges to store water, which helps to reduce flood damage. The water then percolates back into the earth where it helps to recharge the ground water supply and/or maintain water levels in streams and rivers. A one-acre wetland holding water to a depth of one foot, will store 330,000 gallons of water.

Wetlands function as nature's kidneys to filter pollutants and sediments from surface water. They capture and slow runoff water in their thick tangle of plants. When water is slowed, pollutants and sediments drop out of suspension. Wetland organisms intercept nutrients and pollutants, trapping them in wetland plants or substrates. Although too many pollutants can damage them, wetland plants also help to circulate and reuse nitrogen, phosphorus, and other essential nutrients. Many local governments have used this phenomenon to their advantage, constructing wetlands to filter treated wastewater and reducing the overall cost of treatment operations.

Marsh hay, wild rice, blueberries, cranberries, timber, furbearers, and fish are examples of products with economic value that wetlands provide. For this reason, farmers, trappers, fishermen, and others that rely on wetlands for income must exercise care to avoid degrading them while harvesting their products.

Types of Wetlands

Wetlands vary greatly depending on how much water is present, how long water is present, how the water got there, the type of soil, and the kinds of vegetation present. All wetlands, regardless of size and water depth, provide important wildlife habitat. Additional chapters in this section explain the types of wetlands in more detail and provide suggestions for protecting and managing them.

Swamps have saturated soils, may have standing water during part of the year, and are dominated by water-tolerant trees such as silver maple, cottonwood, black ash, or tamarack. Buttonbush, alder, willow, and red-osier dogwood are shrub species that often grow in swamps. Types of swamps include

tamarack

bottomland forests on floodplains, conifer swamps, and dense shrub swamps.

Marsh is another type of wetland covered periodically by standing or slow-moving water. Soft-stemmed plants such as cattails, sedges, and rushes dominate a marsh's nutrient-rich soils.

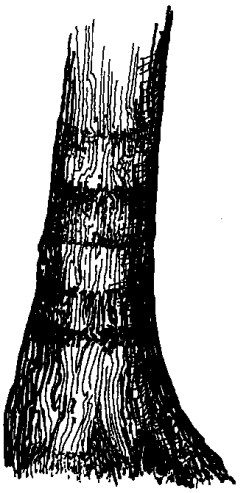
Wet meadows, sedge meadows, and wet prairies are similar to marshes in that they also contain grasslike vegetation. However, these wetlands typically have only seasonally saturated soils and little or no standing water.

Seasonal wetlands are shallow, temporary wetlands that can have standing water from late winter through early spring. Examples are seeps, which usually provide a year-round source of water, and vernal pools, which vary in size from a few square feet to over an acre. These wetlands can be important for breeding and migrant waterfowl, amphibians, and other wildlife.

Bogs and fens are wetlands with a thick accumulation of organic matter called peat. The acidic water of a bog is nutrient-poor because the bog is fed by rain water. Acid-loving plants include sphagnum moss, blueberries, and tamarack. "Insect-eating" plants such as pitcher plant and sundew are also found only in bogs and fens. Fens are somewhat rare in Michigan. Unlike bogs, they are fed by groundwater that has passed through calcium and manganese rich mineral soils. Fens are typically more nutrient-rich than bogs, they support sedges, rushes, and some shrubs.

Wetland Indicators

Some wetlands, such as swamps and marshes, are obvious to most people. Others, like seasonal wetlands or bogs, are not as easily recognized because they may dry out during part of the year or simply do not look very wet. Remember that all wetlands have three things in common and the presence of these may indicate that you have a wetland on your property:



Water marked trees may indicate the presence of a wetland.

Evidence of Hydrology:

• Standing or flowing water for seven or more consecutive days during the growing season.

•Waterlogged soil: Determined by digging a 12-inch-deep hole and then checking for water in the hole; or by looking for soil that glistens with water; or squeezing water from a handful of soil.

• Water marks on trees or small piles of debris lodged in trees or piled against other objects in the direction of water movement near river systems.

Wetland Soils:

• Check with your County Conservation District (CD) for a soil survey and a list of soil types that occur in wetlands.

• Check for a blue or gray color about a foot below the surface. Your local CD office may describe other color characteristics to look for.

• Look for organic matter such as peat or muck.

• Smell the soil for an odor like rotten eggs.

Wetland Vegetation:

More than 5,000 different plants grow in wetlands. Some common wetland plants to look for include:

• Water lilies, cattails, arrowhead, smartweed, pondweed and other plants in standing water.

• Grasses such as reed canary grass, barnyard grass, and prairie cordgrass, or rushes and sedges.

• Trees such as willow, white cedar, cottonwood, silver and red maple, green ash, tamarack, pin oak, and elm.

• Shrubs such as buttonbush, Michigan holly, and red-osier dogwood.

water lily

Are There Former Wetlands on my Property?

If you can answer "yes" to the following questions, it is quite possible that you may have a drained wetland that can be restored:

• Are there depressions or low areas (potholes) on your property that are drained with tile or ditches?

• Are vegetation changes readily visible in the field? For example, do you have patches of stressed or drowned crops or other vegetation?

• Do patches of wetland plants such as cattails, sedges, smartweeds, or red-osier dogwood occur in your fields?

Should I Protect, Enhance, or Create a Wetland?

Wetlands should be preserved whenever possible. Natural wetlands, which developed over thousands of years, are hard to duplicate because of their complexity. Preserving those that are not currently being drained or altered by humans is often the best way to maintain existing wetland functions, including wildlife habitat. Recognize, however, that wetlands are a dynamic system that will change with time. Change may be positive or negative.

Those wetlands that have been dredged, drained, filled, or otherwise altered offer an opportunity for restoration. Often, blocking a ditch or removing a portion of a field tile line may be all that is needed to restore water, which will help to germinate aquatic plant seeds lying dormant in the soil. Remember, a restored wetland need not hold water all year long; in fact, many do not. Temporary wetlands are usually less than two feet deep and often retain water for only a few weeks each spring.

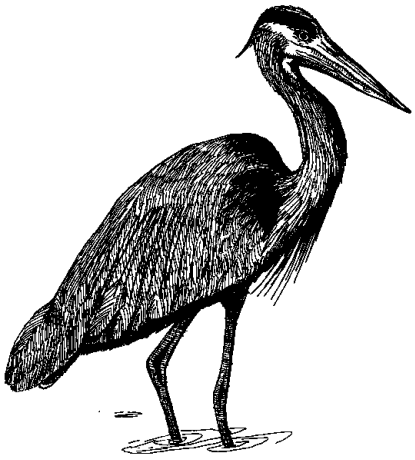
"Enhancement" of an existing wetland can be done to improve wetland functions. However, this can be difficult, and improving surrounding uplands may be more effective. Enhancement efforts may include varying water depths; mowing, burning, or planting; removing nuisance plants; adding nest structures and other habitat improvements.

Creating wetlands can also help wildlife, but this process may be both difficult and expensive depending on site characteristics. Often created wetlands do not function correctly and result with failed projects due to incorrect soils, vegetation, etc. It is hard to duplicate the complexity of wetland systems. Remember that wetlands can influence, and are influenced by, what goes on around them. The type and amount of vegetation around a wetland can greatly affect its value for wildlife, and how the wetland performs other functions. Having clear goals along with a site-specific plan are the keys to successful habitat management.

What Regulations Apply?

Because of their importance, wetland manipulations are regulated by local, state, or federal laws. Check with your township or other local government office to see if there is a wetland protection ordinance that applies to your property. State and some federal regulations can be addressed by contacting the Michigan Department of Environmental Quality (MDEQ), Land and Water Management Division. This agency coordinates the review of project proposals with various divisions within MDEQ, the Michigan Department of Natural Resources (MDNR), and federal agencies such as the U.S. Army Corps of Engineers, if required. Further, the Natural Resource Conservation Service also administers federal wetland regulations for landowners who participate in U.S. Department of Agriculture programs. Allow enough time for permit application and approval so as not to upset the time frame for your project.

In summary, wetlands are very complex systems that offer a variety of benefits to both people and wildlife. There are many types of wetlands that are each dependent on local hydrology, hydric soils, and wetland vegetation. Wetlands should be protected or restored whenever possible. As with any other management activity, prior planning helps to ensure that your goals are reached.



heron

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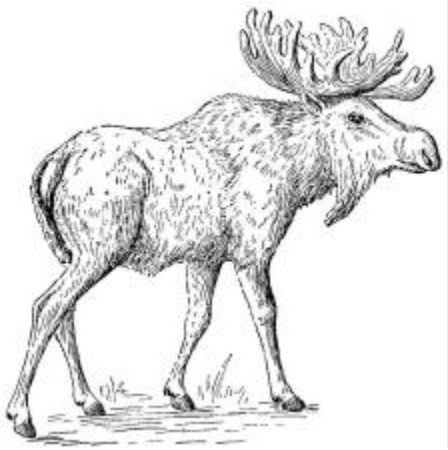
BOGS AND FENS

Bogs and their close cousins--fens--are biologically fascinating wetlands. Their deep peat layers offer a glimpse into the geologic past--seeds, plant parts, and even animals may remain intact in the acidic peat for thousands of years. If a bog or fen exists on your property, consider yourself lucky as they are very rare.

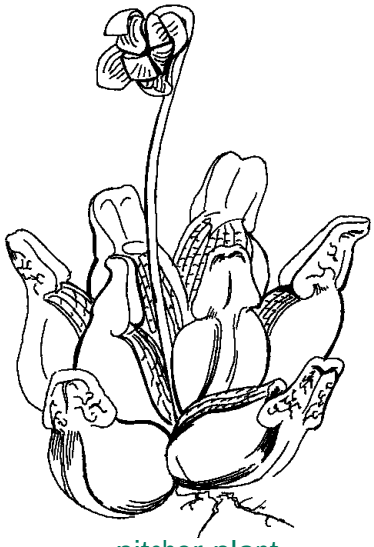
In Michigan, bogs and fens occurred historically as a result of glaciation, dating from about 8,000 to 12,000 years ago when the last ice sheets retreated north, although some bogs and fens are only 3,000 to 5,000 years old. The retreat of these glaciers created tundra climates, and over time, forests of spruce and fir, which still dominate in the north. However, bogs and fens began to form in areas that were too wet for most trees to grow, and that had poorly drained dark soils and cold water. Although both bogs and fens are similar types of wetlands as they are both considered peatlands, what sets them apart from each other is the source of their water supply. Fens typically are fed by a steady source of ground water whereas bogs are usually enclosed depressions filled by rain water.



These unusual wetlands are home to a variety of plants and animals including unique bog lemmings, pitcher plants, and sundews. The familiar song sparrow and red-winged blackbird live there along with yellow-bellied flycatchers, and Nashville warblers, which nest only in northern Michigan. American goldfinch, American woodcock, alder and willow flycatchers, and golden-winged and chestnut-sided warblers are other birds that use them. Ruffed grouse eat the catkins of bog birches, which often grow around the edges of bogs and fens, and migrating ducks use their open pools. Because bogs attract insects, shrews, mice, frogs, and toads, they also attract mink, raccoons, herons, and other predators. Moose also use these areas in the Upper Peninsula. In winter, the white cedar forests that often surround many bogs yield important browse and cover for deer.

Bogs

Bogs are unique wetlands because their nutrient-poor systems support a specific group of plant species. Such plants include carnivorous species such as pitcher plants, sundews, and bladderworts, which eat insects and are able to retain water from precipitation, and sphagnum moss, which grows abundantly over the layers of peat found here. Common shrubs include leatherleaf, bog laurel, bog rosemary and Labrador tea. Blueberries and cranberries are also common.



pitcher plant

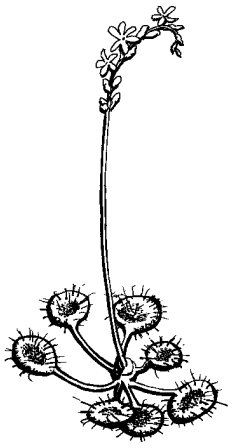
Although they occur throughout Michigan, bogs are more numerous in the Upper Peninsula where they are found along the margins of lakes and ponds and in depressions created by glacial activity. Many southern Michigan bogs, however, were converted to muck farms, and in many other cases landowners felled the trees, drained the bogs, and plowed the soil for agriculture.

Bogs often lie in frost hollows or other cold, wet environments where cold air and water are trapped. On clear nights, heavier

cold air settles to the ground and flows down slopes and valleys often ending in bog lakes or ponds. Although daytime surface temperatures may reach 90 to 100 degrees Farenheit, the root level of plants growing within a bog are typically 45 to 55 degrees Farenheit. Because of the great insulating quality of sphagnum moss, these areas rarely exceed 60 degrees Farenheit.

As bogs age, they tend to become more acidic. As peat accumulates in bogs, it becomes tightly compressed by the weight of material lying over it, and the oldest part turns into fine-textured black muck. This compressed peat becomes impermeable, cutting off the bog from the water table making it acidic, or mineral poor. Over time, the older peat is colonized by shrubs and then trees such as white pine, tamarack, and black spruce.

There are two ways that bogs are formed in Michigan: kettle-lake bogs, and paludification bogs. These processes may take thousands of years. In the Great Lakes region various estimates for forming a single foot of peat range from 100 to 800 years.



sundew

Kettle-lake bogs begin as reeds, sedges, and mosses around the edges of lakes formed by glaciation. This vegetation slowly expands across the entire lake surface, forming a floating mat of peat. This mat slowly consolidates and is then dominated by sphagnum moss and other bog plants. Over time, the peat forms an impermeable layer and isolates the bog from the water table. Shrubs and trees then begin to move in. Thus, this process of natural succession turns an open-water lake into a forested wetland. This process may also reverse itself during cooler and wetter periods and become more open.

Paludification bogs are formed by the blanketing of previously dry land by overgrowth of bog vegetation as it exceeds its basin boundaries. These bogs can be brought about by climatic change, hydrological change caused by beaver dams or logging, or the natural advancement of a peatland. Once this blanket advances and begins to accumulate, the formerly mineral-rich soil is cut off from the water table creating acidic conditions. This kills many existing trees and allows bog vegetation to dominate.

Fens

Fens are somewhat rare in Michigan. They are peat-covered grassy wetlands that are springy when walked upon. Fens are fed by mineral-rich artesian groundwater in the form of springs, rivulets, marl flats, or saturated peat. The constant supply of groundwater being forced up through accumulating peat causes some fens to appear higher than the surrounding terrain. Because the groundwater is rich in calcium and magnesium carbonates, the water is usually neutral or alkaline. Fens are often found on hillsides along lakes, streams, and rivers, which occur in glacial outwash on sandy glacial lakebeds. Others are located in broad outwash channels. Researchers distinguish among several different kinds of fens: prairie fens, northern fens, patterned fens, and poor fens.

bulrush

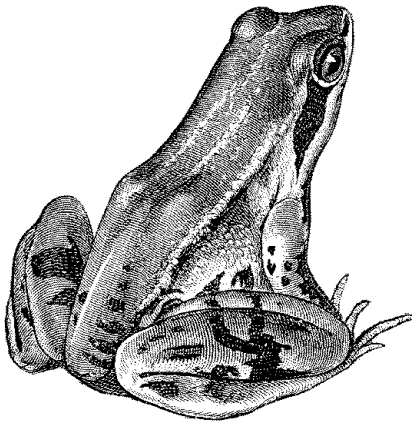
Prairie fens are found in the former oak-savanna prairie region of southern Lower Michigan. They are very rich in calcium and magnesium. Typical plants found in prairie fens are switchgrass, Indiangrass, big bluestem, sedges, rushes, Indian plantain, and prairie dropseed. The wettest part of a prairie fen, which is usually found near the water source, is called a "sedge flat" because members of the sedge family dominate the vegetation. The "fen meadow" is the largest part and is more diverse with many lowland prairie grasses and wildflowers. Slightly elevated areas, especially around the upland edge, also support tamarack, dogwood, bog birch, and poison sumac.

Northern fens are dominated by sedges and rushes and are found in areas of northern Michigan where limestone bedrock is cov-

ered with a thin mantle of glacial drift. Marl flats are very common in these places. Orchids, gentians, and other plants may be present. Bulrush, spike rush, cinquefoil, sawgrass, and white cedar usually surround northern fens.

Patterned fens have a gentle slope of less than one percent per mile, tend to have both acidic and alkaline areas, and feature strips of sedge-peat ridges only a few inches high alternating with depressions. The depressions are wettest with sedge and rush dominating. Besides sedges, the ridges may contain sphagnum, bog rosemary, bog birch, shrubby cinquefoil, leatherleaf, and stunted white spruce and larch. Patterned fens tend to occur on larger flat outwash or lake plain areas in the Upper Peninsula.

Poor fens are those peatlands with reduced water flow and lower mineral content. Consequently, the saturated peat is somewhat acidic. These fens occur throughout the northern Lower Peninsula and Upper Peninsula. Dominated by sedges and grasses, poor fens lack the plant diversity of northern and patterned fens.



Management Considerations

Bogs and fens are extremely sensitive to disturbance. Land-owners cannot create bogs or fens on their property. Bog management amounts to not disturbing the natural succession process and hydrology. Modifying the bog to convert it to a cranberry marsh will destroy the original plant community. Harvesting the top layers of sphagnum for commercial market will damage the fragile ecosystem. Researchers have little information about the recovery rate of harvested bogs but assume recovery is probably very slow or may never occur.

The following are options to consider when managing bogs and fens:

•Protect the mineral-rich groundwater source of fens from pollution or drainage or other alterations in hydrology.

•Avoid diverting or damming water flowing out of fens. Mowing for hay and allowing livestock to graze can also destroy these unique wetlands.

•Periodic burning in winter or early spring may help to retard the invasion of woody species, but because fire can be damaging as well as beneficial, be sure to consult with local fire authorities and a resource professional. Historically, many fens burned along with the surrounding prairie and forest, which were set by Native Americans or lightning. Fire burned the mulch and top growth of the fen--the specialty plants--with little danger to the peat below because of the steady water supply.

•Cottontail rabbits and snowshoe hares may help decrease the invasion of surrounding dogwood, willow, and other woody plants because these are their preferred food in winter.

•Avoid using fertilizers near any wetland. However, be especially careful near fens as polluted runoff can alter fen vegetation, gradually increase invasive species over natives. Remove invasive species such as garlic mustard, glossy buckthorn, or purple loosestrife, whenever they appear in order to avoid future problems.

•Do not alter water courses. Hydrology or water availability is a very important concept in maintaining bogs and fens. For example, changing water courses typically causes the soil to dry out, which can lead to the invasion of lowland and upland tree and shrub species. Also, additional water or drought over several years can have a major impact on the health and condition of these wetlands. Draining adjacent uplands might lead to a higher water table, which can also affect the site. Also, do not dig a pond within the site. Because of their importance and uniqueness, bogs, fens, and their adjacent uplands should be left alone if

garlic mustard

you want to maintain the existing bog and fen.

•Create a buffer strip of at least 100 yards around the wetland. This can be done by planting shrubs or grasses, or by not disturbing the area. Do not develop roads or trails in the bog, fen, or buffer strip.

•If livestock have access to the site, be sure to fence around it because heavy use by cows, horses, or sheep can damage the vegetation, disturb the soil surface layer, and pollute the water with manure.

In summary, bogs and fens are highly unusual, important places. They are important to wildlife seeking secure cover where they can feed, nest, rear their young, and escape predators. They also provide areas for many types of unique, threatened, and endangered plant and animal species. If you have a bog or fen on your property, enjoy its uniqueness and diverse plant and animal life.

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MARSHES

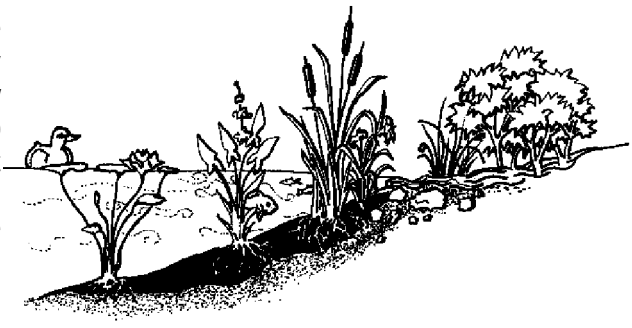
Marshes are shallow-water areas that sustain water-loving plants such as cattail, sedge, arrowhead, bulrush, water lily, and pondweed. Marshes found in Michigan include wet meadows with grasses and sedges, potholes with cattails, and shallow vegetation zones along Great Lakes shorelines. While marshes are generally covered by standing or slow-moving water, certain marshes dry out late in the growing season or during dry years. This fluctuating water level is part of the natural process, which increases plant and habitat diversity, and productivity of the marsh.

Less than an acre or as large as several thousand acres, marshes have appeared and disappeared since the beginning of time. When the glaciers slowly melted about 12,000 years ago, they left behind depressions that formed lakes and potholes. As these bodies of water became shallower and warmer, many turned into marshes--an evolutionary step in the long natural succession process from water to dry upland. Also, when rivers change course in their serpentine march to the Great Lakes, they also leave old isolated sections of a channel, called oxbows, many of which become marshes over time. Marshes may also occupy slow-moving shallow zones of active rivers or develop at river mouths along the Great Lakes as coastal marshes. Fluctuating water levels in the Great Lakes create, maintain, and continually alter these marshes.

The Importance of Marshes

Like most wetlands, marshes are dynamic systems that are important to wildlife and also provide other valuable functions. On average, marshes produce at least three times more biomass than lakes, upland grasslands, and farmland. Their high rate of productivity allows marshes to support complex food chains and a broad diversity of wildlife. For example, about 80 percent of Great Lakes fish use coastal marshes during at least one stage of their life cycle. Marshes also store and collect nutrients and sediments from surface water runoff, and they reduce flooding by temporarily storing water.

All wetlands provide food, water, shelter, and living space to many kinds of wildlife. Mammals such as muskrats, raccoons, mink, and deer feed, rest, and hide in marshes. Herons, shorebirds, waterfowl, red-winged blackbirds, sedge wrens, common yellowthroats, and other songbirds also seek shelter, nesting habitats, and food. Marshes with dense cattail stands provide choice winter habitat to ring-necked pheasants. Further, they supply food and cover to leopard and chorus frogs, snapping turtles, and northern water and ribbon snakes. Uncommon wildlife species that live in marshes include black terns, American and least bitterns, king rails, and massassauga rattlesnakes. Arrowhead and marsh mallow are examples of unique plants that may grow there.



Many human activities can harm marshes. Construction projects, some farming practices, and logging methods may increase silt loads into marshes. Draining marshes to create farmland and filling marshes to make building sites are activities that most commonly have destroyed these wetlands. Streams that provide water to marshes may also deliver pollutants and fertilizer runoff, which eventually alters marsh vegetation. Some marshes are accidentally ruined by well-intentioned landowners who dig ponds in the existing marsh and then deposit the spoils in the surrounding marsh. Because marshes are such a valuable natural resource, they should be preserved, restored, or enhanced whenever possible.

Marsh Conservation

The general rule for wetland management is to protect those that are healthy, restore those that have been damaged, and actively manipulate only those

that are too disturbed to function naturally. If a marsh on your property is not currently being affected by human activities, the best way to protect it for future generations may be to leave it alone, or conduct small management activities. In addition to avoiding harmful practices like draining or filling, consider the following:

• Avoid forest cutting and other mechanical operations, i.e., farming and logging, that may increase sediment within 100 feet of the marsh or any of its connecting streams. Cutting trees near the marsh can change water levels, accelerate erosion, and destroy travel corridors for wildlife using the marsh.

• Create or maintain a buffer zone of grassy vegetation to act as a filter strip around the marsh. Old farm fields taken out of production will naturally vegetate or can be planted to native grasses or wildflowers. This buffer will help protect the marsh and will provide habitat for insects, amphibians, reptiles, birds, and mammals. As a general guide, the buffer should be a minimum of 100 feet wide. For seeding rates and other information, refer to the chapters in the **Grass-land Management** section.

•Fence off the marsh and buffer zone if livestock have access to them. Heavy use by cows, horses and sheep can damage vegetation and pollute the water source with manure. However, light grazing over a short time period can be beneficial.

•Do not use the marsh environment as a dumping ground for refuse and debris, including logging waste. Doing so can lead to contamination of the water, soil, plants, and wildlife.

• Remove invasive plant species such as garlic mustard, glossy buckthorn, phragmites, and purple loosestrife. Reed canary grass is a problem plant that is best removed and replaced by native species such as cattail, bullrush, and cordgrass.

Marsh Restoration

Restoring a marsh on your property is one of the most satisfying of all habitat management projects because the results are usually immediate and dramatic. Normally too shallow to support fish, the restored marsh will become an oasis for other wildlife, and the amount and diversity of animals that quickly move in may surprise you.

The most important consideration is restoring the wetland depression or basin with a stable supply of water. Most likely the marsh has been drained by a ditch or field tiles. If the marsh has been drained by a ditch, plugging the ditch with soil will restore the natural water source. If drainage has occurred-from buried field tiles, removing at least 50 feet of tile will also bring water back to the marsh. Some landowners also add water-control structures to allow periodic drawdowns and re-flooding. The Michigan Department of Natural Resources, U.S. Fish & Wildlife Service, and Natural Resource Conservation Service (NRCS), and County Conservation Districts are among several organizations and agencies that offer assistance to landowners interested in wetland restorations. For additional information, see the **Wetland Restoration Techniques** chapter.

invasive species: reed canary grass, phragmites, and purple loosestrife

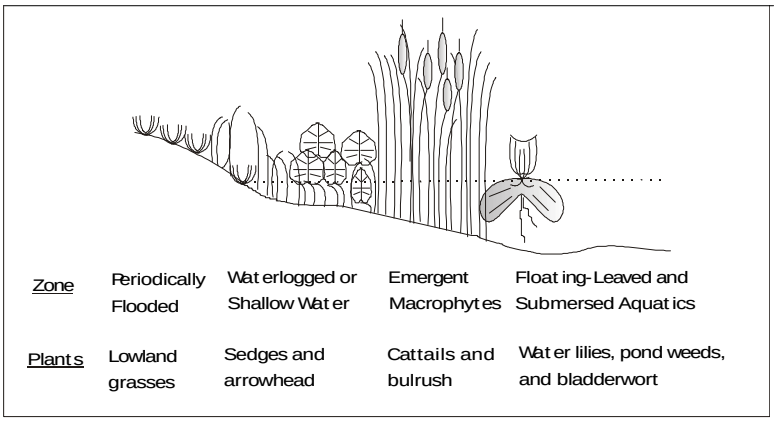
Marsh Creation

Although many landowners are interested, creating a marsh can be expensive and hard to do, especially if the site is not on hydric soils. In addition, quality wet meadows, sedge marshes, wooded swamps, and uplands may be destroyed by landowners trying to create deep water marshes or ponds. Careful planning is required, along with securing government permits. Remember, most private and government groups provide only technical assistance to wetland creation, whereas financial assistance is provided to projects that restore natural wetland systems.

The topography of your property and the surrounding land -- along with the soil type, watershed size, and drainage patterns--are important points to consider before actual construction begins. The U.S. Department of Agriculture maintains a NRCS office in nearly every Michigan County. Agency staff can help you evaluate the water-holding capability of the soil, the elevation of the present water table, and whether or not there will be adequate runoff or spring flow to maintain desired water levels in a con-

structed basin. Also, they can help you design the project.

In your design, think small and shallow. Areas as small as one-half acre or less will support a marsh. However, two to five acres would be productive for wildlife, especially waterfowl. Various water depths result in a mosaic of vegetation zones and increased diversity of both plant and animal species. A general rule worth noting is to provide water depths in the following proportions: 50 percent at less than 1-1/2 feet, 30 percent at 1-1/2 to 3 feet, and 20 percent at 3 to 6 feet.



Cross-section through a fresh water marsh, showing the water depth, and the plants found in each zone.

No simple guidelines exist that cover all the construction methods possible. Site characteristics, available funding, water source, and total size of the marsh to be created all must be considered. The project design may include excavations below the water table and the use of berms to catch surface water.

Great care should be taken in planning any excavation projects--including soil probing--to ensure that you can reach your goals without destroying desirable natural conditions. Digging too deep, for example, could cause many problems. A thin layer of clay or other impermeable soil may be the only reason water exists above the surface at the project site. Breaking this subsurface seal by digging too deeply would remove existing water, much like pulling a bathtub plug. Also, you need to be careful that you are not creating a pond that is too deep for maximum wildlife benefit. Another consideration is the side-slope grade of the excavation. This grade should range from a 4:1 to 6:1 horizontal distance:vertical drop to ensure that a variety of marsh-loving plants will grow in various patterns.

When excavating, be sure to scrape and stockpile the topsoil, then replace the upper six to eight inches on the berm and excavated basin to take advantage of seed sources already in the soil. In general, planting aquatic plants is not necessary because seeds are naturally transported in the environment and are usually already in the soil. But if vegetation is slow to respond on a new site (after 2-3 years) or you wish to add diversity to a present site, you might consider planting duck potato, pickerelweed, bulrush, and cattail—all of which are available from specialty growers. Water depths between one and two feet are ideal for these species. In addition, sago pondweed, coontail, and wild celery are common submergent plants able to grow at a variety of water depths.

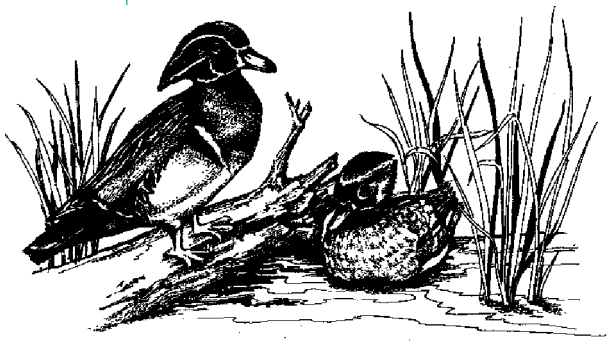
Other Management Considerations

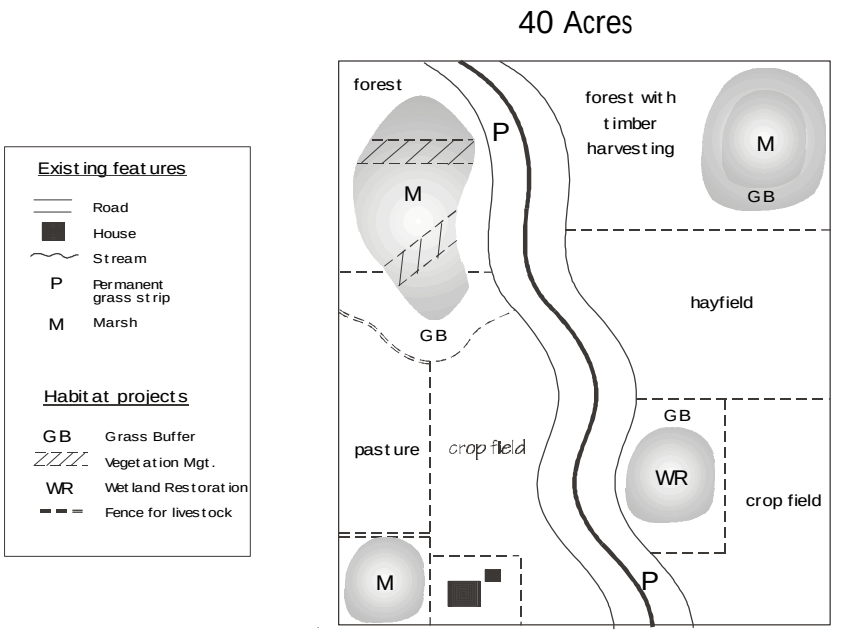
The following are general options to consider when managing a marsh:

•Building nesting structures for wood ducks, mallards, and other waterfowl is not necessary, but can be helpful in attracting them. Ducks, turtles, and other animals will use loafing platforms. To learn more, refer to the chapters on **Wetland Birds**, **Waterfowl**, and **Frogs, Turtles, and Snakes** in the species section.

•You may want to adjust the vegetation:open water ratio of your marsh. Marshes with a ratio of 40 percent vegetation to 60 percent open water provide habitat for the greatest variety of wildlife. Wetlands with higher levels of vegetation will attract rails and red-winged blackbirds. More open water wetlands with a small percentage of vegetation will attract species such as herons and Canada geese.

•If your marsh contains more than 60 percent emergent vegetation, you may want to create openings approximmately 30 feet by 30 feet, or strips 30 feet wide from shore to shore. Openings in cattail marshes can be made in winter by cutting plants at ice level with a backblade pulled by a tractor. This practice works best after a dry fall because spring runoff will





This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

flood plant stubble with at least six inches of water during the next growing season, and should reduce regrowth for a few years. Herbicides that can be used in wetlands, such as Rodeo, can also be used to control vegetation. Remember to always follow label directions on all herbicides.

•Fire is another marsh management tool that can be used during winter or early spring. In addition to creating openings, the technique helps to rejuvenate fertility and to reduce the amount of emergent plant debris. Be sure to obtain necessary permits and follow all safety precautions. For more information, see the chapter on **Prescribed Burning** as a management tool.

•Constructing peninsulas and islands can enhance marsh use by waterfowl, shorebirds, and wading birds. However, if not done properly, such land forms can have a negative impact on wildlife and be a costly addition to your project. Consider increasing shoreline irregularity with small peninsulas. In wetlands larger than two to three acres, you might construct an island. Marshes from four to 25 acres in size should feature a maximum density of one island per four acres. Marshes larger than 25 acres can support a higher density. The islands should be at least 200 feet apart and 100 feet from the mainland to protect nesting waterfowl from predators.

•Another method to control the amount of marsh vegetation is to control the number of muskrats, which eat cattails and other tall emergents and build their homes from the plants. Regulating muskrat numbers through trapping will indirectly balance the amount of vegetation and open water in the marsh.

In summary, marshes are an important part of Michigan's natural landscape. Identifying any that exist or historically existed on your property is the first step toward developing a management plan. By protecting, restoring, enhancing, or successfully creating marshes using the above management practices, these dynamic wetlands will provide critically important wildlife habitat.

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SWAMPS

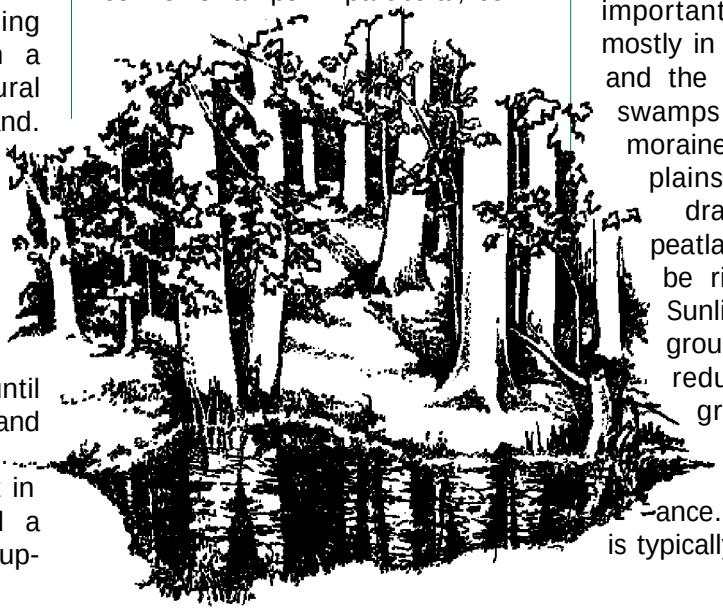
Swamps include a broad range of wetlands that have standing or slowly moving water and are dominated by trees or shrubs. Swamps differ from marshes in that swamps do not contain large amounts of cattails, sedges, bulrushes, and other non-woody aquatic plants. However, these plants may appear around swamp edges or in openings. Michigan swamps include conifer swamps, hardwood swamps, mixed conifer-hardwood swamps, and shrub swamps. Swamps and lowland forests are very similar and are often one in the same. However, swamps are often wetter for a longer period throughout the year and have deeper standing water than lowland forests. These lowland forests may be seasonal wetlands.

Like most wetlands, swamps are ever changing systems. Depending on the surrounding landscape, swamps are often a transitional step in the natural process from water to dry upland. All swamps start out as a lake, pond, stream, or other body of shallow slow moving water. Water-loving trees and shrubs take root in the warm, relatively stable wetland. As plants decay, their material accumulates and adds to the topsoil until the water depth decreases and supports more dense vegetation. Continued succession will result in very little surface water, and a buildup of organic soils, which support more woody vegetation. Occasional flooding or several years of wet weather can slow this process, and several dry years can speed it up.

Swamps provide habitat for mink, muskrats, beaver, otter, deer, black bear, squirrels, hares, barred owls, various species of woodpeckers, wood ducks, nuthatches, several kinds of warblers, black-capped chickadees, snakes, turtles, frogs, toads, butterflies, dragonflies, and many other insects. Uncommon animals such as red-shouldered hawks, cerulean and prothonatory warblers, Indiana bats, smallmouth salamanders, and Blanchard's cricket frog, all rely on swamps for survival.

About one-third to one-half of Michigan's wetland acreage has been lost since 1800. Swamps, conifer swamps in particular, comprise much of the overall loss--about two-thirds of the original 5.5 million acres of conifer swamps have either been drained or converted by logging activity to lowland hardwood, farmland, marshes or shrub swamps.

mink

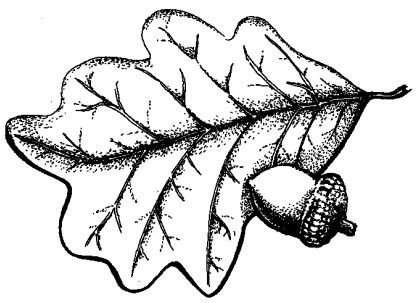


Types of Swamps

Northern white cedar and black spruce dominate most **conifer swamps** in northern Michigan, although balsam fir, eastern hemlock, and white pine may also be important components. Found mostly in northern Lower Michigan and the Upper Peninsula, conifer swamps are situated along moraines, lake beds, outwash plains, and other glacial drainage. Associated with peatlands, conifer swamps may be rich or poor in minerals. Sunlight penetration to the ground is usually poor. This reduces the amount of ground cover and gives some conifer swamps a dark, mysterious appearance. The soil of these swamps is typically acid, but it may also be

neutral or even alkaline if it is influenced by groundwater input. Alkaline sites tend to be cedar-dominated and offer greater plant diversity. In slightly less water-saturated conditions in northern Michigan or along northern floodplains, mixed conifer-hardwood swamps are more common.

Hardwood swamps are those dominated by ash, elm, and red maple but may also include silver maple, cottonwood, and black willow. Pin oak and swamp white oak are included in southern Lower Michigan and quaking aspen, bigtooth aspen, and balsam poplar can be found throughout northern Michigan swamps. In 1800, hardwood swamps comprised about five percent (1.7 million acres) of the state's land base, and most were found in southern Lower Michigan. Today, many of the conifer swamps have been converted to hardwood swamps. This is due to the extensive logging of conifer swamps and changes in hydrology. Much of this has occurred in the northern Lower Peninsula and the Upper Peninsula. Many southern Michigan counties hardwood swamp areas have decreased by as much as 50 percent. Many hardwood swamps are located along lower river reaches that flood in spring and fall. Southern Michigan lowlands tend to be very diverse and support many plants commonly found in states farther south.



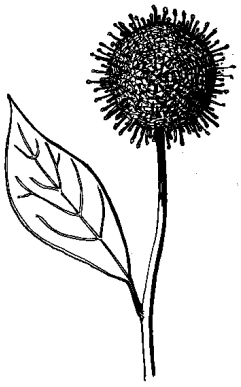
swamp white oak

Combinations of shrubs such as tag alder, buttonbush, willow, and dogwood often dominate **shrub swamps**. Alder-willow swamps are most commonly found along streams and lake margins in northern Lower Michigan and the Upper Peninsula. Buttonbush-willow swamps appear mostly in the southern Lower Peninsula. In 1800, about one percent, or some 43,000 acres, of Michigan was covered with some kind of shrub swamp, mostly in the Upper Peninsula. Today, about 730,000 acres are thought to exist statewide. The increase is due to extensive logging of conifer swamps and to the network of road construction.

Management Considerations

Swamp management for wildlife can be as simple as doing nothing or it can be very complex and involve the manipulation of wildlife habitat. Swamps that have a steady, stable supply of water year round function naturally. Usually they can best be managed by protecting the water source and enhancing the adjacent uplands.

Water is the key to swamp maintenance, even though water levels fluctuate throughout the year. Additional water over several years or many years of drought can impact the condition of the site. Draining adjacent uplands into the swamp, for example, can lead to a higher water table, which may prompt conversion of the swamp to a marsh of cattails. By altering watetables, soils could dry out, leading to succession and a conversion to upland vegetation.



buttonbush

One management option, therefore, may be to leave the swamp alone and allow it to mature naturally, especially if the tract is large (200 acres or more). Old-growth forest left intact, for example, will favor area-sensitive birds like the red-shouldered hawk, the cerulean warbler, and the prothonotary warbler. Do not fragment the swamp by making roads, and trails. Create a buffer strip of grass, shrubs or trees at least 100 feet wide around the swamp. Remove invasive species like garlic mustard, glossy buckthorn, and purple loosestrife that may be growing in the swamp or around it.

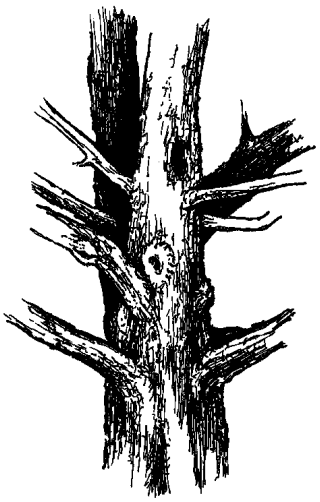
Swamps that have been fragmented can be regenerated by planting tree and shrub species suited to the sites, but the process takes a long time and may not be successful. The slow growth of many swamp-loving trees and the exacting conditions required to restore them are good reasons for maintaining what already exists. In many cases, little or no timber harvest is needed to increase the value to wildlife.

If timber harvest is part of your overall plan, however, take no more than 25 percent of the trees at one time and space harvests 10 to 20 years apart. Removing one to four trees in a group is the best way to

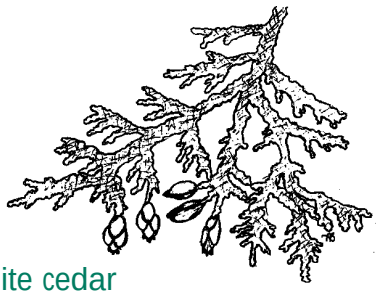
mimic natural disturbances such as lightning strikes and severe storms that topple trees. This method of uneven-aged management (also called selective cutting) promotes a swamp of mixed-aged, young and old trees and is the best timber harvesting strategy as it creates the least amount of disturbance to the swamp. Uuneven-aged management can retain benefits to a variety of wildlife species that require mix-aged forests. However, it is not the best harvesting method for many edge-loving wildlife species.

When conducting timber harvesting, retain a good mix of tree species, including swamp white oak, basswood, and hackberry, while managing for structural diversity--a mixture of ages, diameters, crown sizes, and shapes of trees. Leave old logs, large standing snags, and den trees because they provide food and habitat for invertebrates, amphibians, woodpeckers, and other cavity-nesting birds. See the **Timber Harvesting** chapter in the Forest Management section for more harvest strategies.

Because swamps are often devoid of young trees and an understory of shrubs, they don't provide high quality habitat for some wildlife species such as deer, rabbit, wild turkey, grouse, and woodcock. Opening the canopy by careful timber harvest to allow sunlight to reach the ground may stimulate the growth of vegetation that these species prefer. However, where stands exist on poorly drained muck soils or on sites with a high water table, the results of the timber harvest are far less predictable. The species composition of the resulting stand may not be at all like the parent stand. Consider, for example, that full-crowned swamps release up to 1/4 inch of soil moisture into the air each day through the process of evaporation and transpiration. The higher water table and seasonal flooding, which could result from extensive logging, may completely change the vegetation composition. Also, success in regenerating conifer swamps can be poor, especially if white cedar is the target species. White cedar is often promoted as critical to deer management because it provides both quality food and cover. However, once cedar is cut, white spruce and balsam fir usually regenerate the site because deer browse the nourishing shoots of white cedar. For more information see the chapter on **Lowland Conifers**.



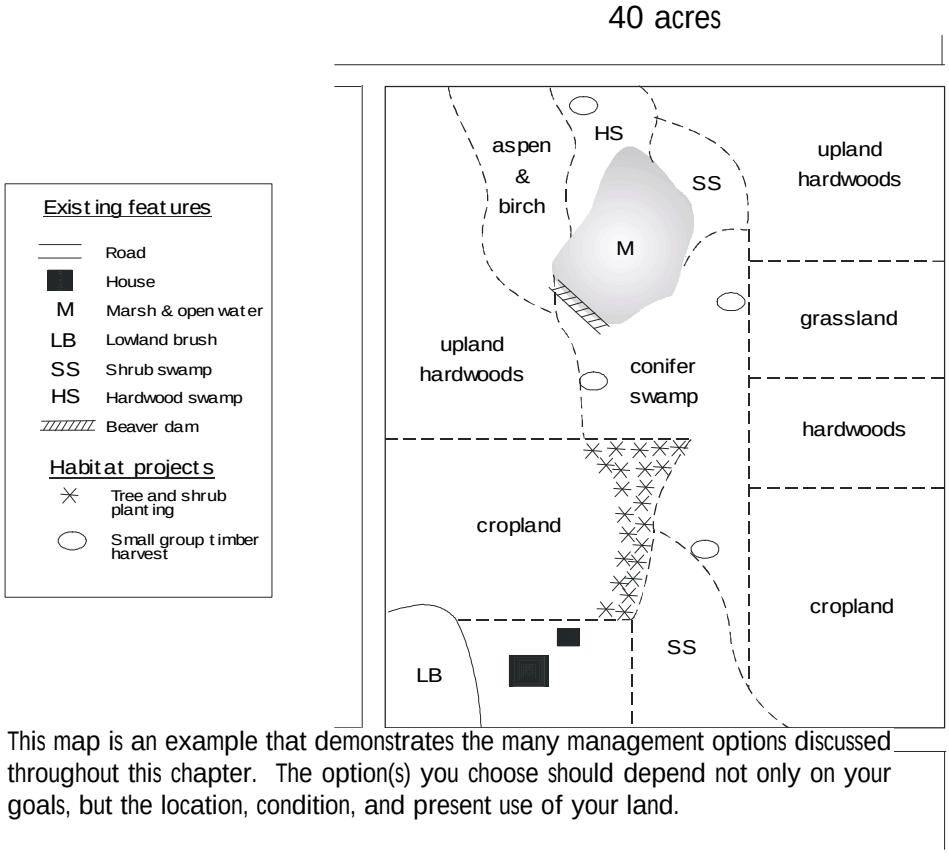
Minimize harvest activities in spring when water levels are high and flood events are likely. Do any selective cutting in late summer, and only when soils are dry and firm. Some swamps freeze, allowing for a winter harvest. Be careful not to disturb the soil any more than is necessary and avoid making permanent logging roads, which will alter the flow of water. Do not log where deer browsing is severe. Locate skid trails and any roads on the upland edge of the cut, and leave clumps of scattered trees as seed sources for regeneration.



white cedar

Shrub swamps with a ratio of 40 to 60 percent open water can provide habitat for a variety of wildlife such as beaver, muskrat, waterfowl, and numerous reptiles and amphibians. If your shrub swamp contains more than 60 percent woody vegetation, consider creating openings 30 feet by 30 feet or 30-foot-wide strips from edge to edge. Make the openings in winter by cutting willow, buttonbush and other woody plants at ice level with a chainsaw, loppers, or backblade pulled by a tractor. This practice works best after a dry fall because spring flooding over the cut stems during the next growing season will eliminate or reduce regrowth for several years.

Wildlife professionals do not usually recommend building water-control devices in swamps because of the difficulty in duplicating and enhancing the natural wetland processes. However, if dikes or other means of water retension already exist, waterfowl and shorebirds may benefit by drawing down the water level to only a few inches in spring to allow preferred plants such as smartweed, wild millet, arrowhead, bulrushes, and sedges to grow on exposed mud flats. The spring draw-down also provides waterbirds with improved access to insects, crayfish, and other invertebrates. Once the plants have produced seed in late summer or



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

early fall, reflood the area with six inches of water to attract herons, rails, red-winged blackbirds, and waterfowl. Throughout the fall you can increase the depth to 12 inches to enable migrants to reach acorns and other food. Because ice action during the winter and early spring can cause significant damage to trees, it is important to draw down the area in late fall to water depths less than twelve inches. This practice of flooding and drawdown is best conducted in dormant swamps that have a dependable water supply and heavy soil to help retain the water. They should be at least one acre in size and contain a large number of mast-producing trees such as oak, red maple, willow, and ash.

Before creating dikes, earthen dams, or other water-control structures, consult with a professional to see if the management goal is desirable and realistic in terms of the site's potential. Water control structures are helpful in maintaining vegetation growth and regrowth. Unfortunately, they can be costly to install and maintain, and may alter the natural processes of the area. Remember that wildlife-flooding practices used in the southern United States are usually inappropriate for the north. Furthermore, government permits will be needed for most activities in a swamp.

Beaver dams often create combination marshes and swamps. Although many individuals are tempted to eliminate the beaver and its dam and replace it with an earthen dam, this is extremely costly and difficult due to soil conditions. If you have a beaver dam on your land, realize its importance to the landscape and enjoy the natural engineering abilities of the beaver.

In summary, swamps occur throughout Michigan and are important havens for many wildlife species. Determining the water source and evaluating the condition of the swamp and adjacent uplands will help you decide on management options. Simply protecting the swamp and its water source as it now exists will often be the most effective management decision. When considering harvest of swamp timber, carefully consider the various possible outcomes as these are highly complex environments.

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STREAMS AND RIVERS

Michigan wetlands are classified according to where they are found. Wetlands that occur on the edges of lakes and reservoirs are called lacustrine. Wetlands that form on the edges of shallow bodies of water such as marshes or bogs are called palustrine. Those that include rivers, streams, and surrounding areas are called riverine. Riverine wetlands are often the least stable because periodic flooding causes erosion and sedimentation.

Riverine wetlands are also among the most important. Streams and rivers serve as travel corridors for wildlife, both resident and migratory. Streams are identified as flowing bodies of water with a defined bank and bottom. These waterways, along with adjacent communities called riparian zones, provide a variety of substrates and an abundance of food--insects for birds and fish; and amphibians and reptiles for herons, raccoons, and other predators. Water, combined with trees, shrubs, and grasses, furnishes a rich variety of habitat for muskrats, mink, and beaver. Frogs and salamanders live in the shallow water of streams and along their muddy banks. Wood ducks laze in quiet backwaters and nest in tree cavities. Kingfishers fish from tree limbs above the river. Vireos, thrushes, and warblers use streamside cover as part of their nesting habitat and as shelter during migration. Brown bats and swallows gorge themselves on insects produced by these waterways and their adjacent communities. Shallow river expanses also provide important spawning-nursery habitat for fish, especially northern pike.

Because waterways are dynamic pieces of the wildlife-habitat puzzle, you are fortunate if a stream or river crosses your property. Michigan has an abundance of moving water--more than 36,000 running miles of navigable rivers and streams--plus countless more miles of brooks and other tiny tributaries. Some are so small they are barely noticeable, and yet each is vitally important.

Management Options

There are several things you can do to improve wildlife habitat in a riverine wetland. Before considering improvement projects, the waterway and riparian zone must be assessed to determine its current condition. In general, if a stream or river has little riparian vegetation, little in-stream cover (rocks, logs, vegetation), is relatively straight and shallow, or is subject to considerable amounts of erosion, it may be in need of some improvements. As with any wetland, it is important to seek assistance before making any management decisions. Contact the Department of Environmental Quality Land and Water Management Division, or your local Conservation District office for assistance with your management plan.

The following are options to consider when managing streams and rivers:

Keep Livestock Out

Allowing cattle and other livestock to access the stream can create enormous problems. The animals are capable of destroying wildlife habitat, polluting the water, and trampling streambanks causing erosion. If cattle must cross the stream to reach pastures on the other side, install a fence that will limit their access to one site. Adding

approaches of concrete, gravel or broken rock will lessen the cattle's impact. If livestock currently drink from your stream, consider the variety of low-cost watering systems now available. At the very least, choose a small section of the waterway that does not have a steep embankment, and weigh the cost and benefits of building a fence.

Improve Riparian Habitat

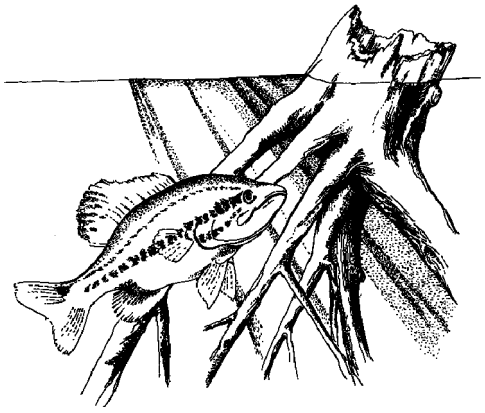
Maintaining a buffer strip from 100 to 200 feet wide or wider on each side of the waterway will help provide homes for wildlife, prevent erosion, and maintain water quality. The buffer will slow siltation of the stream and absorb pesticide and fertilizer runoff. You can improve the existing buffer or create a new one by planting trees, grasses, or shrubs. In southern Michigan, silver maple, red maple, cottonwood, and basswood can all be grown from seedlings. In northern Lower Michigan and the Upper Peninsula aspen, black ash, alder, balsam fir, and white spruce are good species to consider. In really wet areas black spruce and tamarack might be better choices. If beaver are undesirable because of possible tree damage on your property, consider planting evergreens although beaver might even girdle and kill a few of them. Refer to the chapters in the **Forest Management** section for more information on tree species and their requirements. Gray dogwood, silky dogwood, red-osier dogwood, hawthorn, ninebark, serviceberry, elderberry, and highbush cranberry are fruit-bearing shrubs that offer good sources of streamside food and cover for songbirds, pheasants, and ruffed grouse.

If you want to create a grassland instead of forest or brush, wildflowers and certain grasses like timothy, orchard grass, or switchgrass may be suitable choices. Depending on soil conditions, you could also plant alfalfa, medium-red clover, and other legumes, which will attract birds as well as rabbits, woodchucks, mice, and other small mammals. Planting wildflowers is also a good option. If you fertilize or mow streamside areas, stay back from the water's edge a distance of at least 100 feet. For more information, refer to the **Grassland Management** section or to the chapter on **Wildflowers** in the Backyards section.

Doing nothing, of course, is also an option. If you choose not to mow, cultivate, or selectively log the riparian corridor, natural processes will eventually change that area with no effort on your part. The disadvantage to the natural process of succession is that changes may not be what the landowner wants. However, if the natural changes fit within the landowner's goal, then doing nothing is the right management option and will also benefit the riverine wetland.

Any harvest of streamside timber must be done with great care. The trees and shrubs that grow along Michigan's waterways are critical components of wildlife habitat. They attract insects that fish and wildlife feed upon, help cool water temperatures, and provide shade. Fallen trees provide loafing areas for ducks, snakes, and turtles and protective cover for fish. They also provide important habitat for insects and smaller forage fish and are a natural source of nutrients. Besides food in the form of nuts and berries, riparian cover offers dens, roosts, and nesting sites as well as safe travel lanes. For these reasons cutting timber in riparian zones can seriously damage the stream and its value to wildlife if done improperly.

However, if timber harvesting is part of your overall plan, arrange logging trails and roads as far away from the waterway as possible to avoid erosion and any alteration to the stream flow. Also, use extreme caution when cutting within 100 feet of a stream, lake, pond, or open water wetland. Logging can be conducted in the suggested 100-foot buffer area without harming nearby waters if good management practices are employed. Key things to keep in mind when logging within the buffer area are



keeping soil disturbance to a minimum and not operating wheeled or tracked logging equipment when soils are wet. Further, use selective harvesting techniques as they result in the least amount of disturbance. Try to spare most nut and fruit producing trees and leave at least one to six snags or den trees per acre for those birds and mammals that rely upon them. Dead trees about to fall into the stream should be left alone. Remove in-stream logs and fallen trees only if they are causing problems.

Improve In-stream Habitat

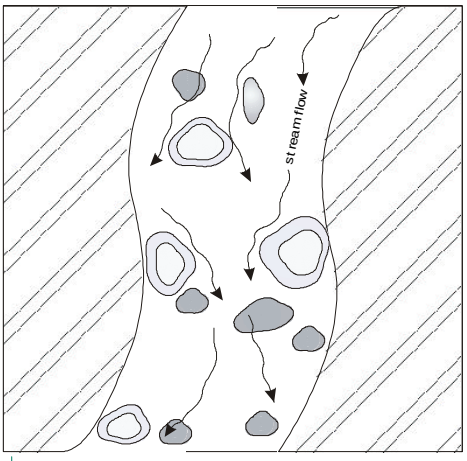
The goal of most landowners who improve habitat within a stream is to improve fish populations, but many of the improvements they make will also benefit wildlife. Stream management is an exacting science, the objectives of which are often to create a diversity of habitat with a variety of water depths, remove sediments by flushing action, add cover for fish, and increase substrate and other food-producing habitats. Wildlife is a secondary beneficiary of these improvements. For example, increasing the amount of insects for fish means more food for turtles, frogs, and birds. Producing more fish enhances the food supply for herons, mink, and otter.

Improving in-stream conditions can be as simple as adding rocks, logs, and rootwads to create hiding cover, or as work-intensive as building wing dams and bankside cribs. Costs can range from no expense to very expensive, especially if earth-moving equipment must be used. Remember, it is important to receive guidance from a professional before starting any of the projects listed below so as to not cause damage to the stream or river. The Department of Environmental Quality (DEQ) Land and Water Management Division is responsible for administering Michigan's Inland Lakes and Streams Protection Regulations. A permit is required to do any in-stream work. This protects streams and inland lakes larger than five acres from unauthorized dredging, filling, or construction of permanent structures below the ordinary high-water mark. The law also requires a permit for dredging within 500 feet of a lake or stream. Alerting Michigan DEQ officials to illegal excavation activities is also an excellent means of stream and river conservation.

The following are five basic project suggestions to consider when improving in-stream habitat:

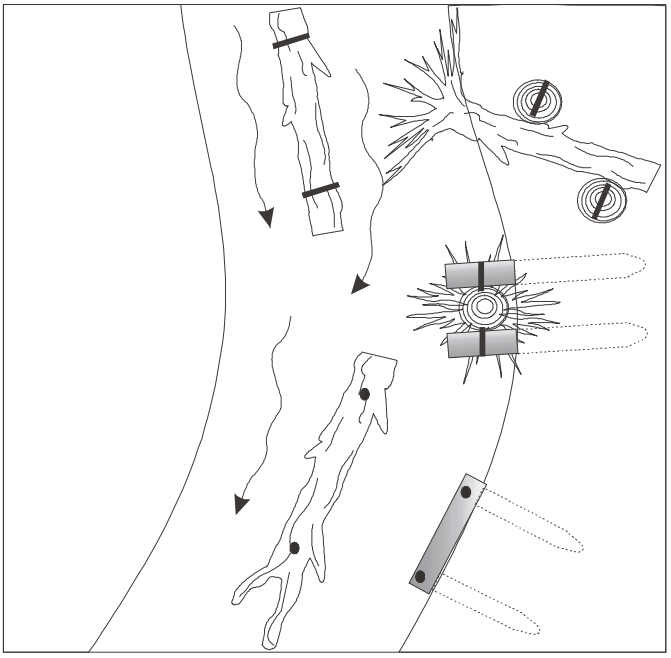
1. **Boulder placement**. Adding large boulders with irregular surfaces creates overhead cover and resting pockets for fish to hide. It also increases water depth from the natural scouring that occurs downstream of the boulders. The best results occur when boulders are placed in groups anywhere in the stream where currents exceed 2 feet per second.

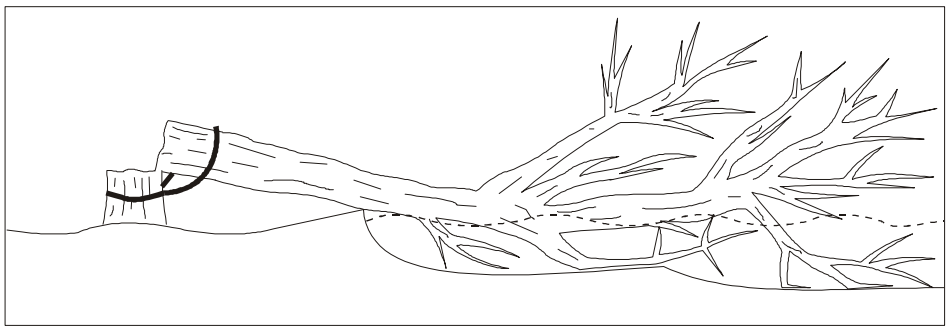
2. **Cover logs**. These structures provide overhead cover where water depth is adequate but cover is lacking. Logs with diameters larger than 10 inches work best in open pools, rapid currents, or flat water where the water is at least 8 inches deep. Crooked logs and those with protruding limbs of several inches produce turbulence and spot scouring, both of which are advantageous. Use logs already in the stream or roll a few felled logs from the bank into the stream. Place them parallel to the flow or at a slight angle. Anchor with stakes (construction rebar works best) to prevent washing away during flood periods.



stream boulder placement

3. **Rootwads**. When trees fall over from windstorms or erosion, their complex root systems, or

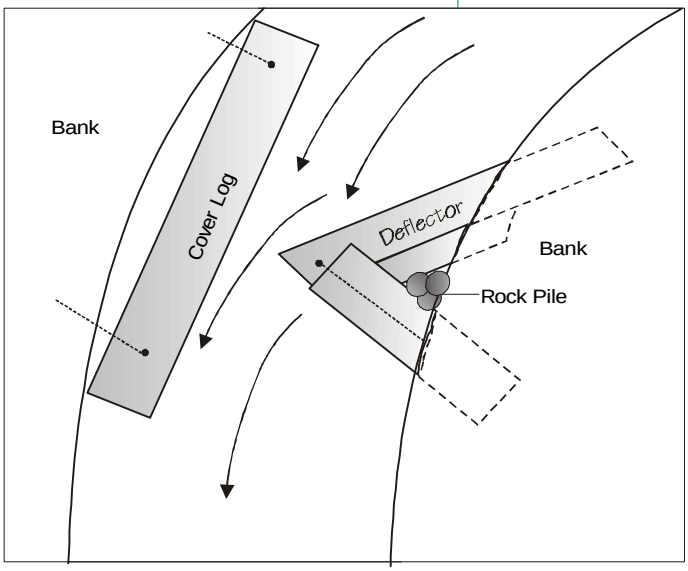

Cover logs and root wads



Hinge-felled tree cover

rootwads, usually become exposed. When submerged, these rootwads can create ideal habitat for fish. If rootwads exist in your stream, leave them. If they lie along the banks, consider pulling them into the stream, especially in places where the waterway meanders to prevent washing away during flood periods.

4. **Tree covers**. Felled trees placed in wide, shallow streams with sand or gravel substrates provide excellent overhead cover for fish and good substrate for insects. They may also help to increase water velocity by serving as deflectors to constrict wide, shallow channels. The increased velocity helps flush sediment out and creates deeper scour pools that create good fish habitat. Individual trees can be hinge-felled so they topple into the stream but remain connected to the stump. Adding a cable from trunk to stump will ensure stability. Choose trees that can be spared without creating an erosion problem. These trees should always be placed nearly parallel to water flow. Placing the tree perpendicular may cause erosion around the ends.



Deflector and Cover Log

5. **Deflectors**. Deflectors constrict and divert water flow to create meanders in the stream. In addition, pools are formed in the stream bed by the scouring and relocation of fine sediment and gravel. Deflectors work well in places where the banks are too low or too wide for dams, and they are much more cost-effective than dams. Various designs abound--the simplest ones involve placing heavy boulders or anchored logs across the stream to create a narrow opening through which rushing water creates the desired effect. Care must be taken not to direct water flow into the opposite bank, thus creating a new erosion problem.

In summary, rivers and streams and their adjacent riparian communities are among the most important of all wildlife habitats. Managing these waterways as part of the overall plan for your property can produce relatively fast, long-lasting benefits that are cost-effective and enjoyable.

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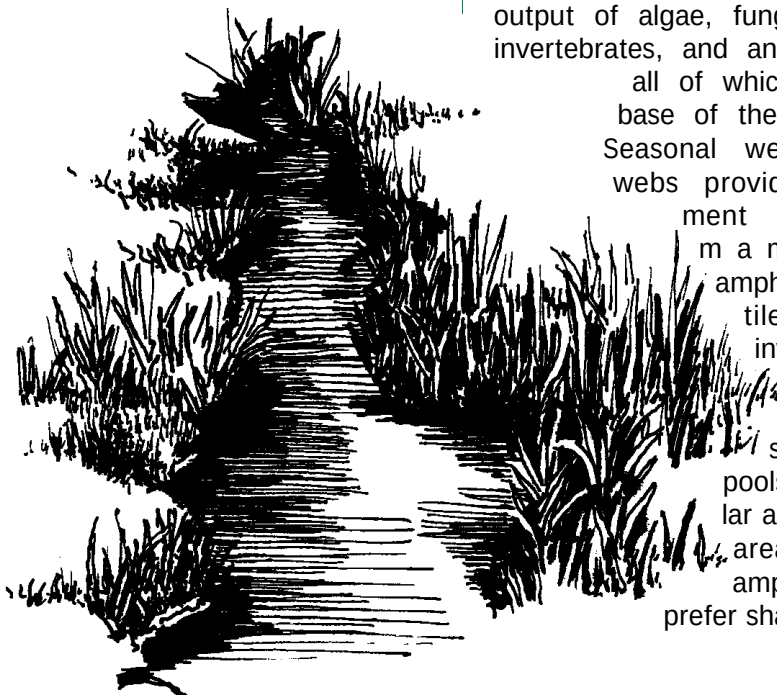
SEASONALLY FLOODED WETLANDS

Scattered throughout Michigan are thousands of small seasonally wet areas that may only hold water from late fall to late spring or early summer. Seasonal wetlands result from winter snowmelt and spring rains, and typically occur in low areas in woods and open fields. Some of these seasonal wetlands may not have visible standing water, but instead they have waterlogged soils. By mid-summer, most seasonal pools have dried out or are just barely moist. Although many of these seasonal wetlands may be less than a half-acre in size, they provide an important food source for migratory songbirds, waterfowl, breeding and feeding areas for amphibians and reptiles, and critical winter food supplies for wild turkeys, deer, and other birds and mammals. There are many different types of seasonal wetlands including seasonal pools, springs and seeps, coastal plain marshes, and lake plain prairies. If you are lucky enough to own any of these seasonal wetlands, you will notice they are used by a wide variety of wildlife.

Seasonal Pools

Seasonal pools are most often found in low, wooded areas that collect runoff water after spring thaw and heavy storms. Although usually found in woodlands, seasonal pools also occur in grasslands and active crop fields. These sites are rich in plants and invertebrates because of their shallow depth and warm temperatures, as well as the build up of decaying organic material. Such conditions lead to a large output of algae, fungi, bacteria, invertebrates, and annual plants, all of which form the base of the food web. Seasonal wetland food webs provide nourishment for birds, mammals, amphibians, reptiles, and invertebrates.



Wooded seasonal pools in particular are important areas for amphibians that prefer shallow water

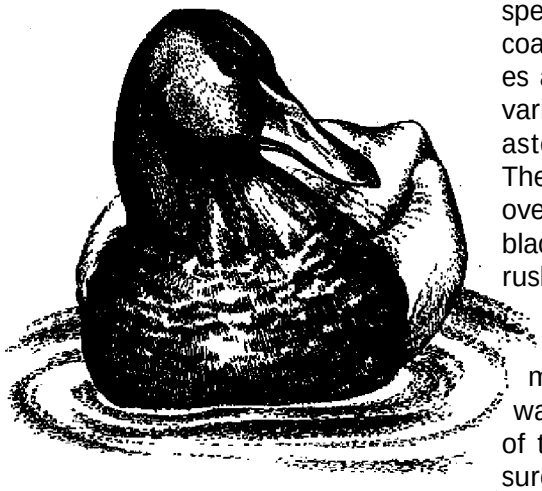
because they are free of predatory fish. Birds migrating through the area often rely on the large amount of insects found in these sites to help them get to their summer nesting area. Local birds also eat the insects to build up energy reserves for nesting and brood rearing. Because these areas are wet for only a short period, the pools generate a large and diverse array of plants including jewelweed, iris, marsh-marigold, skunk cabbage, and blue-joint grass. Plant species found in more open areas include smartweed, beggarticks, nut-grasses, and wild millet. Many wildlife species depend upon seasonal pools for part of their life history. Examples are spotted salamanders, chorus frogs, spring peepers, leopard frogs, wood ducks, yellowthroats, swamp sparrows, muskrats, raccoons, deer, and turkeys.

Springs and Seeps

Springs and seeps occur in rolling or hilly topography where ground water percolates through

smartweed

the soil and emerges from the ground on lower slopes. This ground water develops into either small streams or small bodies of pooled water. Springs are identified by their faster discharge rate and their tendency to come from a single, concentrated source forming a stream, while seeps are identified by their slow discharge rates usually forming pools. These areas are often surrounded by wet meadows, which may not be noticed in the summer due to dryness. Because many springs and seeps do not readily freeze during winter months, they offer a dependable source of water year around. Wildlife depend on springs and seeps when rivers, creeks, ponds, and other water sources are dry or frozen. The ground water that per



canvasback

colates at lower elevations often creates a snow-free area in winter and provides wildlife with access to green vegetation. As flocks of turkeys and herds of deer disperse from winter haunts, they seek these lush food areas. Because these small wetlands--some of which are so tiny as to be hardly noticeable--produce insects, they are attractive to many kinds of songbirds. Further, the constant, always-moving shallow water is favored by reptiles and amphibians, including several kinds of salamanders.

Coastal Plain Marshes

Coastal plain marshes are an unusual and unique kind of seasonal wetland. Though called marshes, these wetlands are more like wet meadows, which are very wet in the spring, yet sometimes dry by late summer. Dating to an earlier geologic time, coastal plain marshes occur primarily along the western side of the Lower Peninsula and as far inland as the middle of the state. Ranging in size from a half-acre to over 20 acres, they do not necessarily exist along the Great Lakes shoreline. They are named after, and are unique because they boast a large number of plant species found along the Atlantic coastal plain. Coastal plain marshes are usually dominated by a rich variety of vegetation such as bushy aster, twigrush, and bulrush. These marshes are also home to over 45 rare plant species such as black fruited spike rush, dwarf bulrush, meadow beauty, and prairie dropseed. Coastal plain marshes usually dry up by late summer to the point were standing water only remains in the center of the wetland. No one knows for sure why they exist in Michigan or how their unusual plant species, most of which are annuals, appeared. The natural periodic reduction of water levels favors these species and helps them to persist by exposing bare substrate for germination.

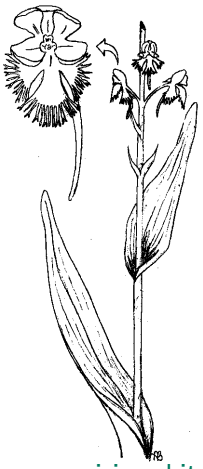
Lake Plain Prairies

Lake plain prairies are coastal wet meadows occurring in scattered fragments along Lakes Michigan, Huron and Erie. These wetlands vary dramatically in their level of wetness from season to season, and even year to year.

Many of these shallow wetlands function as a first step in the transition zone from upland vegetation to deeper wetlands. They are the wet prairies leading to shallow marshes, deep marshes, and shallow open-water zones. Often used as feeding, breeding, and brood-rearing areas for shorebirds, wading birds, waterfowl, amphibians, and reptiles, lake plain prairies can also serve as spawning grounds for muskellunge, smallmouth bass, yellow perch, northern pike, and other fish during years when high Great Lakes water levels flood these areas. Big bluestem, prairie cordgrass, bluejoint grass, and New England aster are examples of wet prairie plants that can withstand occasional, temporary flooding. This community is home to several rare plant species including prairie fringed orchis, tall green milkweed, creamy wild indigo, dwarf bulrush, and globe-fruited seedbox. In addition, several rare wildlife species exist in these prairies such as the fox snake, king rail, least bittern, and red-legged spittlebug.

However, as the shoreline drops in elevation and the soils become more saturated, the vegetation composition changes and red-top grass, giant golden rod,

SEASONALLY FLOODED WETLANDS



prairie white fringed orchis

h aster, and other et meadow plants begin to domi- nate. Bottle- brush sedge, lake edge, and other edges then take er where the soils saturated most of year. Depending the slope of the reline and the ater table, this zone between wet prairies and sedges may be 30 feet wide or hundreds of feet wide. Human development of shorelines have destroyed many of these lake plain prairies that are valuable to wildlife.

Management Considerations

The following are options to consider when managing seasonal wetlands:

•Protect wetland water sources and surrounding uplands to provide critical habitats for wildlife. Draining or filling them for agriculture, housing projects, or other human use fragments wildlife habitat and alters water courses. Logging activities and livestock grazing around seasonal pools can have a major negative impact on water supply, temperature, and ground cover. Altering water courses to raise water levels or duration may reduce plant diversity and insect production and can turn seasonal wetlands into more permanent wetlands such as marshes and swamps. On the other hand, reducing water levels or duration through draining or building roads can turn a temporary wetland, into an upland. Although practices that destroy one cover type may create another, the unique combination of ingredients found only in seasonal wetlands will be gone.

•Protect seasonally flooded wetlands from off-road vehicle (ORV) use. Coastal plain marshes and their associated mud flats, in particular, are prime targets for ORV users who like the "mud holes" but who often damage the soil surface, destroy valuable plants, and alter the hydrology or water resource.

•Restore degraded or drained seasonal wetlands by providing a consistent source of water during the period of late winter through spring. Several organizations and agencies are interested in helping landowners manage seasonal wetlands. For additional information, see the **Wetlands Restoration Techniques** chapter in this section.

•Maintain or establish vegetation in a strip at least 100 feet wide around the wetland to help protect them. Because of their low elevation on the landscape, wetlands are sinks for nutrients, sediments, and pollutants. Manage surrounding uplands to trap erosion and prevent nutrient overloading.

•Never use any wetland as a dumping ground for refuse and debris, including logging waste, because these activities lead to contamination of the water, soil, plants, and animals. Before draining or filling any wetland, contact the Land and Water Management Division of the Michigan Department of Environmental Quality, which is responsible for regulating certain activities in wetlands.

•Remove exotic nuisance plants such as purple loosestrife, reed canary grass, and glossy buckthorn. These aggressive species have little or no value for wildlife and can quickly out - compete native plants in small seasonal wetlands.

•Build loafing platforms to attract turtles and certain species of waterfowl. Nesting structures for ducks, geese, and songbirds, in or near seasonal wetlands, is normally unnecessary. However, nesting structures may help these species to use some areas.

In summary, to the casual observer seasonal wetlands may not appear to be important. Dry during much of the year, they nevertheless provide key food and cover for many kinds of animals during late winter through early summer when wildlife need high energy foods for the start of the breeding season. These wetlands are unique, provide important wildlife habitat, and are part of our diverse landscape. Because they figure importantly in the production and welfare of Michigan wildlife, seasonal wetlands should be protected at all times and restored whenever possible.

bullfrog

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WETLAND RESTORATION TECHNIQUES

Wetlands come in a wide variety of types and sizes, and support a great diversity of wildlife. We have come to realize that collectively wetlands are of great benefit to society by providing wildlife habitat, improving water quality, reducing flood damage, and offering recreational opportunities and aesthetic value. In the past, we had less understanding of the functions of wetlands and often placed little value on them. As a result, many were drained, filled, or otherwise degraded for other land uses.

Historically, Michigan had an estimated 11 million acres of wetlands, or about one-third of the state's land mass. Since European settlement, over 35 percent of these wetlands have been lost. In southern Michigan the loss is even greater -- more than 75 percent in some counties. In some cases, the loss is permanent. In others, we are able to reverse these impacts, such as drainage, and restore the wetland.

Wetland restoration techniques provide private landowners with an opportunity to benefit wildlife, themselves, and their community. If at one time a wetland existed on your land, you might be able to restore it. This chapter explains how.

Wetland Ingredients

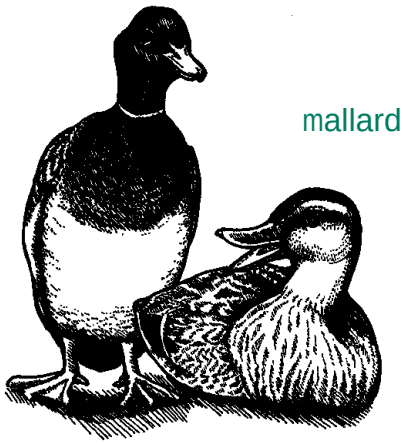
There are three characteristics that every wetland posesses.

1) Hydrology: A supply of water that is at or near the ground surface at least a portion of the growing season.

2) Hydric soils: Soils that develop under saturated conditions. Hydric soils have the capacity to hold water on or near the ground surface for at least a portion of the year.

3) Wetland vegetation: Plants that are adapted to grow in wet soils.

Wetland restoration involves returning one or more of these three characteristics to a site. Hydric soils form over a long period of time and the soil characteristics are very difficult to create. For this reason, restorations take place where the hydric soils remain but the hydrology or vegetation has been altered.



mallard

Wetland Creation Versus Restoration

Wetland creation involves impounding water with berms and dikes or by excavating depressions in areas that did not previously contain wetland soils or vegetation. Essentially, all three key characteristics are missing. Adding these characteristics where they do not exist is difficult, costly, and often unsuccessful. Financial assistance to land owners is not generally available. For these reasons, landowners are often discouraged from undertaking creation projects. However, it is possible to create a small shallow pond for wildlife on upland areas. Refer to the chapter on **Building and Managing Ponds** in this section for more information.

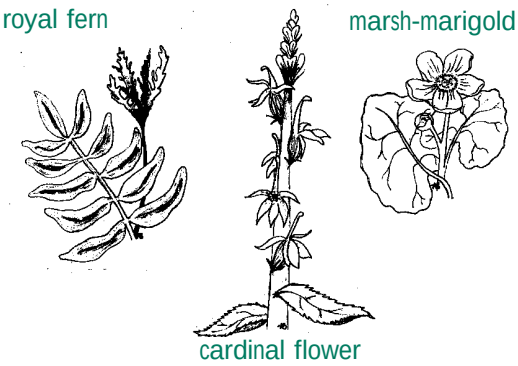
Wetland restoration involves returning one of the wetland ingredients, generally water retension, to a degraded or drained wetland site. Sites that have been ditched, tiled or leveed, or degraded from excessive logging, uncontrolled cattle grazing, or unrestricted off-road vehicle use are all candidates for restoration. Projects can span the spectrum from curtailing these or other damaging practices to restoring the water source and/or other wetland properties. Because the degree of current damage will vary, the effort needed to restore sites will also vary. For instance, a partially drained wetland may be fairly simple to restore to its natural

water level. The remainder of this chapter will focus on restoring wetlands that have been fully or partially drained.

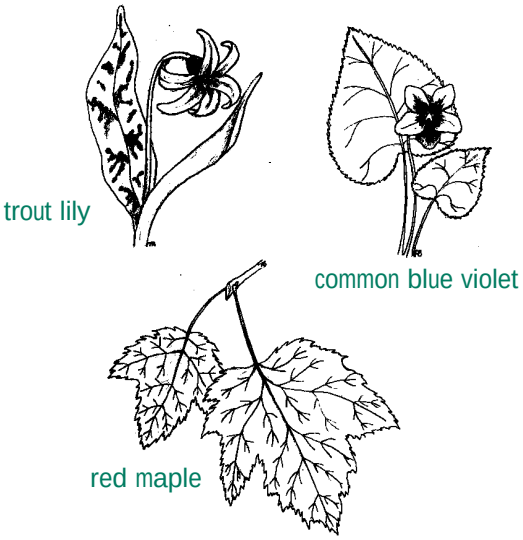
Locating Restoration Sites

Identifying a drained wetland is the first step in restoring it. Some degraded or partially drained wetlands are readily apparent, while others may be apparent only through review of soil maps, photographs, or other records. Drained wetland sites will have hydric soils. You can obtain a copy of the County Soil Survey from your local Conservation District (CD) office and ask a staff person to help indicate any hydric soils on your property. You can also ask the CD staff if aerial photographs are available for review. On photos, degraded wetlands or wet spots appear as dark areas and field tiles appear as dark, linear marks. Reviewing photos taken from several different years, and those taken 20 years ago or more may help identify areas that were wet at one time. In addition, records from, or conversations with, previous landowners or neighbors may help to identify past drainage.

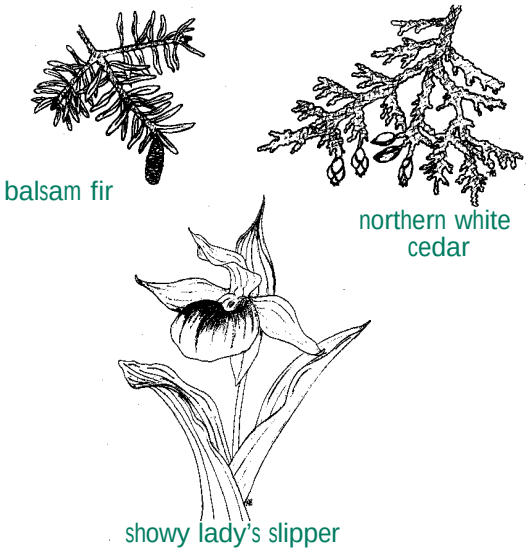
A field inspection can also help to identify restorable wetlands. Hydric soils often display similar field characteristics (see **Introduction to Wetland Management**). Also, drainage ditches or evidence of drain tiles may be apparent. Spots in fields that hold water briefly after a heavy rainfall may be tiled and drained wetland basins. Also, look for clumps of wetland vegetation in existing fields, low areas where crops are stressed or do not grow, or wet areas where farm machinery has been stuck. On fields no longer farmed, look for changes in vegetation including the presence of wetland vegetation, and depressional areas that are wet or hold water at least a portion of the year.



Wetland plants that occur in wetlands 99 percent of the time.



Wetland plants that occur in wetlands 67-99 percent of the time.



Wetland plants that occur in wetlands 34-66 percent of the time

Before Beginning

Wetland restoration is typically NOT a do-it-yourself project. A wildlife biologist or wetland specialist can help assess the project area, look for potential impacts to others, and determine if hydric soils and a water source are present. Voluntary programs offering technical and financial help may be available to help restore your wetland - check with your local CD staff for initial assistance before proceeding any further. You can probably save yourself time and money by working with the CD staff.

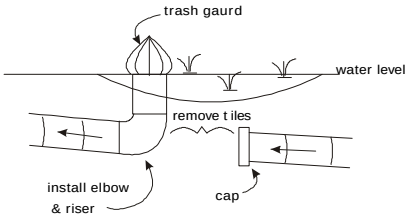
Projects begin with planning to determine feasibility and design. Without proper planning, projects may lead to problems for you or your neighbors. Develop a reasonable management goal and stick to it. Safety is a primary concern both during and after construction. Also, the good neighbor policy applies -you don't want to flood a neighbor's crop field or basement, or interrupt their drainage. By talking with your neighbors you can address their concerns, and may find they want to join in on the project. In addition, watershed size is important - too much water or too little water may mean the project is not workable. If a project looks like a "go," survey equipment will be used to determine water levels for the completed project and to help design structures, such as ditch plugs,

dikes, or spillways. Finally, local, state, or federal permits may be needed. In Michigan, permits are required from the Michigan Department of Environmental Quality (DEQ) for any work in a stream, flood plain, and most existing wetland areas.

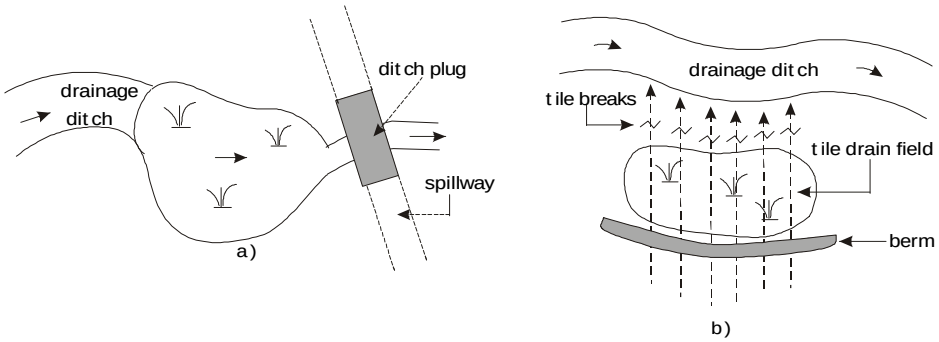
Restoration Techniques

Typical projects restore water to a fully or partially drained wetland basin by removing underground drain tiles, plugging open ditches, or building small dikes. Projects are often one to three acres in size, and have an average water depth of about 18 inches. Many small-basin wetlands of this type that were drained for agriculture, provide opportunities for restoration today. Generally marshes or swamps, with seasonal or permanent water, are most often restored.

The simplest restoration, a "tile break," involves removing a section of underground agricultural tile that is draining a wetland basin. Drain tile, or field tile as it is often called, is usually made of clay or perforated plastic and buried at a depth of two to six feet. Generally, a contractor with a backhoe is used to remove or crush a 25 to 50 ft section of tile downstream of the basin. The downstream end or outlet pipe is then plugged with a bag of redi-mix concrete or clean



Removing tiles from a drain field to restore a wetland



Examples of restoring drained wetlands a) drainage ditch stopped with ditch plug, and spillway b) tile drain field broken, and berm constructed to prevent flooding in areas that are to remain dry.

clay fill, and the trench is filled. Sometimes, a portion of unperforated tile, called a “riser”, is connected to the downstream end of the tile line and brought to the surface in order to control the water level. Water will fill the wetland basin until it reaches the mouth of this riser where it will then flow back through the tile line into the ditch. This may work well when you wish to maintain downstream drainage.

A “ditch plug” restoration builds an earthen wall to impound water. This type of restoration uses equipment to fill a portion of a drainage ditch to natural ground level. Again, a riser may be used to let water flow through a tube once it reaches a certain level. A small dike or berm may also be used, which will impound the water that will begin to collect once the drain has been plugged. A dike prevents the drainage of water downstream and requires a spill way or other water-control structure to regulate the water level and prevent the dike from being washed away during periods of heavy runoff.

Typically, a berm or dike is constructed with a top width of eight to 10 feet and a maximum side slope of 3:1 (three feet of horizontal width to each foot of rise). A three foot high dike would have a bottom width of 24 to 30 feet. When constructing a low-level dike, soil is often pushed up or excavated from within the former wetland site. This helps to form a deeper pool within the basin. Sod and topsoil are stripped from the construction site and stockpiled. The dike or berm is then constructed with subsoil, often with a good clay component. Topsoil from the basin, which is a good seed source for wetland plants, is then spread back into the basin and on the dike or berm. Disturbed upland areas, including areas of the ditch plug, dike, or berm, are seeded with grasses to minimize erosion and provide cover. Generally, nothing is planted in the wetland basin as wetland vegetation usually re-establishes itself quickly from seeds that have remained dormant in the soil.

Managing water, especially excess water, is important on restoration projects. A water-control structure can be used to manage water levels within a project. Examples include plastic or metal risers, and corrugated metal or plastic stop-log structures. These help to manage the normal flow of water. An emergency spillway, which is a wide trough-like opening in the side of the dike, should be designed into wetland restoration projects if excess water is expected

during flood events. Emergency spillways are sized according to the watershed but typically are at least eight feet wide and one to two feet below the top of the ditch plug, dike, or berm. These spillways allow water to pass through without damaging the retension structures in high-water events. Since water management is critical, consult a professional for design specifications suitable for your wetland.

Most restoration projects involve open-area wetlands, but forest and shrub wetlands are also important and can be restored too. Restoration of wooded sites should be done cautiously, however, to avoid killing the trees and shrubs that normally grow in wetlands. Woody wetland plants can often withstand brief flooding during the growing season, but be aware that prolonged inundation may stress trees and kill them.

Maintenance of the Restored Site

Simple basin restorations should be relatively maintenance-free. However, some restored wetlands, particularly those with water-control or earthen structures, require some maintenance. Water-control structures should be checked periodically. Fallen leaves, twigs, or other debris may build up around the mouth of the structure. An accumulation of debris may partially obstruct the flow causing the water level to rise. Inspection of the site, particularly during and after a big storm, will allow you to remove materials before problems develop.

Ditch plugs, dikes, and berms also require some care. Established seedings of grasses should be periodically mowed or burned to prevent woody vegetation from invading. Root growth from woody vegetation will allow water to penetrate the earthen structure, which will cause it to leak and may contribute to a future washout. Annual maintenance also means keeping muskrats, beaver, and woodchucks in check by filling their excavations, and removing some through trapping if necessary.

As you enjoy your restored wetland, you can also keep an eye open for potential problems and address them quickly. It is much easier to solve a problem while it is small than to wait until it is out of hand. Also, remember that a restored wetland is most often only four feet deep at its deepest spot and averages only two feet deep throughout the basin. This is not a fish pond. If you want to create a fish pond, see the chapter on **Building and Managing Ponds** in this section.

State and federal agencies and conservation groups often have programs that may be able to assist you in identifying potential restoration sites and in wetland restorations. These programs may provide technical assistance and cost-share expenses. Start with your local CD office staff as they will be able to direct you to available assistance programs.

In summary, restoring wetlands may require more time, effort, and money to complete than many other wildlife projects. Fortunately, technical and financial help is available, and the rewards are well worth the effort. Most landowners are quite pleased to see how quickly the wetland is re-established when water is restored. They also often report rapid use by wildlife. You will also have the satisfaction of returning to health a part of Michigan's natural history.

FOR ADDITIONAL CHAPTERS CONTACT:
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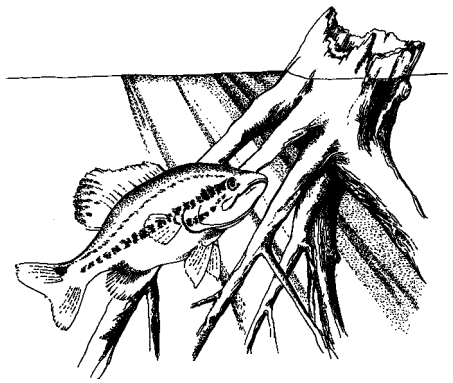
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

BUILDING AND MANAGING PONDS

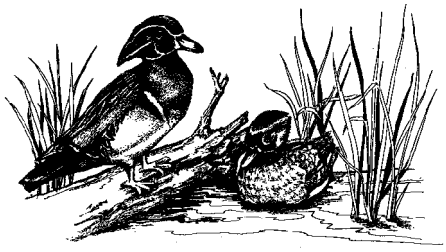
Small and large, deep and shallow, ponds abundantly dot Michigan's landscape. People, fish, and wildlife love the resources that these small bodies of water provide. Michigan landowners have built an estimated 50,000 ponds on farms and near rural households to store water for irrigation and livestock, to provide fire protection, to attract wildlife, and to raise fish for recreation. Deep water ponds are great places for fish production because of their cooler temperatures and reduced vegetation. Although shallow ponds are not as valuable for fish production, they provide suitable sites for cattails, bulrushes, and other vegetation that create food and cover for wildlife.

The type of pond to construct depends upon your goals. If you want to raise bluegills, bass, or trout, then make the pond deep. If your goal is to attract ducks, frogs and wetland birds, then build it shallow. Some landowners try to achieve both goals with a single project and usually fail, especially if the pond site is smaller than several acres. For more information on creating shallow water ponds for wildlife, see the chapters on Marshes and Wetland Restoration Techniques. Landowners interested in pond development for other uses should consult with their Michigan State University Extension office or the U.S. Natural Resource Conservation Service.



Deep Water Ponds

To successfully raise fish you must ensure a balanced fish population, provide appropriate water temperature, and limit growth of emergent (cattails and bulrushes) and submergent (pondweed and milfoil) plant species. The Michigan Department of Natural Resources Fisheries Division has information about how many fish and what species to stock to meet your pond's size and shape. Minimum depth for sustaining warm water species like bass and panfish is 10 feet. For trout and other cold water species, the minimum is 12 feet or more unless a cold spring or stream feeds the pond. The entire pond need not be this deep, but unless 25 to 50 percent of its surface area lies at such depths, the pond will not provide the right amount of dissolved oxygen in winter and range of temperatures in summer that fish need to survive. Even though some fish may live in shallower ponds, they will not grow as fast nor as large as they would in better habitat. In addition, they



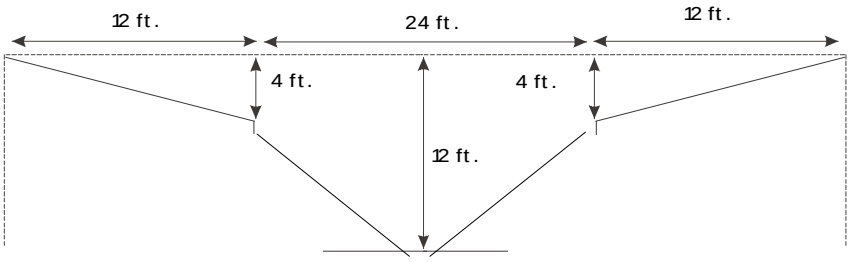
wood duck

are vulnerable to winter and summer kills. Fish ponds should be 1/2 acre or more in water surface area.

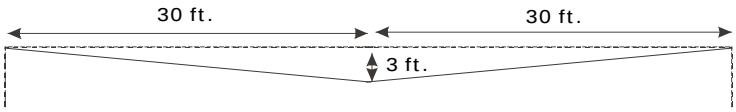
Minimizing the amount of shallow edge around your deep water pond will reduce emergent vegetation, most species of which grow in water less than four feet deep. For this reason, create steep slopes to a depth of four feet or more. Slopes should range from a minimum ratio of 2:1 (2 feet of horizontal per 1 foot drop) to a maximum of 3:1 (3 feet of horizontal per 1 foot drop). Minimize the amount of edge by constructing a circular or rectangluar shaped pond.

Shallow Water Ponds

Wildlife species attracted to constructed shallow water ponds (depending on size) include waterfowl, songbirds, shorebirds, wading birds, amphibians, and reptiles, as well as some upland birds and mammals. Although a portion of the pond can be six feet or deeper--to reduce emergent plant growth and to maintain an opening useful to waterfowl and other wetland birds--depths ranging from six



Example of a deep water pond with minimal shallow edges, due to a 3:1 slope reaching 4 ft deep, a deep water level of 12 ft. to facilitate a diversity of fish species, and a 25% open water area, 24 ft. across, which provides the correct temperatures and amounts of dissolved oxygen, depending on the season.



Example of a shallow water pond with maximum shallow area due to a 10:1 slope reaching 3 ft. deep at a horizontal length of 30 ft. The total width of the pond is 60 ft. to reduce impact of predators on young birds.

inches to four feet are most productive for a variety of wildlife. Ponds deep enough to house fish can have a negative impact on the production of wildlife such as frogs, toads, salamanders, and even ducklings. Wildlife ponds often host some of the same plants as marshes, including cattails and bulrushes in the shallow areas and pondweed and other submerged plants in the deeper spots.

For shallow ponds, increasing the amount of edge makes the pond more productive for wildlife. Irregular-shaped projects or long, rectangular ones with scalloped edges will have more edge, increasing its wildlife value. Slope design should be flatter, ranging from 3:1 to 10:1 (horizontal:drop), and projects that are at least 60 feet wide reduce the impact of predators on ducklings and other young birds.

Constructing a Pond

Generally, ponds should be dug on fairly level areas not suited for wetland restorations. Many parts of Michigan are favorable because of the flatter topography and groundwater which lies close beneath the soil surface. Water will slowly seep through gravel, loam, and sand layers of a dug depression with a high water table. Conversely, surface run-off will readily fill basins constructed on clay soils. While some people have excavated springs to create ponds, we do not recommend it. Remember that springs provide important wildlife habitat to wild turkeys, frogs, salamanders, and turtles. For more information on springs, see the chapter on Seasonal Wetlands.

Most landowners thinking of building a pond assume that low areas offer the best location. Actually, upland sites may be better because the groundwater table generally follows the land's contours, and it may be fairly close to the surface at higher elevations. Upland excavation most certainly will be better than in the low spots, as they may be muck-filled and more difficult to work with. Excavation projects in lowlands or wetlands should be avoided and may require a permit from the Land and Water Management Division of the Michigan Department of Environmental Quality. Marshes, lowland woodlands, brushy wetlands, bogs, and other wetland types provide important wildlife habitat, and converting them to deep or shallow ponds is not recommended.

The Natural Resources Conservation Service, an agency of the U.S. Department of Agriculture with offices in most Michigan counties, have soil surveys on record that can tell landowners how well certain soils on their property will hold water. Soils for pond construction should contain a minimum of 20% clay. It is important when constructing ponds to know water-holding capacity, depth to water, and expected fluctuations of water in the soil because excavation will have to go below that level to maintain water. This information is also helpful if the source of water for the pond is runoff.

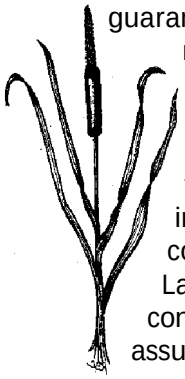
The best way to determine water table depth is to review a soil survey with an NRCS staff member to get an idea of expected normal conditions, then dig test holes when the water table is likely to be at its lowest, usually in the hot, dry

leopard frog

part of the summer. Spring and summer groundwater depths often vary by two to four feet or more in Michigan, which is why many shallow ponds dry up in summer. This condition typically occurs where the soil is sandy or the slope too great. Although the drying process may have a negative impact on fish stocks in deeper ponds, it actually helps promote a diversity of plant growth in shallow ponds. When water returns to the site, typically in fall, wildlife will greatly benefit.

In addition, be sure not to dig the pond too deep. A thin layer of impermeable soil, such as clay, may be what holds the water table where it is. Puncturing this soil layer is much like pulling the plug of a bathtub.If this layer of soil is broken, the water table will no longer exist at the previous level and the created pond will be dry.

Operators of earthmoving equipment all too often do not take groundwater tables into account when they contract with landowners. An agreement to create a pond that is 15 feet deep, for example, could produce a pond with only 12 feet of water if the groundwater table lies three feet below the surface. In this instance the operator would have to dig to a depth of 18 feet in order to satisfy the agreement. Landowners are advised to get a written agreement from the contractor that guarantees water depth, not depth of the excavation. Another misconception is the common belief that water seeping into a test hole must come from springs. Landowners and their contractors all too often assume the "spring-fed" depression they dig will fill with water. In truth, the water flowing into the test hole is probably groundwater seeping through sand or gravel. This water will fill a depression only to the level where it currently exists.



An option is to create a pond by impounding existing surface water. For example, field ditches that furnish a constant flow of water can be dammed with an earthen berm. Adding a spillway will allow you to control water depth. For more information, refer to the brochure on Wetland Restoration Techniques. However, such ponds usually require the periodic removal of silt and other sediments. Also, such projects require a permit from Michigan Department of Environmental Quality and may also need to be coordinated with the county drain commissioner's office. Further, runoff and stream water are rarely as pure as groundwater, which has been well filtered and is free of phosphorus and other pollutants. On the other hand, groundwater may be low in oxygen and contain iron, copper, or other minerals that are detrimental to fish. For this reason, if a fish pond is desired, one should test the water source before 'building' the pond.

The actual design of your project will be based on your goals. Also, design considerations will have to take into account the soil type and terrain and the aesthetics desired. Keep ponds away from woodlots to minimize loading from leaves and other nutrients, and locate them away from homes and buildings for maximum wildlife use. Keep in mind excavating costs can soar if dirt must be moved farther than 150 feet. The most cost-effective ponds, then, are those

invasive species: garlic mustard, glossy buckthorn, and purple loosestrife

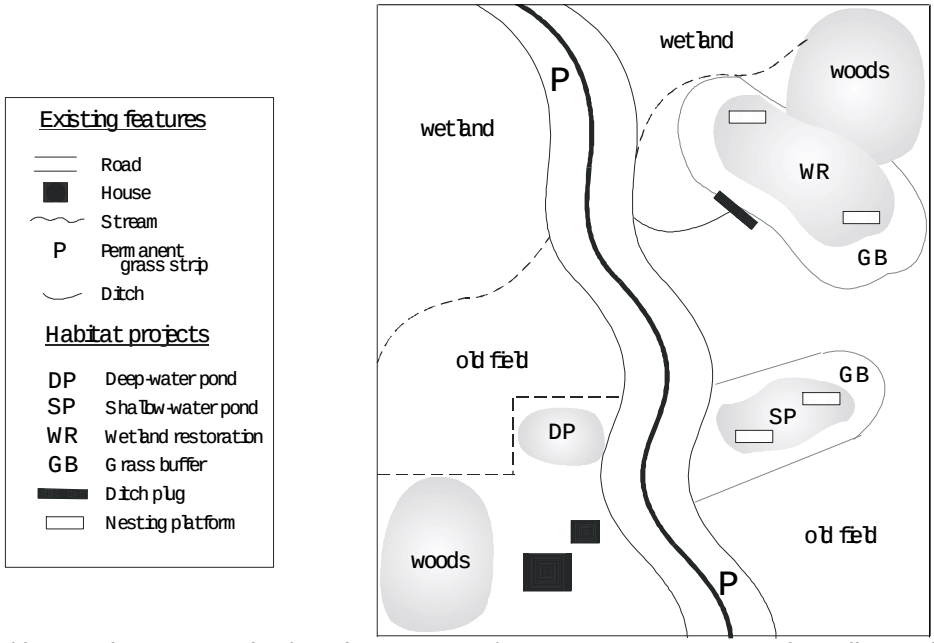
that are no wider than 300 feet. However, they can be bigger if the budget allows.

The least-expensive ponds are usually those that require the removal of excavated dirt (spoil) only once. With the help of the contractor, plan where you will put the spoil. Many landowners are amazed at the large volume of spoil, which typically takes up 20 percent more storage volume once it is removed because it loses its compact nature. A half-acre pond, for example, with a quarter-acre that is 18 feet deep, may easily require a full acre of land for spoil disposal. Place the spoil on an upland site and take precautions to prevent erosion back into your pond.

Management Considerations

Ponds offer opportunities for wildlife and fish management. Those that have a reliable supply of water year around function natural-

BUILDING AND MANAGING PONDS



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

ly and can best be managed by protecting the water source. The hydrology (water availability) of your pond is critical in maintaining the water quality and quantity. A berm around the pond that is one foot high by four feet wide and is vegetated will help to filter surface water from sediments and contaminants before reaching the pond.

Within at least 100 feet of the pond, avoid the application of pesticides and fertilizers, and do not continuously plow or mow to the water's edge. Creating a buffer zone of grassy vegetation at least 100 feet around the pond will help protect the pond. For seeding rates and other information, refer to the Grass Planting chapter. Fence the pond and buffer zone to restrict livestock access. Continuous use by cows, horses, and sheep can damage vegetation and pollute the water source with manure. Do not let the pond become a collection point for trash or debris. Consider building loafing platforms to attract waterfowl and turtles. To learn more, refer to the chapters on Frogs, Turtles, and Snakes, and Homes for Wildlife.

Unavoidable problems could include the invasion of garlic mustard, glossy buckthorn, or purple loosestrife. The latter is a beautifull, purple-flowered invader that can quickly take over a wetland by outcompeting native plants. This noxious weed has little value to wildlife and can be difficult to eliminate because of its strong root-stock. The best method is to dig it out by hand before it becomes firmly established. If already established over a large area this plant may be cut in winter, and then sprayed with the herbicide Rodeo until June. However, it may be easier to identify the plant after June when it blooms, at which time Rodeo can also be used. Be sure to follow all label directions.

In summary, deep ponds can hold fish and shallow water ponds can attract wildlife to your property. However, landowners should think about the many considerations involved, including construction and maintenance costs. Government cost-sharing programs for pond creation are rare. If your property is located in a lowland area, you may be able to restore a wetland instead of creating a pond. This option wold most likely create better habitat for a variety of wildlife. Because of the high priority for restoring drained wetlands and the relative lower cost of these projects compared to pond creations, there are several programs that cost share restorations. Refer to the other chapters in the Wetlands Management section for more information.

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FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

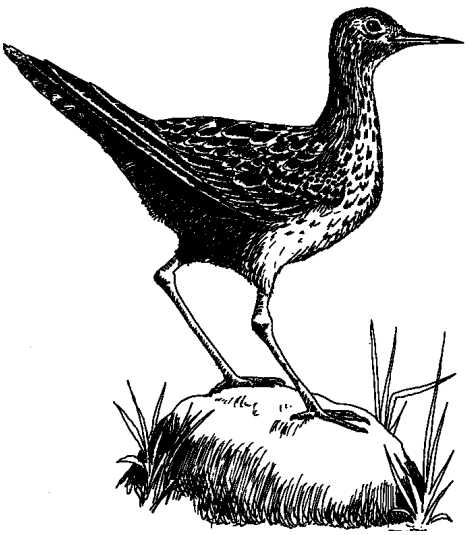
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

INTRODUCTION TO GRASSLAND MANAGEMENT

The nearly 7,000 kinds of grasses make up the most widespread plant family in the world. Grasslands in Michigan range from mowed lawns to idle fields to grainfields. Before settlement, grasslands of several types were scattered throughout Michigan, such as wet meadows, oak and pine barrens, dry sand prairies, and tall grass prairies. One grassland that most people think of is the tallgrass prairie, which was primarily a Midwest ecosystem that extended into southwest Lower Michigan. These prairies were unlike anything the settlers had ever seen, and they supported more than 300 species of wildflowers and grasses, some of which grew to a height of nine feet.

Many experts consider North American grasslands to be a fairly recent development in geologic time. Thousands of years ago, huge glaciers covered much of Michigan. About 14,000 years ago, the climate became warmer and the glaciers began to melt and retreat. Prairies, barrens, and wet meadows began to establish themselves on landscapes that were level or gently rolling on sandy or loamy soils. After the glaciers were gone, the climate cooled and the conifer forests of northern Michigan, including the Upper Peninsula, appeared. Vegetation changed over the next several thousand years with warmer, drier periods favoring grasslands in sandy and loamy channels, rolling hills, and flat lakeplains, and the spread of oak and hickory into southern Michigan.

Perhaps as important as climate is the element of fire to establish and maintain Michigan's grasslands. Whether caused by lightning or set purposely by Native Americans, fire helped prairies to grow by stimulating grass and wildflowers to reproduce, reducing competition from weeds, and discouraging the encroachment of shrubs and trees. No one knows exactly how many prairies existed in Michigan before settlement, but researchers have identified 39 known prairie areas, mostly in the southern Lower Peninsula. These prairies ranged in size from less than 100 acres to 25 square miles and may have totaled approximately 2.3 million acres.



upland sandpiper

least shrew

Value to Wildlife

Grasslands support a variety of wildlife species. In fact, some kinds of birds cannot live in any other ecosystem. Northern harriers, sharp-tailed grouse, upland sandpipers, bobolinks, and savannah and Henslow's sparrows thrive best in grassland habitats of at least 100 acres. Grasslands smaller than 50 acres will attract bobwhite quail, bluebirds, red-winged blackbirds, American goldfinches, dickcissels, common yellowthroats, and vesper, field, and song sparrows. Other species, such as the Eastern meadowlark, grasshopper sparrow, and sedge wren, can prosper in grasslands from 10 to 20 acres. Mammals also find grasslands valuable, such as the meadow and prairie vole, 13-lined ground squirrel, and badger.

Because grasslands provide nesting, brood rearing, and roosting cover, they are important to quail, pheasants, and wild turkeys. Pheasants in particular also find native grasses such as switchgrass, Indiangrass, and the bluestems suitable for winter shelter because the grasses stand up to snow.

Deer use grasslands for food at birth to their fawns there. Rabbits raise their young and find food and security in grassland edges. They are also home to mice, shrews, voles, some kinds of snakes, and a host of avian and ground predators including hawks, owls, raccoons, skunks, opossums, foxes, and coyotes.

Taking Inventory

When you evaluated your land, as explained in the **Habitat Planning** section of this manual, what grasslands, if any, did you find? If you own a native grassland, consider yourself lucky. You may be able to restore the grassland to full productivity by eliminating as much competition as possible and then interseeding desirable plant species. Or you may own an old field that was once in crop production and is now left idle. Field borders, old fencerows, farm lanes and other corridors, and odd areas that can not be plowed or disked offer further opportunities for grassland establishment. Your active hayfields are a type of grassland, too. They can be managed for livestock forage and wildlife. The current quality of your grasslands will depend on soil and water conditions, and plant composition. Each combination may attract different wildlife species.

This **Grassland Management** section has chapters on warm season and cool season grasses, grass planting, converting old fields to grasslands, restoring a prairie, and prescribed burning. What follows is an overview of each.

Warm Season Grasses

There are two basic kinds of grasses--warm season and cool season. Wildlife thrive in both. Warm season grasses are usually referred to as prairie grasses and include Indiangrass, big bluestem, little bluestem, switchgrass, and prairie cordgrass. Native to Michigan, they grow best under the heat of a summer sun followed by warm nights. You can see them mixed with colorful native wildflowers at public and private prairie areas and sometimes along roadsides and railroad rights-of-way. Besides their value to wildlife, warm season grasses can provide forage for livestock and add beauty to the landscape.

switchgrass

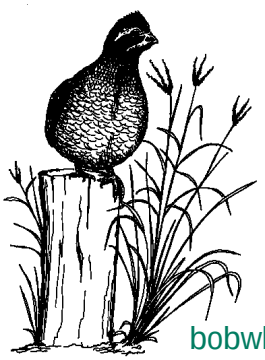
They are four reasons why wildlife biologists usually prefer warm season grasses for wildlife cover: (1) they hold up to the elements, (2) they are native to Michigan, (3) they can be planted along with wildflowers, and (4) they live a long time. Often called bunch grasses because they grow in clumps, these plants do not break down easily under heavy winds or deep snow. Their disadvantages are that they are initially more costly to plant than other types of grass and typically take up to three years to establish. Patience is the key to success. Once native grasses take hold, however, they need little attention and will live many years through proper maintenance. Maintaining them through prescribed burning every few years will keep them healthy and productive for wildlife. Other management options include light grazing by livestock, periodic mowing, or the spot application of a selective herbicide .

Cool Season Grasses

Most of the grasses you see in Michigan are cool season grasses not native to the state. These include brome grass, timothy, and orchardgrass. Native cool season species include Canada wildrye, redtop, and June grass. Alfalfa and clover are cool season legumes that are planted with cool season grasses because the legumes fix nitrogen for themselves and other plants, provide food for many kinds of insects, and offer habitat diversity for wildlife. Cool season grasses and legumes grow best when the daytime temperatures on spring and fall days reach 65 to 75 degrees Fahrenheit followed by cool nights.

redtop

Cool season stands are valuable to wildlife because they provide nesting and cover in spring and summer and sometimes roosting cover in summer and fall. Most landowners are familiar with these grasses. Advice on planting and equipment are easy to come by, and the stands are easy and more affordable than warmseason grasses to establish. Annual mowing will keep them productive although the stands lose vigor over time and may need to be replanted. They also tend to break down under wind and snow.



bobwhite quail

What to Plant and Where

What should you plant, and where should you plant it? Consult your overall Management Plan before deciding to plant cool season or warm season grasses. Many landowners whose goal is to provide year-round habitat for pheasants, quail, and grassland songbirds plant both types side by side, along with a nearby food plot containing corn, buckwheat, millet, and sunflowers or a similar mixture of preferred wildlife foods. However, warm season grasses should be planted before cool season grasses to ensure full stand development. If your property is small and you are able to provide only one component of habitat, consider working with neighbors who might be willing to furnish other needs.

Planting more than one kind of grass will provide the variety of grass heights and density for good nesting habitat, especially for waterfowl, pheasants, and songbirds. Mixing in legumes in cool season plantings and wildflowers in warm season stands will encourage insects, which in turn provide food for wildlife. Stiff-stemmed legumes and wildflowers provide perching sites for meadowlarks, sparrows, and other birds. The wildflowers offer a source of nectar for hummingbirds and bee species.

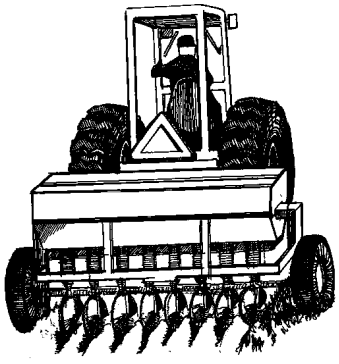
What species of grasses, legumes, and wildflowers you establish depend on soil type, depth, texture, and fertility. Certain grasses and legumes grow better on dry sites, and other types thrive on wet sites. Warm season grasses, for example, tend to grow well on sandy, droughty, or excessively drained sites. Most cool season grasses perform better on well-drained soils of sandy loam.

Besides soil considerations, other site conditions include drainage and erosion concerns and potential weed problems. Check with your Conservation District office for a Soil Survey map, which will identify erosion potential as well as soil types on your property. Identify plants already growing on the site you are considering for grass planting. Also learn what you can about the history of cropping or other land use. This information will help you to know what to plant and how much effort will be needed to maintain the grassland once it is established.

To increase the value of grasslands to wildlife, especially smaller sites of five to 20 acres place them next to or near other suitable grassland habitat. Examples are hayfields, pastures, and wetlands. Your grassland will help wildlife the most if the landscape around your property is also in grasslands or associated habitats. The best defense against predation is to plant a large grassland area rather than a small one. Ten acres is better than five acres, and 20 acres is better than 10 acres. If a larger planting is not possible or practical, you can help protect nesting birds from predation by edge-loving raccoons, hawks, opossums, and skunks, and parasitism by brown-headed cowbirds by placing the grassland at least 50 yards from hedgerows, woodlots, and dead trees. The buffer between these habitat types can be planted to shrubs. The shape of the grassland planting is also important, especially small grasslands. To reduce predation, plant in circles or squares rather than in linear strips.

Old Fields

Idled farm fields, borders and corridors can often be converted to grasslands if the site and soil conditions are favorable. After those determinations are made, you will need to identify what stage of natural succession the field is in. What is currently growing there? Are the plants annuals or perennials? Have shrubby plants like dogwood, blackberry, and sumac already begun to invade? Are there any trees? If so, what kind? Before converting an old farm field to a grassland, you must eliminate the existing vegetation. Burning, mowing, disking and the application of selective herbicides are all methods used to return an old field to bare-soil conditions. Old fields may not be as beneficial to some grassland species as planted prairies; however, they, too, provide food, shelter, and security for many species.



Prairie Restorations

Pure prairies are ecosystems that are relatively free from the invasion of shrubs and trees. They occur where sites are too wet or too dry for woody vegetation to grow, or where plant succession has been checked through fire. If you have a prairie on your property, chances are it will be a prairie remnant that is degraded, but that might be restored. Doing some detective work at the local library and the county Conservation District office may turn up clues such as historical photos. Talking to neighbors and former owners may yield more information. Armed with a good identification guide of native grasses and wildflowers, you might be able to identify remnant prairie plants. Or perhaps a local expert will walk your property with you and help with identification.

If you have a former prairie and want to restore it, you may need to remove shrubs and trees, by mowing, burning or herbicide use. In some cases you may be able to interseed the site, preferably with seed from native plants from the immediate area or begin a new planting altogether.

Excessive weed growth is the biggest hurdle to establishing a lush grassland that has maximum benefit to wildlife. Native grass plantings in particular may take three to five years to dominate the site, especially if weeds were not controlled during the first year after planting. During that first year of life, native grasses grow mostly below the ground as their root systems develop. Because little growth appears above ground where weeds are likely rampant, many landowners become needlessly discouraged. Once the stand is established, though, periodic burning will keep it healthy. Other methods to maintaining grasslands include strip mowing in alternating years, light grazing by livestock, and spot treatment of problem weeds or invading shrubs with a selective herbicide.

Prescribed Burning

A prescribed burn is a fire purposely set to achieve a predetermined objective. Prescribed burns are often used today to kill or set back the growth of undesirable vegetation such as woody plants or noxious weeds and to promote the regrowth of warm season plants such as switchgrass. Most burns take place in the spring, however depending on what you hope to accomplish a fall burn may be in order.

These fires need to be conducted by individuals who are trained and experienced in fire management. Before prescribed burns take place a burn plan has to be developed and burning permits secured from the local fire authorities. Safety from pesonnel injury and damage to property is always the first concern when planning a fire.

In summary, grasslands in Michigan are important ecosystems for many species of birds and mammals. Whether you restore former grasslands, convert old fields, or create new grasslands, patience is one key to success. Another key is regular maintenance, to control natural succession. The benefits, however, include providing valuable wildlife habitat, livestock forage, and landscape diversity that is pleasing to behold.

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PRIVATE LAND PARTNERSHIPS
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COOL SEASON GRASSES

Grasslands are areas often referred to as prairies or meadows, consisting primarily of grasses with associated wildflowers. These areas provide essential habitat for many species of wildlife. Presently, Michigan has only small remnant prairies scattered across the state. At the time of Michigan's settlement, there were approximately 2.35 million acres of grasslands. Historically ranging from several to thousands of acres, grasslands have drastically declined because they have been coverted to agricultural fields or lost because of fire suppression.

Although we have lost almost all of our native prairies, Michigan still has some grassland areas. Non-native cool season grasses have been planted along roadsides, as hayfields and pastures, and often establish themselves in the fields retired from farming. These fields can provide important wildlife food and cover.

Within grasslands, a variety of wildlife such as pheasants, wild turkeys, songbirds, foxes, hawks, raccoons, and sandhill cranes eat abundant insects, seeds, and small rodents that grasslands produce. Also, mice, voles, shrews, woodchucks, and many kinds of ground-nesting birds raise their young there. The size of the grassland plays a significant role in attracting certain species of wildlife. Small grasslands one to five acres in size are activity zones for deer and rabbits. Other wildlife species, such as bobolinks and meadowlarks, may require 20 or more acres of grassland to survive.

There are two types of grasses to consider planting: cool season and warm season. For more information about warm season grasses, please refer to the chapter on **Warm Season Grasses**. Cool season grasses develop most rapidly during spring and early summer when cool nights follow warm days. They begin to grow again in late summer and early fall when these same conditions apply. Growing best in temperatures of 55 to 75 degrees Fahrenheit, cool season grasses go dormant when temperatures reach 90 to 95. These grasses include timothy, orchard grass, and brome grass--all introduced species--and native Canada wildrye, redtop, and June grass, which is also called blue grass. Legumes such as alfalfa and the clovers--ladino, sweet, white, red, and others--are often included in plantings of cool season grasses.


Canada wildrye


redtop

Most wildlife managers in Michigan prefer that warm season grasses and cool season grasses be incorporated into wildlife plans that contain grasses because they provide excellent wildlife habitat. However, for the novice, cool season grasses are easier and less expensive to establish. Normally, cool season grasses are established in one growing season, whereas warm season grasses take three to five years. However, warm and cool season grasses planted in separate side by side stands will provide more diversity and are extremely valuable for wildlife.

Stand Composition

Soil type will determine what kinds of cool season grasses to plant. The Natural Resource Conservation Service can supply, free of charge, a soil survey of your property, which identifies the type of soils you have and where they are located. For a small fee you can purchase a soil test kit from your county Michigan State University Extension office. The test determines if lime or fertilizers need to be applied to the soil for the particular grass that you choose to plant.

Canada wildrye is a native tall erect bunch grass that does not grow into dense stands. Found most often in sandy or marshy shores, it may also grow within sand dunes, and in forests along. Usually reaches a height of two to six feet. A palatable grain, it also

provides good nesting and roosting cover.

Redtop, also native, grows to four feet tall, has delicate leaves and stems, and also provides good nesting and roosting cover, even into winter if snowfalls are scarce.

June grass is a short, nearly prostrate variety that is usually mixed with common white clover or alsike clover, and planted in large meadows for browse. The mixture is tolerant of partial shade and will grow well on the north edge of a woodland.

Timothy and **orchard grass** are both about 30 inches high, ideal for nesting and brood-rearing cover. Timothy grass grows well on sandy loam soils that are fairly well drained, and orchard grass does better on mostly loam soils. Orchard grass is a clump grass, which permits pheasant chicks to easily walk through it. A large variety of protein-rich insects eat its soft, succulent leaves, but it produces poor-quality hay. The stiff, erect stems of timothy create good fall roosts for pheasants as well as good nesting cover for some songbirds. Mixed with ladino clover and red clover, timothy produces an excellent hay crop in early July. When the legumes die back after five or six years, timothy will form a useful pure stand.

Although hated by farmers and gardeners, **quack grass** has high value to wildlife, mostly because its seed head provides food. You may wish to avoid planting fescue and brome grass for wildlife. These sod-forming grasses tend to become too thick to allow easy movement by some wildlife and provide little food value.

orchard grass

timothy

red clover

alsike clover

quack grass

birdsfoot trefoil

smooth brome - A sod-forming grass that tends to become too thick for wildlife to move through.

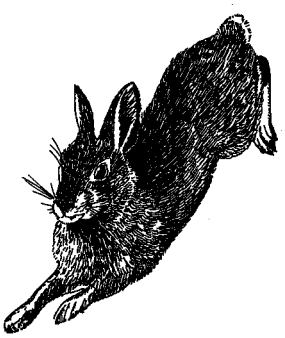
Clover, alfalfa, and the other legumes remove nitrogen from the air and add it to the soil where it becomes available as fertilizer for other plants. Grasslands do not need to be fertilized as long as legumes are actively growing. Adding legumes to cool season grasses improves the variety of the stand by increasing the mix of structure and palatability of plants to plant eaters from insects to deer.

Common white clover is a short creeping clover, very persistent and well suited to wet soils with poor drainage. It also grows well in partial shade and is often selected for woodland trails, forest openings, and logging roads where ruffed grouse, wild turkeys, deer, and rabbits eat it. **Medium red clover** lives three to six years, reaches a height of 12 to 16 inches, and grows on soils ranging from poorly drained to dry, sandy types. It does best, though, on well-drained sandy loams and clay loam soils. Mixed with orchard grass or timothy, it helps provide cover and food, called browse.

Alsike clover lives only two or three years but is well suited to wet, poorly drained sites. An excellent companion to birdsfoot trefoil, orchard grass, and redtop, alsike provides browse and brood habitat in wet meadows.

Ladino clover lives six to ten years and thrives on soils that are well drained or fairly well drained. Planted with orchard grass and timothy, ladino attracts deer, turkeys, grouse, and rabbits in spring and summer.

Both white and yellow blossom **sweet clovers** make high-quality spring browse, excellent fall seed,



eastern cottontail rabbit

and good winter roosting cover for pheasants, quail, and rabbits. The white blossom variety is taller (to six feet), better tolerates droughty soils, and stands more erect during the winter to provide better cover than yellow.

Birdsfoot trefoil looks much like alfalfa but will tolerate more soil types than does alfalfa. Although it grows on a variety of soils from well-drained loams to wet clays and mucks, birdsfoot trefoil is harder to establish than clovers. In addition, birdsfoot trefoil is extremely aggressive after it becomes established and is not always highly recommended.

Alfalfa tolerates only well-drained sites and requires the highest pH soil of all the legumes. It will last six or seven years when annually mowed.

Planting Rates

The kind of habitat you wish to establish will also determine what kind of cool season grasses and legumes you should plant and how much of each. For example, if your goal is to provide one acre of meadow for nesting pheasants, a commonly used mixture is 7 lbs. of medium red clover, 2 lbs. of alfalfa, 3 lbs. of timothy grass, and 3 lbs. of redtop grass.

Cool season grasses are popular with farmers because they establish quickly and respond to heavy fertilization, which can be reduced when mixed with legumes. They do better in high pH soils (5.8-7.0), which are maintained through the use of agricultural lime. The grasses typically outlive the legumes. Legumes should be inoculated with the proper bacteria before planting to increase germination. Seed three or more varieties of grass/legume mixtures at the rate of 8 to 12 lbs. per acre. For best results and highest benefit to wildlife, legumes should comprise 50 to 60 percent of the mix. Sow with conventional tillage (plow/disc/drag/plant), conservation (no-till) methods, or frost seed. More information is available in the **Grass Planting** chapter.

Stand Size

Pheasants, bobolinks, and meadowlarks are among many wildlife species that do best in habitats where the predominant landscape type is grass. Township-sized areas containing 25 percent grassland have the highest benefit to these species. Grasslands larger than 40 acres are usually more beneficial to wildlife than are smaller fields because they make it more difficult for predators to find nesting birds and other prey. One consideration, however, is that if your plan calls for making a large field from several smaller fields, the removal of fencerows may destroy travel corridors and food/shelter habitats for other kinds of wildlife. Also, cool season fields larger than 80 acres begin to have less favorable impact on edge-loving species such as deer.

Stand Management

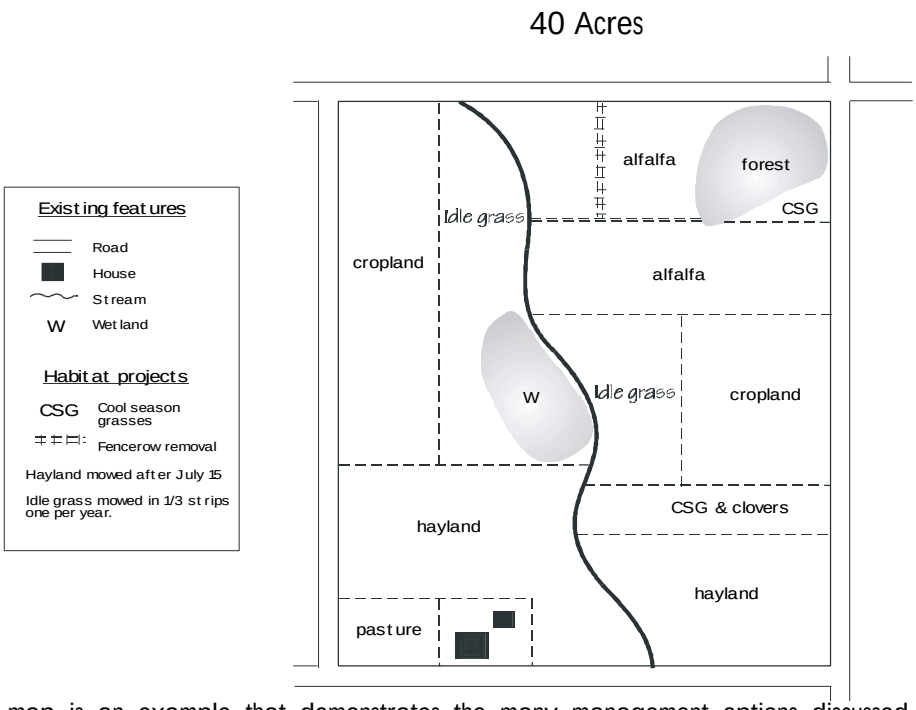
The quality of cool season grasses usually peaks at two to four years after establishment. Subsequently, they become filled with matted grasses and dead vegetation, reducing their vigor and offering less variety. In time, woody plants (shrubs, brush and small trees) move in and dominate. The grassland then becomes a brushland and habitat for other wildlife species.

To keep the stand in high-quality grasses and legumes, management tools such as burning, mowing, discing, fertilizing, and grazing may be needed. The controlled use of selective herbicides is another consideration. These tools stimulate regrowth and reduce the competition from dogwood, sumac, aspen, and other woody plants; increase stand vigor; and provide quality grassland habitat.

A **prescribed burn** is a planned fire, burning with a specific purpose. It is best done on a day with little or no wind, in early spring or late fall when vegetation is dry. Discuss your plans with local authorities, obtain the necessary burning permit, and observe all restrictions and safety procedures.

eastern meadowlark

COOL SEASON GRASSES



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

For more information see the **Prescribed Burning** chapter in this section.

If you plan on a **mechanical treatment**, you could--depending on your goals--mow or disc about one-third of the grassland each year. Mow in strips of 30 to 60 feet wide and leave undisturbed areas from 60 to 100 feet wide between the mowed areas. Mow between July 15 and August 31 to avoid destroying nest sites and give the grassland enough time for regrowth before winter. Mowing height should be four to six inches. Light discing has the added advantage of bringing back annual weeds, legume seeds, and grasses, whose seeds have been lying dormant. However, these annuals may not be the preferred types. Like the mowing treatment, disc in strips 30 to 60 feet wide, but leave at least twice that width of undisturbed cover between strips.

Grazing will also help to set back succession but must be done carefully because overgrazed grass loses productivity. Do not graze during the wildlife nesting season, and do not reduce plant height below eight inches.

Chemical treatment is also an effective means of controlling woody invaders. However, correct application is critical. Carefully follow label directions and take care not to excessively damage non-targeted vegetation.

In summary, cool season grasses provide a variety of benefits to wildlife. They are easy to establish and less costly than other grass options. However, read the additional chapters within this section to determine if cool season grasses are the right choice for you.

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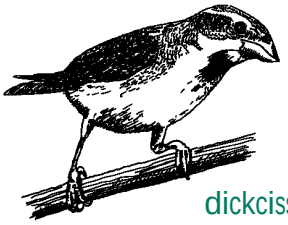
WARM SEASON GRASSES



dickcissel

Grasslands are areas often referred to as prairies or meadows, consisting primarily of grasses with associated wildflowers. These areas provide essential habitat for many species of wildlife. Presently, Michigan has only small remnant prairies scattered across the state. At the time of Michigan's settlement, there were approximately 2.35 million acres of prairies either occurring as tall grass prairies in southern Michigan, or as dry sand prairies in both the central northern Lower Michigan and parts of the Upper Peninsula. Historically ranging from several to thousands of acres, prairies have drastically declined because they have been converted to agricultural lands or lost because of fire suppression.

Within grasslands, a variety of wildlife such as pheasants, wild turkeys, songbirds, foxes, hawks, skunks, and sandhill cranes eat abundant insects, seeds, and small rodents that grasslands produce. Also, mice, voles, shrews, and woodchucks, and many kinds of ground-nesting birds raise their young there. The size of the grassland plays a role in attracting certain species of wildlife. Grasslands one to five acres in size are activity zones for deer and rabbits. Other wildlife species, such as bobolinks and meadowlarks, may require 20 or more acres of grassland to survive.

There are two types of grasses: cool season and warm season. For more information about cool season grasses, please refer to the chapter on **Cool Season Grasses**, Warm season grasses are "bunch grasses" (grow in clumps) that develop most rapidly during summer when warm nights follow hot days. They include the native prairie species such as big bluestem, little bluestem, Indiangrass, and switchgrass. To increase diversity and provide additional food and cover, many warm season grasses are mixed with native wildflowers such as bergernot, leadplant, coreopsis, aster, blazing star, black-eyed susan, and other coneflowers.

Most wildlife managers in Michigan prefer that warm season grasses and cool season grasses be incorporated into most wildlife plans that have grasslands because they provide excellent wildlife habitat. In fact, Michigan landowners have planted a portion of their land that is set-aside in the federal Conservation Reserve Program (CRP) to warm season grasses. These grasses have stiffer stems that stand up to snow and provide more substantial winter cover than cool season grasses. Also, bunch grasses allow young wildlife to move easily through vegetation, are drought tolerant, native to Michigan, and have a longer life than cool season types. Furthermore, bunch grasses, which possess deep root systems, promote better soil infiltration of water that then percolates into groundwater supplies. Besides making better use of water, they are efficient at removing nutrients--nitrogen, phosphorus and potassium--from the soil. Thus, warm season grasses are useful as buffer strips around wetlands as well as in areas where erosion is a problem. Unfortunately, warm season grass seed is usually more expensive. Also, they normally take three to five years to establish compared to one year for cool season types, and may require more maintenance during the early years of establishment, which would include mowing and burning.

Stand Composition

Soil type will determine what kinds of warm season grasses to plant. The Natural Resource Conservation Service office can supply, free of charge, a soil survey of your property. The survey will identify what types of soil you have

and where it might be located. The soil may be wet, moist, or dry; and composed of sandy, loam, or clay. Before planting, yur soil should be tested for pH and fertility. The test should determine if lime or fertilizers need to be applied to the soil for the particular type of grass you choose to plant. Nitrogen should not be applied to warm season grass plantings. Soil test boxes are available from your county Michigan State University Extension office . A small fee will be charged for this service.

The kind of habitat you wish to establish will also determine what kind of warm season grasses and forbs you should plant. For example, if your goal is to provide one acre of grasses for nesting waterfowl, a commonly used mixture is 2 lbs. of big bluestem, 1 lb. of little bluestem, 2 lbs. of Indian grass, 0.5 to 1 lb. of switchgrass and 0.5 lb. of wildflowers. Use native Michigan seed whenever possible. For more information on soil testing, soil surveys, and seed mixtures, see the chapter on **Grassland Plantings** in this section.

Big bluestem is a three to six foot tall perennial whose seed matures in September or October when the normally blue-green grass turns straw color with darker purple tones. Palat-able to livestock when pastured during the growing season, big blue is often referred to as the "prairie king" because of its importance in native grasslands. Big bluestem responds best on well-drained upland sites containing loamy sands, sandy loams, and loams but will also grow on poorly drained soils and wet areas

Indiangrass is a three to five foot tall native grass with similar soil requirements as big bluestem, especially in lowland prairies where the two grow together. It is also common along rivers and sandy hill areas. Its blue-green leaves are similar in color to cabbage leaves, and the six to 10-inch long flower heads are yellow or bright bronze. Fully bloomed--usually in September--the plump heads add beauty to the prairie and are easily identified. It produces excellent quality hay when harvested early and is relished by livestock.

At four to eight feet tall, **switchgrass** is one of the tallest of all native prairie grasses and stands up better to snow than the others. It is also the best adapted to a wide range of soil conditions on both uplands and lowlands and has strong tolerance to pre-emergent herbicides such as attrazine. Thus it can be planted with corn or in the year following corn without herbicide carry-over fears. It grows well in valleys and swales where it receives runoff water. Triangular in outline with one seed at the end of each branch, switchgrass seedheads mature in Sept-ember when the entire plant turns a yellow-orange color. Its smooth hard seed and strong seeding vigor make it easier to plant and establish than the other warm season grasses. However, unless you include it as a minor addition to a mix of warm season types, it will easily dominate the stand. Sometimes pure stands of switchgrass two to 10 acres in size are planted to promote outstanding winter cover for wildlife. It produces abundant good-quality hay and pasture.

Little blue-stem grows from two to three feet tall and is red-brown color in fall with white-tufted seed heads. Widely tolerant to drought, little blue is a reliable producer of native hay and forage as well as an outstanding check against erosion on steep slopes. On meadows and well-managed pastures, it often forms pure stands that maintain themselves against invasion by other species. On drier sites such as gravel slopes and well-drained overflow areas, it occurs in clumps.

Stand Size

Grasslands from less than an acre in size to fields of a 1,000 acres in size will be used to one extent or another by many wildlife species, from insects to deer. Some wildlife species need a large grassland for their survival while other wildlife need small areas or may use only a portion of the grassland for their habitat requirements. Pheasants, bobolinks, and meadowlarks are among many wildlife species that do best in habi-

pheasant chicks

tats where the predominant landscape type is grass. Township-sized areas containing 25 percent grassland have the highest benefit to these species. Grasslands from 20 to 40 acres are usually more beneficial to nesting wildlife than are smaller fields because they make it more difficult for predators to locate nests. One consideration, however, is that if your plan calls for making a large field from several smaller fields, the removal of fencerows may destroy travel corridors and habitats for other kinds of wildlife. Also, warm season grass fields larger than 150 acres begin to have less favorable impact on many species because of the loss of edge. On the other hand, dickcissels and vesper, grasshopper, and henslow's sparrows respond best to large grasslands, up to 1,000 acres in size.

Stand Planting

Warm season grasses take about three to five years to reach maximum height, and so landowners should not judge their efforts too early. Seedbed preparation is critically important. Because the seeds of warm season grasses are tiny and fluffy (except for switchgrass), they are difficult to run through typical planters and broadcasters. Planting alternatives include no-till grain drills specifically designed to plant the fluffy native grass seed, hand seeding, or purchasing more expensive debearded grass seed (seed that has had the fluffy material removed) which then can be planted more easily with a conventional planter. Plant at the total rate of 4 to 6 lbs./acre of pure live seed (PLS) for a mixture of two or three grasses. PLS takes into account that a quanity of seed will contain seed hulls, inert materials, and seed that will not germinate. A 10 lb. bag of seed may contain only 7 lbs. of PLS. Add wildflowers at the rate of 0.5 lbs. to 1 lb. per acre.

Stand Management

The quality of a warm season grass stand usually peaks at five to seven years after establishment. Subsequently, they become dominated with matted grasses and dead vegetation, which reduce their vigor and offer less variety. In time, woody plants (trees and shrubs) become established. The grassland then becomes a brushland and becomes habitat for other wildlife species such as deer, rabbits, and songbirds who prefer brushy habitats.

Watch your native grass stands for signs of deterioration, such as poor reproduction. To keep the stand productive for years, management tools such as burning, mowing, and grazing may be needed. The careful use of selective herbicides is another consideration. These tools stimulate regrowth and reduce the competition from woody plants, increase stand vigor, and promote quality grassland habitat.

A **prescribed burn** is a planned fire, burning with a specific purpose. It is best done on a day with light wind, relatively low humidity, in early spring when vegetation is dry. Discuss your plans with local authorities, obtain the necessary burning permit, and observe all restrictions and safety procedures. Trained individuals using appropriate equipment should conduct burns. For more information see the **Prescribed Burning chapter**.

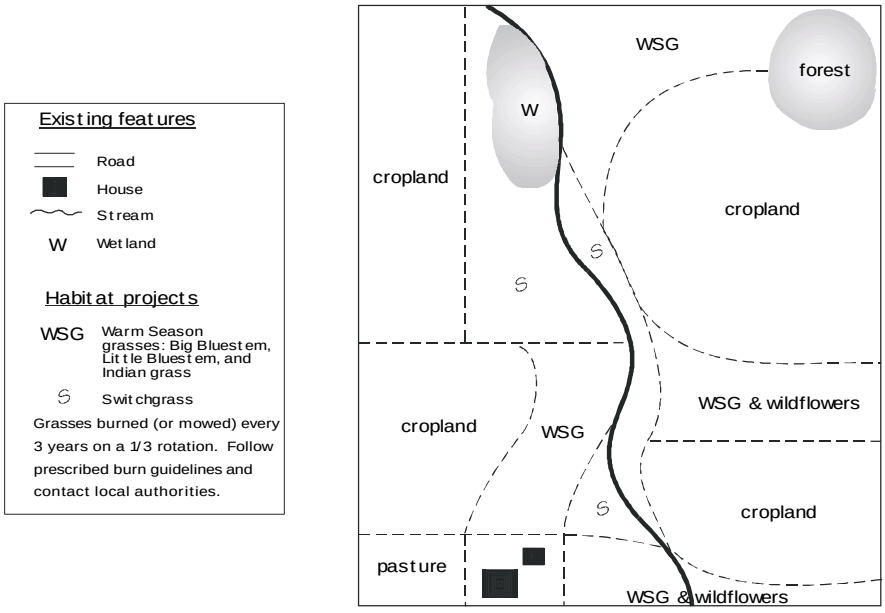
Mowing or grazing in a three to five year rotation will slow encroachment of woody plants. Depending on your goals, and the size of your grassland, you may wish to divide the field into three to five segments of equal size and treat one segment each year. Mow in strips 30 to 60 feet wide and leave unmowed areas of 60 to 100 feet wide between them, or mow blocks of grass on a three to five year rotation. Mowing, haying, or grazing the grass stands should occur between July 15 and August 31. This will give nesting birds an opportunity to hatch their eggs. Do not mow or graze warm season grasses below eight inches in height, damage to the plant could occur if cut below this level. When haying or grazing, fertilizers should be added every three to five years to return nutrients back to the soil.

Chemical treatment will also control woody plants, but correct application is critical. If you ignore label instructions, you may destroy non-target vegetation, which could have a negative impact on wildlife.

In summary, warm season grasslands were originally found throughout much of Michigan. They are an extremely important component of many wildlife species habitat needs. Efforts must continue to protect and enhance the grasslands that remain in Michigan and landowners can play a major role towards that objective.

WARM SEASON GRASSES

40 Acres



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

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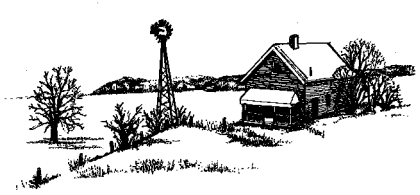
OLD FIELDS

Old fields are those which contain annual plants, perennial broadleaf plants, or a mixture of the two, as well as perennial grasses. Old fields, which include crop stubblefields allowed to lie fallow, are fairly abundant in Michigan, especially where agriculture has been practiced. These land types occur when land goes out of cultivation for a period of time. Some people quit farming, others let fields lie fallow for a year or two, and still others enroll idle acres in federal conservation programs. Old fields may appear to be wastelands but they actually are capable of supporting many kinds of birds and small mammals. For example, foxes, coyotes, hawks, and owls hunt in old fields, pheasants and songbirds live in them, and deer bed there.

Federal conservation programs pay landowners not to produce crops on those acres but to establish permanent vegetative cover to protect the soil from erosion; reduce water, air, and land pollution; and provide wildlife habitat. If your land qualifies, you can apply for cost-sharing programs that may help pay for seedbed preparation,



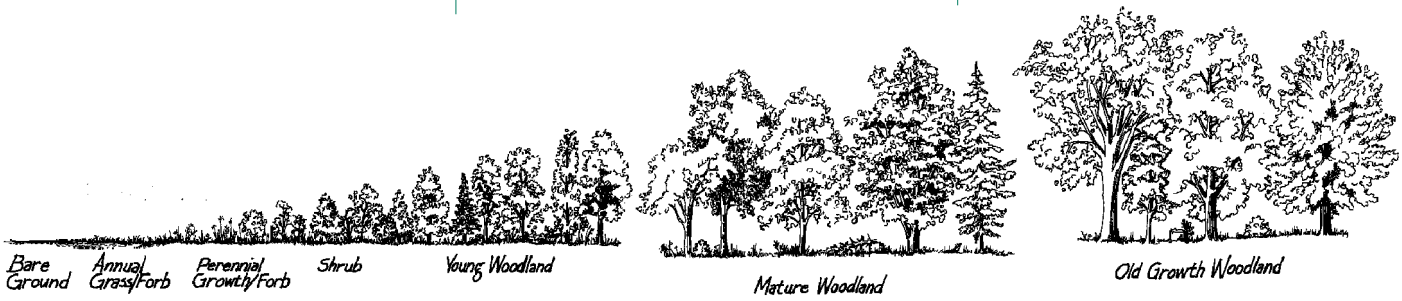
fencing, liming materials, fertilizer, seed, and seeding operation, and pesticides. For more information, contact your county Conservation District.

Land managers should decide whether to keep fields idle or convert them to grassland. This chapter explains the benefits to wildlife that occur when fields are left idle and natural succession is managed.

The Role of Succession — A Land Aging Process

Old fields left idle are one of the early stages in the five steps of the natural cycle of succession that, over time, turns bare ground into a forest. Bare soil is the starting point. The first plants to establish themselves in bare soil are annual plants which live one growing season and then die, such as ragweed, pigweed, smartweed, lambsquarter, foxtail, pokeweed, barnyard grass (wild millet), and mare's tail. These plants provide seasonal nesting and brood-rearing habitat for pheasants, quail, bluebirds, and other songbirds, and insects for food.

The next successional stage is biennials and perennials. Perennials are those non-woody plants that grow back year after year. These include goldenrod, asters, milkweed, daisy fleabane, other forbs, and many kinds of grasses and clovers bush, ladino, common white, alsike, and others. Biennials are those plants that grow one year and produce seed the next year. They include sweet clover, mullein, curly dock, wild mustard (yellow rocket), shepherd's purse, black mustard, foxglove, and the thistles. Small mammals such as mice, rabbits, and skunks now begin to use the habitat, along with foxes, hawks, and owls, an abundance of butterflies, meadowlarks, bobo-links, Savannah sparrows, and other songbirds.




opposum

After a few years, sumac, dogwood, blackberry, autumn olive, buckthorn, and other shrubby plants begin to invade the habitat. It now becomes more attractive to raccoons, opossums, deer, and songbirds such as cardinals, gray catbirds, and juncos.

As succession continues, red maple, cottonwood, birch, aspen, and chokecherry are tree species most likely to invade. During the early stage of this forest development, young seedlings provide browse for rabbits and deer. The increasing amount of vertical structure attracts thrushes, woodpeckers, blue jays, and orioles. As the forest grows over time, more shade-tolerant trees like sugar maple and beech invade. Squirrels, wild turkeys, deer, and wood ducks are examples of wildlife that eat the nuts produced by these trees, which also furnish den cavities for screech owls, squirrels, raccoons, woodpeckers, nuthatches, and chickadees.

Managing Succession

You can manage your land for any stage of succession, or you can create as much diversity as possible by managing for several stages at once. How you manage your old field depends on three items:

(1) the goals of your overall plan

2) the size, shape, and other conditions of your property

(3) what "tools" you choose.

There are at least three “tools” to maintain idle fields.

Prescribed burning is the well-planned and controlled use of fire to speed up or set back natural succession. In forests, a very hot fire will set back succession, but a cool fire in a young forest can actually advance succession. To fully understand the results of burning habitat on your land, consult with a wildlife biologist or other professional. Also, be sure to check with the local fire department to see what regulations apply. Remember that prescribed burning can be dangerous and should be done with the help of a trained professional.

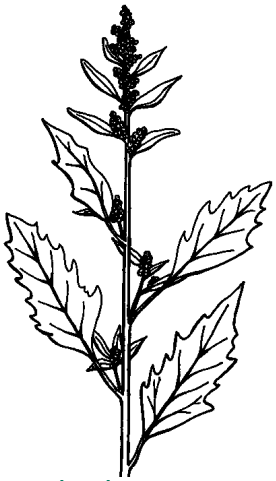
For more information see the **Prescribed Burning** chapter within this section.

Chemicals such as herbicides and fertilizers are often used to maintain openings in forests, to control the invasion of woody plants in the early stages of succession, or to promote the growth of desirable plant species by eliminating their competition. The use of herbicides, if applied properly, changes habitat but generally does not have a toxic effect on wildlife. The use of fertilizers tends to increase plant growth and nutrition.


ragweed


pigweed


barnyard grass


lambsquarter

quack grass

Chemicals such as 2-4-D will eliminate broadleaves for a season and reduce diversity in the stand. Herbicides such as glyph-osate (Round-Up) will kill all plants. If you disk the field without using an herbicide, quack grass will quickly spread eliminating valuable annuals. Using a herbicide will reduce quack grass and allow the favored annuals to come back. Seeds of annual plants are larger than those of perennials and are more preferred by wild-life. Important ones are giant and common ragweed, smartweed, barnyard grass, lambsquarter, pigweed, and foxtail. Wildlife use this food year around, but it becomes most important in winter and early spring. Indiscriminate use of herbicides or fertilizers, however, can have more negative than positive effects. Seek the advice of a conservation professional before applying chemicals.

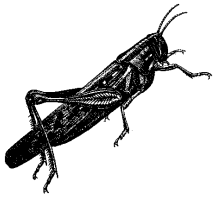
Mechanical alterations, which include mowing, manual cutting, discing, and plowing, are other methods for maintaining early successional stages and for removing unwanted vegetation. Soil type, depth, potential erosion, and the size and density of the target vegetation are all factors to consider. Also, the mowing of some woody species causes them to grow faster and spread more rapidly.

Fields left alone for eight to 10 years will produce primarily goldenrod and asters, which have limited value to wildlife. Discing a portion of the idle field each year on a three- to five-year rotation will restore root vigor by reducing the effects of crowded root systems. Discing will also scatter the seed to better establish valuable annuals. For example, if your idle field is 25 acres, disc five acres (five one-acre blocks or strips) each year to get the complete range of early successional annuals, biennials, and perennials.

Site Preparation and Stand Maintenance

Field preparation should create a bare-soil condition through plowing or repeated discing. Eliminate quack grass with Round-Up or a similar herbicide. After the last field tillage, the seeds of dormant annual plants will grow into the prepared site and provide first year food and cover. Augment, if you wish, with a cover crop of small grain. The best soil pH for weed growth and crop growth is 6.0 to 6.5. If soil pH is above 5.5, the dormant seeds of various clovers (which you can rotate with periodic discing) will naturally sprout and provide two or three years of food and cover. If pH is below 5.5, add lime.

Second-year growth will show more annuals, plus biennials and seedling perennials. Each successive year will show a greater percentage of perennial forbs and grasses. A once-over deep discing during the spring of the fourth year will again create a mixed annual-perennial crop. A heavy discing two or three times over will set back the site even further. Continue to disc on a rotational basis or recycle the field by plowing if grasses and perennial forbs cover more than 70 percent of the ground surface.



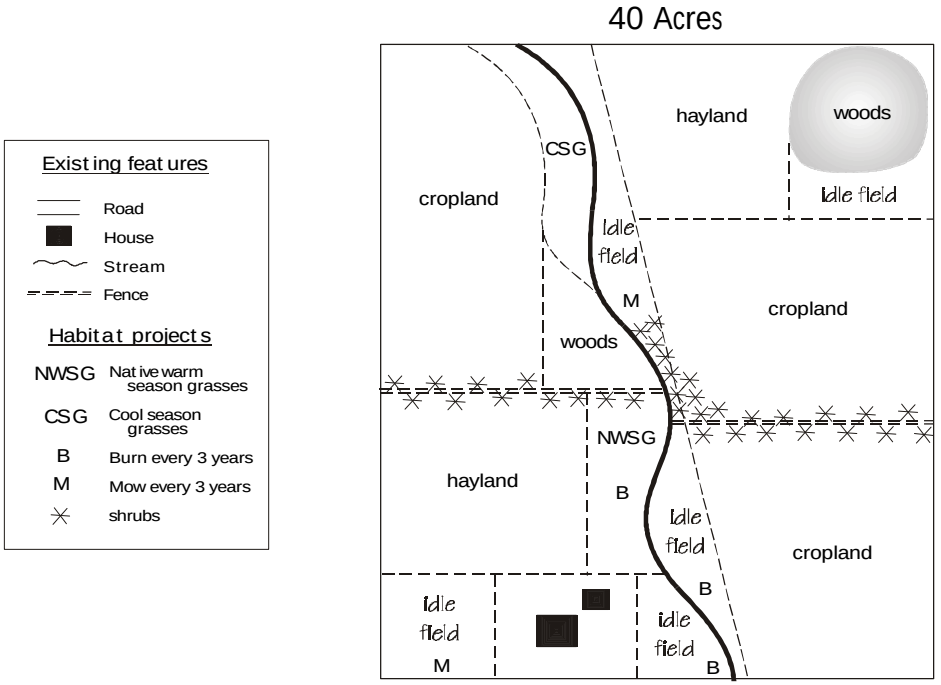
grasshoppers are abundant in old fields.

Planting Options

Because plantings assist the advancement of succession, they are usually done in combination with one or more of the other tools. The timing of discing or other treatments determines which annual weed varieties will dominate in an idled field. Fields treated from April 15 to June 1 will usually explode with lambsquarter, pigweed, and ragweed. The earlier the treatment, the more ragweed will appear in the stand. Stands prepared later in the summer will favor annual grasses and the establishment of biennials.

redtop

You can help provide additional wildlife food by planting a crop in the old field and not harvesting it. A field prepared in September and lightly seeded to winter wheat (one bushel per acre) will provide wheat seed, abundant insect life and a late crop of ragweed seed. The mixture of unharvested wheat and ragweed will furnish a food source and summer/fall roosting cover for pheasants, quail, and rabbits. Some of the wheat will provide a second-year crop through volunteer seeding. Likewise, a field planted in early spring (before May 1) to oats (one bushel per acre) will create a



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

similar food/cover situation for one year. Not being winter hardy, the oats will offer a food source for only one year.

If you plan to manage idle fields for grassland habitat, consider planting cool season and warm season grasses. Cool season grasses are those species which grow most rapidly during spring and early summer and again at the end of summer and early fall when cool nights follow warm days. These include grasses such as orchard grass, timothy grass, June grass, and redtop, which are usually mixed with many kinds of clovers (white and red). Warm-season grasses grow most rapidly during the peak of summer when warm nights follow hot days. Growth slows in fall when soil temperatures drop. Native grasses to Michigan include Indiangrass, switchgrass, big bluestem, and little bluestem. Whenever possible, plant native species and follow natural patterns as dictated by the terrain and soil conditions of your property. Questions about suitable plants, sources of planting stock, and ground preparation are best answered by your Conservation District wildlife biologist, local extension agent, or NRCS staff. For more information, see the chapters on **Cool Season** and **Warm Season Grasses** in this section.


Indiangrass

In summary, old fields provide not only a variety of benefits to wildlife but also help protect soil from erosion and reduce water, air, and land pollution. There are many management options that can assist you in maintaining your old field. Choose one that will help meet your wildlife goals.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

PRAIRIE RESTORATIONS

Restoring a prairie may occur in two ways: (1) rehabilitating a degraded site, or (2) reestablishing a site by planting a new prairie. Before any management techniques can begin, it is important to determine if the site was historically a prairie and to identify any prairie plants still growing. This chapter will guide you through the step-by-step process needed to restore your prairie.

Landscape Perspective

Before settlement, Michigan grasslands were mainly barrrens, savannas, and wet prairies with a few dry prairies. Dry prairies, in particular, disappeared quickly because they often grew on rich soil and were easy to clear for farming. Researchers have identified at least 39 prairie areas that existed prior to European settlement. They ranged in size from 80 acres to 25 square miles. Estimates of the amount of prairies when Michigan was first settled is about 2.35 million acres, and they were mostly confined to portions of the Lower Peninsula, which were lightly timbered and contained large park-like openings called savannas, barrens, or prairies.

Prairies were grasslands, which had few if any trees. Barrens, on the other hand, may have had several trees scattered across each acre of their landscape. Savannas, which served as transition areas between grasslands and forests, had many trees per acre but not more than 50 percent canopy cover. Grassland specialists classify most savannas as either oak savannas or jack pine savannas. The most scenic of these were the oak savannas of southwest Lower Michigan, which extended as far north as Newaygo county. A large area of dry prairie existed along the Detroit River, and the state's largest wet prairie occurred for 16 miles along Saginaw Bay from Quanicassee to nearly Bay Port and was three miles wide at its widest point. Wet and dry prairies occurred in Wayne and Oakland counties. Presently, Detroit Metro-politan Airport is sitting upon a historical wet prairie where remnant prairie plant species still persist.

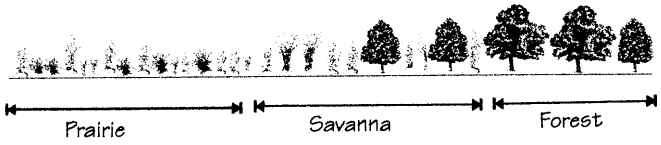
The Importance of Prairies

Prairies are an important part of any ecosystem where they occur. They provide key habitat for many

species of wildlife, serving as important breeding, feeding, nesting, and brood-rearing centers. Bobwhite quail, wild turkeys, bluebirds, meadowlarks, bobolinks, and other songbirds eat the abundant insects and seeds that prairies provide. Mice, voles, shrews, and woodchucks, along with many kinds of ground-nesting birds, raise their young there.

Prairie plants encourage infiltration of water into the soil because their root systems are deep. Better percolation increases recharge of ground water. Besides making better use of water, they are very efficient at removing nutrients such as nitrogen, phosphorus, and potassium from the soil. These long-lived plants can tolerate seasonal flooding, drought, and other severe environmental events.

Prairies often become established in areas where flooding, fire, or other disturbance limits competition from trees and shrubs. Wet prairies, for example, may be under water part of the year; dry prairies



Prairie-forest continuum: Boundaries are not clearly established, blending occurs between habitat types.

may grow in sandy soils too dry for trees and shrubs. Fires, whether occurring naturally or lit deliberately by Native Americans, played a dominant role in the ecosystem because they encouraged native grasses and forbs (wildflowers) to grow and discouraged the encroachment of trees and shrubs.

Prairie Identification

One of the first steps to determine whether or not you have a remnant prairie is to check historical maps showing the presettlement vegetation for your county. Your local Conservation District office has these maps, which show the forests, prairies, and wetland types discovered by Michigan's original surveyors. However, the maps are representative only to a scale of 20 acres, and so smaller areas may have been overlooked. For this reason it is also important to look for remnant prairie plants on your site in areas that may have contained grasslands historically.

The best way to identify prairie grasses and wildflowers is to carry a field guide containing color photos or drawings. Major grasses to look for include big bluestem, little bluestem, Indiangrass, and switchgrass. Key wildflowers are rough blazing star, gray-headed coneflower, common evening primrose, butterflyweed, black-eyed Susan, moth mullein, swamp milkweed, cardinal flower, Joe-pye-weed, hoary puccoon, aster, coreopsis, tick clover, bee balm, prickly pear cactus, horsemint, and roundheaded bush clover. You may find these plants as scattered clumps across a grassland or opening, or you may discover them as bunches in several smaller areas. Living treasures, these remnant prairies are a snapshot to past native systems, and every attempt should be made to restore them.


black-eyed Susan

For species descriptions, refer to the chapter on **Warm Season Grasses** in this section and to the **Wildflowers** chapter in the Backyard Management section.

Prairies may be stable grassland systems where the invasion of trees and shrubs does not occur. However, more commonly, there is encroachment of oak, pin cherry, spirea, sumac, aspen, autumn olive, june berry, sassafras, and white and jack pine.

Evaluating the Restoration Process

The **Wetland** section covers restoration and management of wet meadows, fens, and wet prairies. This chapter focuses on the restoration of dry prairies, barrens, and savannas. The three key methods of restoring them include the following:

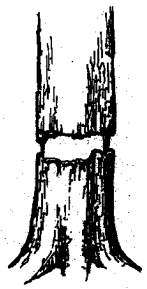
(1) tree and shrub reduction or removal
(2) prescribed burning, which may be followed with interseeding of prairie plants
(3) the new planting of the site

For best results, choose the method that produces the greatest benefit with the least amount of disturbance to the ecosystem. Remember that in most prairie restorations, you are dealing with a sick patient. The way to health is to nurture the patient over time. The way to do that is to first identify your goal. If you want to restore an oak savanna or barren, for example, then allowing limited tree growth on the site is acceptable. But if the goal is to restore a tallgrass prairie, then trees must be eliminated and kept out. If remnant prairie plants simply do not exist, you may have to start over completely.

Tree and Shrub Removal

Sumac, aspen, black locust, autumn olive, hawthorn, honeysuckle, buckthorn, and raspberry are aggressive species that often take over Michigan's native prairies. If any of these aggressive species exist on your restoration site, remove them by cutting them between July through September and immediately applying a glyphosate herbicide such as Roundup to the stump. Be sure to follow all label directions.

On sites with high densities of oak, hickory, or black walnut, you will need to remove or greatly reduce their numbers. Left unchecked, such species increase to the point where they shade the ground and will not let grasses and wildflowers grow. Use a chainsaw on larger trees or a limblopper on those that are sapling size. Another method to kill them is to cut a two-inch deep band around the trunk at two feet above the ground and another two inches higher. To complete this "girdling" treatment, use an ax or hatchet to remove the bark between the two cuts.


"girdling"

Prescribed Burning and Interseeding

On sites where many prairie plants currently exist and there is limited competition from trees and shrubs, a prescribed burn is in order. Fire increases prairie plant growth, flowering, and reproduction and lengthens their growing season, while reducing the growing season for weeds. Further, fire helps control invasion by killing woody plants and returning important nutrients to the soil.

A prescribed burn is a planned fire that is burning for a specific purpose. First, create a burn plan, which includes discussion with local authorities, obtaining any required permits, and observing all restrictions and safety procedures. These include carrying out the burn on a day with light wind and relatively low humidity in early spring or late fall when vegetation is dry. For more information, see the chapter on **Prescribed Burning** within this section.

For remnant prairies that have low plant densities or lack a variety of prairie plants, consider interseeding after the prescribed burn.

Interseeding is the process of sowing seed into the existing soil. Hand broadcasting, machine broadcasting, or drilling with a no-till planter are interseeding methods. When broadcasting by hand or machine, prepare a mixture of 50 percent seed and 50 percent perlite, vermiculite, or cracked oats. The material will help carry the light, small seeds and enable you to spread them at recommended rates. Divide the site into sections to ensure that you will have enough seed to cover it uniformly.

Try to match the seed mix to the soil type, using plants that like moist conditions or sites in low-lying areas and plants that prefer dry soils on upland sites. For best results, secure local seeds, collecting from on site or as close to the site as possible. You should always check with landowners for permission. After broadcasting the seed, incorporate it into the soil by shallow (less than 1/2 inch) hand-raking, dragging, disking, or by the pressure of a cultipacker. For sites larger than three acres, a no-till drill is the best way to get the seeds into the ground.

Planting

In highly degraded areas, such as former agriculture fields, where very limited or no prairie plants exist, burning will not be enough to ensure a quality restoration.

Planting a new prairie may be the best management practice. Consider two methods:

(1) The use of conventional farm tillage to prepare the site by killing or removing all former vegetation before planting.
(2) the use of chemicals to eliminate all present vegetation, and a no-till drill to incorporate the seed into the soil.

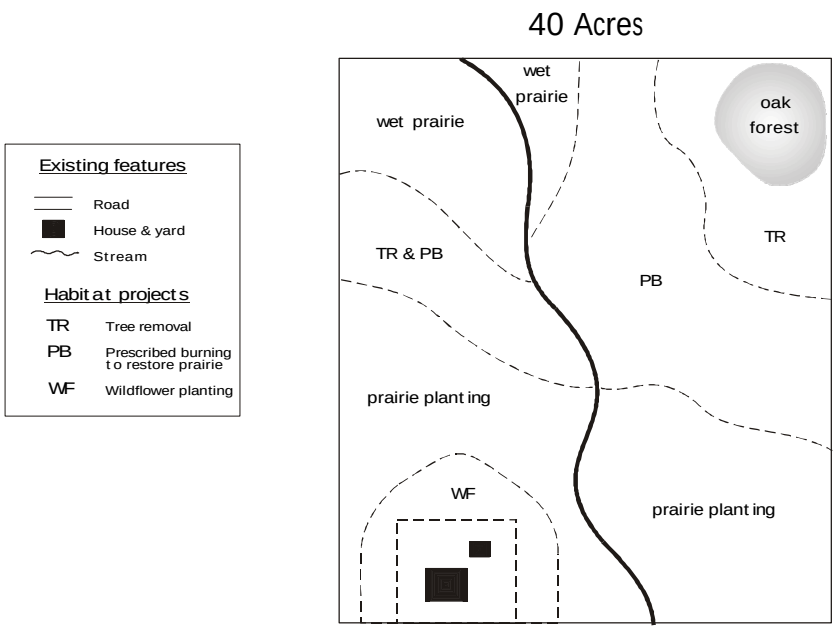
With either method, plant during the period May 1 to June 15. Native grasses and wildflowers need only be planted 1/4 inch to 1/2 inch below the soil. However, it is not uncommon to see seed sitting on top of the surface after planting. For more information, see the chapter on **Grass Planting** in this section.

Post-Planting Maintenance

The amount of weed seed present in the planting site is usually the most variable and unpredictable factor in prairie restoration. There is no way to predict with certainty the amount of weed competition that will be present during the first few years of restoration. Landowners can do four things to reduce the weed problem:

(1) plant as late as possible in spring,
(2) mow or hand weed to reduce shading
(3) burn at prescribed times
(4) spot apply herbicides
(5) have lots of patience

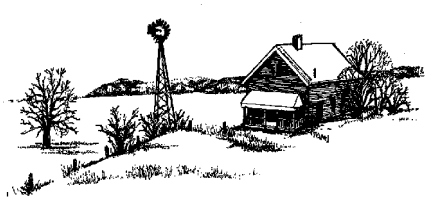
Give the site at least three full years because the clump-growing native grasses require that long to establish themselves. After the first growing season, it is not uncommon to have only one plant per square yard. The grass may only be six to eight inches tall during its first year of growth and dif-



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

ficult to recognize until it grows a seed head in late summer of year two. After the second growing season, each plant may be one to two feet tall and occupy a square foot or so. By the end of the third growing season, you should have an established stand of native grass three feet or taller, depending on the species planted.

In summary, restoring a prairie is exacting, time-consuming labor that requires patience. Once established, however, prairies will need only periodic maintenance. Not only are they a key type of habitat for many birds and small mammals, but they offer pleasing diversity to the landscape. Native prairies with their ever-changing kaleidoscope of wildflower color are a delight to observe. In winter, the copper color of standing bluestem provides beauty to a stark landscape while affording protective cover for many kinds of wildlife.



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FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
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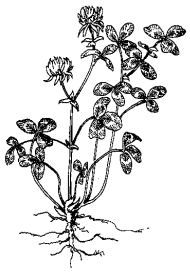
GRASS PLANTING

Grasses and/or grass legume mixtures can provide outstanding habitat for nesting, brood rearing, and winter survival of pheasants, quail, and many songbirds. Besides producing food for insects, which, in turn, become food for birds and other animals, the grasses produce seeds, another source of high-energy food. Rabbits, deer, and wild turkeys eat the green browse. Planted in the right location around your property, these habitats also provide an attractive landscape.

Cool season grasses grow most rapidly during spring and early summer when cool nights follow warm days. They include native Canada wildrye, redtop, June grass, and introduced species such as timothy, orchard grass, and brome grass. Cool season plants also include legumes such as birdsfoot trefoil, alfalfa, and several kinds of clover. Many landowners mix legumes with cool season grasses because the legumes contribute to soil fertility and create food and cover for wildlife.



Warm season grasses grow most rapidly during summer when warm nights follow hot days. They include the native or prairie species such as big blue-stem, little bluestem, Indiangrass, and switchgrass. Some landowners mix a half-pound of perennial native wildflower seeds (forbs) per acre to warm season grass plantings to create even more food and cover diversity and to add beauty. Many wildlife managers in Michigan prefer warm season grasses because they stand up better in snow than do cool season types, last longer, and are native to the state. Plantings of warm and cool season grasses next to each other will provide excellent variety and are the most valuable to wildlife.

Site Conditions

Site conditions to consider before planting include potential weed problems, drainage, erosion potential, and soil type, depth, texture, and fertility. Some grasses and legumes do better on dry sites, and others grow well on wet areas. Certain grass species have very narrow preferences, and others seem to do fine on most sites. Timothy grass, for example, grows well on sandy-loam soils that are fairly well drained. Switchgrass, on the other hand, performs on a variety of soil types. Certain clovers do better in wet areas whereas alfalfa responds best in well-drained soils of sandy loam.

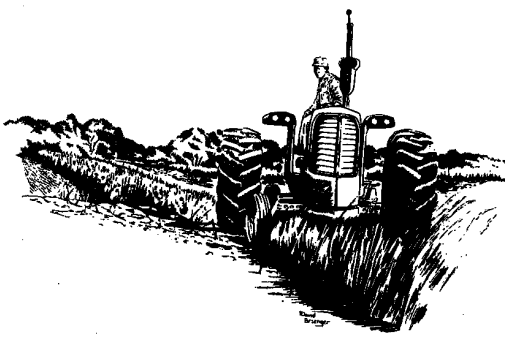
The panel below lists preferred soil type, moisture content, and tol-

SPECIES	SOIL	MOISTURE	SUN-SHADE
Grasses			
Big Bluestem	S-L	D-M	S
Little Bluestem	S-L	D-M	S
Indian Grass	S-L	D-M	S
Switchgrass	S-L-C	D-W	S
Canada Wildrye	S-L	D-M	S,Sh
Timothy	S-C	D-M-W	S
June Grass	L-M	D-M-W	S, Sh
Redtop	L-M	M-W	S
Orchard	C	D-M	S
Legumes			
Ladino	S-L-C	D-M	S
Alsike	L-M	D-M-W	S
Medium Red	S-L-C	D-M-W	S
White Dutch	L-C-M	D-M-W	S,Sh Sh
Sweet Clover	S-L-C	D	S
Alfalfa	S-L	D	S
	S- Sand L- Loam C- Clay M- Muck	D- Dry M- Moist W- Wet	S- Sunny S, Sh- Some Shade Sh- Shade

erance for sun or shade for many types of grasses and legumes. Your Natural Resource Conservation Service office will have a county soil survey map, which should include your property. The map may help you decide what type of grass to plant and where. Also, refer to the chapters on **Warm** and **Cool season Grasses** and **Prairie Restoration** in this section.

Proper soil pH and fertility are necessary for the intended crop. A soil test will determine needs and recommend rates of nutrient application. Your county Michigan State University Extension office has soil test kits available for a small fee and can analyze samples for you. Before planting cool season grasses and legumes, the soil pH should be between 5.5 and 7.0. If lime is needed to raise the pH level, apply it at least three to six months before planting or the fall before your planting season. The level of pH for warm season grasses is not that critical; lime is not required, for example, on sites with a pH above 5.5.

Follow the soil-test recommendations for adding nitrogen, phosphorus, and potash. The recommendations will vary, depending on what you intend to plant. For example, for cool season grass mixes containing legumes, 200 to 300 lbs. per acre of a starter fertilizer (such as 6-24-24 or 8-32-16) low in nitrogen and high in phosphorus is often recommended. Once the stand is established, the legumes will provide the necessary nitrogen.



Site Preparation and Planting Rates

There are two ways to plant grasses. Conventional tillage uses plowing and disking (and sometimes herbicides) to prepare the seed bed to ensure proper seed to soil contact and depth. The key is to get a firm surface before planting, and the way to do that is to follow the plow and disk with a cultipacker or roller. A site has been properly prepared when a footprint barely shows. No-till planting uses special equipment called a no-till drill that cuts a narrow trench through the sod and soil, drops seed into the trench at the correct depth and distance apart, and presses the soil back in place. No-till planting reduces the amount of work to prepare the site and also reduces the potential for erosion. The method relies on herbicides to control weed competition.

If planting into an area with tall grasses or sod, success demands that you kill unwanted vegetation the fall before. If no-till is your chosen planting method, then mow the area before the first frost or in mid-September. Two weeks later, spray a relatively safe, broad-spectrum herbicide such as Roundup, which will kill all emergent vegetation. Be sure to read and follow label directions. You can plant grass and grass mixtures with a no-till planter early in the spring before greenup occurs. If you are late with planting, you may have to kill weeds and other regrowth with another application of herbicide.

If you choose to use conventional tillage, you must eliminate all unwanted vegetation by plowing and disking, which you should do in the fall. The following spring, plow and disk once more if regrowth has occurred (or spray with herbicide). For smaller sites, a roto-tiller may do the job of cultivation.

A key reason that no-till is growing in popularity is that it does not disturb the soil, which may allow dormant weed seeds to germinate. No-till also reduces compaction because fewer trips across the field are needed. In addition, fuel and time are saved, and erosion potential minimized. Warm season and cool season grasses, as well as legumes, need only be planted 1/4 inch to 1/2 inch below the surface and require only 1/8 to 1/4 inch of soil as a cover. It is not uncommon to see seed sitting on top of the surface after planting.

Cool season grasses are usually planted as mixes of several plant types at a rate of 8 to 12 lbs. per acre. Legumes used in mixes should constitute 50 to 60 percent of the mix. Warm season grasses can also be mixed and are usually planted at rates of 4 to 6 lbs. per acre of Pure Live Seed. If using switchgrass in the mix, however, add only 0.5 lbs. to 1 lb. because switchgrass is aggressive and may take over the stand.

Warm season grass seeds tend to be fluffy and bulky. Pure Live Seed (PLS) takes into consideration that a pound of warm season grass includes seed hulls, inert materials, and seeds that will not germinate. To determine PLS producers multiply the percent of Pure Seed times the percent of Total Germination and list this information on a tag that comes with each bag of seed. Most warm season grasses will range from 50 to 95 percent PLS per bulk pound, and there will likely be a difference

Cool Season Mix	Pounds Per Acre
Orchard Grass	2
Timothy	2
Medium Red Clover	2
Sweet Clover	2
Cool Season Browse	**Pounds Per Acre**
Orchard	2
Ladino Clover	3
Alsike	2
Medium Red Clover	2
Warm Season Grass Winter Cover	**Pounds Per Acre**
Switchgrass	6

Cool Season Mix Wet Sites	Pounds Per Acre
Bluegrass	3
Red top	3
Med. Red Clover	2
White Dutch Clover	2
Warm Season Mix Wet Sites	**Pounds Per Acre**
Big Bluestem	4
Switchgrass	4
Warm Season Mix Winter/Nesting Cover	**Pounds Per Acre**
Little Bluestem	2
Big Bluestem	2
Indiangrass	2
Wildflowers	0.5

The above panel lists a variety of mixes that can be planted to benefit wildlife.

between each bag of seed or each grass type.

Grass and grass mixtures can be planted with a no-till drill, one of several mechanical spreaders, or broadcast by hand. Warm season grasses are more difficult to plant because of the fluffy nature of the seed. When run through typical broadcasters and no-till planters, the seed tends to bridge over the top of the mixing unit and will not flow properly. When broadcast planting, planting rates should be increased 25 percent above normal rates. Special no-till planters are now available that overcome this problem. Another option is to buy debearded seed, which has the fluff removed, although it will cost more and may be hard to find. Switchgrass seed is the only warm season grass type that is smooth and therefore will run through conventional planting equipment.

Plant during the period April 15 to June 15. If soil moisture and temperatures allow it, early seeding is preferred. You can also plant cool season grasses during August; however, spring plantings are more successful. In areas with little fall vegetation, such as a recently harvested bean field, frost seeding in late winter/early spring is an alternative. Broadcast seed over the site and the alternating thawing and freezing action will work the seed into the ground where it will germinate. Frost seeding is an especially good method to use on wet sites that equipment cannot reach during peak planting time.

Be sure to inoculate all legume seed before planting. The inoculant is a graphite-like bacteria that, when mixed with water and then applied to the seed, allows the plant to use nitrogen from the air. If frost seeding, double the rate of inoculant.

Post Planting Maintenance

Cool season grasses and legumes are usually evident in the first month after planting, and attractive, solid stands are often the norm by the end of the following spring. Because warm season grasses grow more slowly and in clumps, they require three to five years to establish themselves. After the first growing season, it is not uncommon to have only one plant per square yard. The grass may only be six to eight inches tall and difficult to recognize until it grows a seed head in late summer of its second year. After the second growing season, each plant may be one to two feet tall and occupy a square foot or so. By the end of the third growing season, you should have an established stand of native grass three feet tall or taller, depending on the species planted. Patience is the key to growing warm season grasses. Give them a full three years before deciding if your planting is a success.

To ensure success of any grass planting, you must control unwanted vegetation. If using a herbicide, choose a selective type like 2-4-D, which will kill broadleaf plants (including clover, other legumes, and forbs), and be sure to read and follow all label directions. Your county Michigan State University Extension office can also help identify the problem and will suggest an appropriate herbicide. Mowing before annual broadleaf weeds go to seed may be a better option. After planting warm season grasses in the spring, mow for the first time between July 15 and August 31. If weeds continue to be a problem the next year, mow again before April 1 . The best time to mow cool season grasses is July 15 to August 31. This avoids the nesting season of most birds. Always mow warm season grasses at a height of eight inches or more to avoid injuring plants. Cool season grasses and legumes should be mowed at four to six inches to stimulate late-season growth.

You can allow livestock to graze warm season grasses in late July and August. If you do not require winter cover for wildlife but want spring nesting cover, you can allow livestock to graze cool season grasses until October. Do not allow livestock to graze any type of grass below eight inches.

Grasses and legumes that are hayed or grazed (including heavy browsing by deer) should be "top dressed" with fertilizer or manure after each seasons' hay harvest or on a three-year rotation. Top dress with 100 to 200 lbs. of 6-24-24 fertilizer in a mixed grass legume stand or 19-19-19 fertilizer in pure grass or grass dominated stands.

Proper mowing or grazing and top dressing will help keep the stand in vigorous, high-quality grasses and legumes for many years. Disking is another method to stimulate regrowth and reduce competition from dogwood, sumac, aspen, and other invasive woody plants. If you plan a annual treatment, consider mowing or lightly disking about one-third of the grassland each year. Try to mow strips from 30 to 60 feet wide and leave undisturbed areas of 60 to 100 feet wide between them.

Burning is also a key management tool every three years or so for warm season grasses and wildflowers. If possible, burn one-third of the grassland each year. Carry it out in early spring when vegetation is dry and do it on a day with light wind. Discuss your plans with local authorities, obtain the necessary burning permit, and observe all restrictions and safety procedures. For more information see the **Prescribed Burning** chapter.

In summary, depending on your goals and current field conditions, there are a variety of grasses or combinatons of grasses you can plant to meet your needs. There are, as well, several planting methods available to get a successful grass stand established.

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WORKING TOGETHER FOR WILDLIFE

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PRESCRIBED BURNING

Prescribed burning is a very important management tool for maintaining and enhancing grasslands. Fire was an important natural part in the development and maintenance of grasslands, forests, and wetlands, throughout history. To many of us, fire is a feared enemy that destroys everything in its path. Because of this, the use of controlled fires, such as prescribed burning, is underutilized as a management tool for improving and maintaining habitats.

For thousands of years, tall grass prairies and open brushlands were kept free of trees by the occasional wildfires that cleared the landscape every two to 50 years. These fires were caused by lightning, or set intentionally by Native Americans. They had discovered that fire killed woody plants, but encouraged fruit bearing shrubs, and forage producing grasslands.

Present day research and experience have shown that prescribed burning can be an effective management tool. Prescribed burns are used most frequently to maintain and restore native grasslands. Prescribed burning can recycle nutrients tied up in old plant growth, control many woody plants and herbaceous weeds, improve poor quality forage, increase plant growth, reduce the risk of large wildfires, and improve certain wildlife habitat. To achieve the above benefits, fire must be used under very specific conditions, using very specific techniques.

Brushlands can be invigorated and maintained with fire to benefit species such as bluebirds and sharp-tailed grouse. Burning old fields controls saplings and woody vegetation, and improves grasslands for use by nesting wildlife and grazing livestock. Forest openings can be manipulated with burns to benefit more than 150 wildlife species. Upland nesting cover used by pheasants, waterfowl, and songbirds will remain productive if periodically burned. Cattails and sedges are returned to vigor by an occasional burn. Lastly, if you want more oaks in a hardwood stand, a fire will kill off less tolerant species such as maple, and basswood, allowing the oak to compete more successfully. Burning is also more cost-effective than other treatments like bulldozing, cutting, or chemicals.

Objective

Every prescribed burn should have a clear objective. This objective is necessary to evaluate the success of the burn. To show the success, or lack thereof, of a prescribed burn, a photograph can be taken before, directly after, and one year following the burn. Objectives for a prescribed burn often include one or more of the following:

- Kill woody plants
- Remove grass and wildflower dead vegetative build-up (duff)
- Promote regrowth of warm season plants
- Promote regrowth of cool season plants
- Reduce or set back noxious weeds
- Increase populations of wild flowers
- Reduce cattail mono-cultures
- Reduce wildfire fuel build-up
- Promote growth of fire dependent trees such as Jack pine
- Increase populations of threatened and endangered species.

Burn objectives should be identified in the burn plan. The objectives help determine the weather conditions for the burn, the timing of the burn, and how hot the burn should be.

Notification

For both safety and legal reasons, certain groups should be notified before a burn to prevent unnecessary concerns and danger.

Notifying neighbors, fire departments, and local law enforcement officials should be part of the prescribed burning process. Working with the local fire department is crucial because a burn permit may be necessary, and there may be a burning ordinance in your area. A copy of the burn plan should be given to the local fire department. The National Weather Service should have a telephone number listed in your area. They will be able to keep you up to date with changing weather conditions.

Considerations

There are many things to consider when planning for a prescribed burn. **Burns need to be conducted by individuals who are experienced and trained in the use of fire.** However, as a landowner, it is important to understand prescribed burning and its use. For instance fire moves faster uphill than on a level surface, so slope of the burn area must be taken into account.

When using fire it is important to plan for firebreaks. A firebreak is an area that will contain a fire within its boundaries. A plowed or disked strip, reaching down to mineral soil, is the most common method of establishing a firebreak. Sometimes, a mowed path, or a walking trail, can be used as a fire break. Firebreaks can also be planted to grasses and clovers so they can provide key food and cover to wildlife. For example, if an area is burned every five to seven years, the firebreak is disked up the fall before the burn. Then, after the spring burn, the firebreak is planted to grasses and clovers. Firebreaks should be at least 20 feet wide.

Equipment

Basically three kinds of equipment are needed for prescribed burning:

1. tools to ignite the fire
2. tools to control the fire
3. safety equipment

A drip torch, a can of liquid fuel with a long spout, burning lightly at the end, may be used to start and spread the fire. It will drop a three to one fuel oil-gas mixture on the grass at a steady rate. This allows for a continuous fire line, and quicker, more efficient fire application than a fire rake.

To control (mop up) your fire properly, fire swatters, 12 inch X 18 inch pieces of reinforced rubber attached to a handle, or fire brooms, are great to smother small grass fires. A backpack water pump can be teamed up with a swatter for maximum efficiency. The pump operator would lead knocking down larger flames (using a spray for cooler fires and a stream for hotter ones) while the swatter can follow up making sure the fire is put out. To aid in the extinction of the fire, one quart of dishwashing detergent can be added to 50 gallons of water (one tablespoon of detergent to one gallon). This mix helps the water to "cling" to the grass fuel. Low-pressure, field crop sprayers with handgun nozzles can work for small burn areas that have safe boundaries, as well as backpack and herbicide sprayers. An all-terrain vehicle can also be helpful for carrying extra tools or tanks of water to your site. If high-pressure pumps are used, then water should be rationed to prevent it from running out partway through the burn. If a wetland, pond, stream, or other water source is near the burn site, then pumps and sprayers will be easy to refill.

Safety equipment is also very important. Make sure that a first aid kit and plenty of drinking water are always nearby. Poorly managed burns or ignorance of safety measures can lead to property damage, and even injury or death. Even in well-managed burns accidents can occur. **Before, during, and after every burn, safety should be the major consideration**. Proper clothing can also add a measure of safety. Fireproof Nomex pants and shirts are essential. Leather boots and gloves, along with eye protection, should be worn at all times. Never wear synthetic fibers like nylon, which can melt and stick to skin. A long sleeve shirt, a hard hat, and long pants, will keep you safe from radiant heat and flare-ups. The more skilled the burn crew is the more likely the fire will be controlled and thus beneficial. Generally, three or four people are needed on each fireline (more if safety may be challenged). One will ignite the fire and be in charge of operations (the fire boss), one or two should keep the fire on its correct path, and any others should help mop-up (extinguish flare ups or escaped flames).

Timing

The timing of a burn determines the plants which will be benefited and controlled, the impact on wildlife species, and safety. Most burns are conducted mid to late spring, or in the fall. Burning to favor desired grasses should take place just as they are starting to green up, and the soil surface is damp. Generally, a late spring burn

will control woody vegetation and cool season grasses better than an early spring burn but are not as beneficial for wildflowers. This burn will also provide warm season grasses with nutrients they need to grow.

Before burning, nesting times of grassland species should always be checked to prevent the destruction of nests and their inhabitants. The best time for spring fires is late March into April; generally in the morning or evening, when the relative humidity and temperature are not changing as rapidly as during daylight hours. The drier the area the earlier the burn should be to avoid damaging the earliest blooming wildflowers. Though fall burns are possible and can be beneficial, they are often avoided, due to the cooler temperatures, drier ground, and destruction to winter wildlife habitat they may cause.

Weather Conditions

Weather has an overriding effect on a prescribed burn. A burn plan will outline the weather conditions, which must be met before the burn is conducted. It is very important to have the latest and most updated weather conditions available before starting the burn. Relative humidity is an important factor to consider when planning a controlled burn. If the relative humidity is below 50%, the dryness of the grass is prone to causing very hot fires. If the relative humidity is above 70% the fire will have a hard time catching at all. Therefore a relative humidity between 50% and 70% works best.

Temperature is also important when laying out a burn plan because of its relation to relative humidity. Below 32 degrees Fahrenheit grass mats will rarely burn, and above 80 degrees Fahrenheit burning is hazardous. Between 40 degree Fahrenheit and 60 degrees Fahrenheit is ideal.

Wind direction and speed should both be taken into account as well . The wind speed should be between three and seven mph, and the wind direction should remain steady. If either varies greatly, the fire can shift with gusts of wind, and may burn too quickly with an increase in wind speed. Both of these variables can severely hinder safety precautions if not watched closely. In general, wind is calmer in the morning and the evening. Smoke management is crucial. Always warn your neighbors of your burn, and prevent smoke from hindering any roadways by planning your burn when the wind direction is going away from the road.

Of all the weather parameters the wind speed and direction are most critical. Unless professionals are included in the burn crew a burn at over seven mph is not recommended. Faster burns are less effective. They may not remove all the litter and unwanted species. In addition, safety comes first. Often the safest time to burn is in the evening between 7 pm and 10 pm. This is when humidity is on the rise, temperature decreases, and wind speed dies down, creating the setting for a slower (and safer) fire. However, burning after dark can be dangerous. Areas still smoldering can be missed.

Burn Techniques

There are 4 basic burn techniques used in the prescribed burning of grasslands. These four techniques include:

1. back fire
2. parallel (flank) fire
3. perimeter (ring) fire
4. strip head fire

Each method has strengths and weaknesses depending on the weather conditions, size of the area, and expertise of the individuals conducting the fire. Special considerations when conducting the burn include power lines, telephone lines, and oil or gas lines.

A **backfire** is used downwind of the burn site. This is most often the coolest and safest fire. However, it is slower burning and therefore takes longer to finish. The fire is ignited on the downwind side of the fuel and slowly burns into the field against the wind, expanding the firebreak. This burn technique is often used in conjunction with other burn methods.

A **parallel or flank fire** burns hotter and faster than a strip fire or backfire. It works well on square or circular parcels. A fire is ignited on the sides of the burn site parallel to the wind direction at the same time or soon after a backfire is lit. The people igniting the fires on either side should keep continuously in touch by 2 way radio.

A **perimeter fire** is not only one of the quickest burn methods, but also creates a hotter fire than those listed above. Since this type of burn technique develops a hotter and faster moving fire, which can be harder to control, it must be handled carefully. This method

PRESCRIBED BURN PLAN (attach aerial photo)

Landowner:
Address:
Location of Burn: County _____ Township_____ Range _____
Section_____ Field # _____
Burn Objective: _____
_____
_____

Burn target date(s): _____

Desired Burn Conditions: Wind Speed _____ Wind Direction _____
Relative Humidity _____ Soil Moisture _____

Parties to Notify
Local Fire Dept._____ Sheriff's Dept. _____
Resource Agency _____ Neighbors _____

Fire Plan: indicate on aerial photo the wind direction, fire lanes, location and type, back-up fire lanes, firing sequence and hazards such as roads, buildings, power lines, etc.

Suppression in Event of Escape Plan: Discontinue firing sequence. Leave sufficient personnel with the prescribed burn to prevent further escape. Remainder of crew suppress escaped fire. Notify local department if necessary.

Equipment Needs Rake _____ Swatters _____ Drip torches _____
Backpack Sprayers _____ Water Wagons _____
Other _____

Burn Crew:
Fire Boss _____ L-Flank fire _____
Backfire _____ Water Wagon _____
R-flank fire _____ Mop-up _____

maintain native grassland communities. An objective is established and a burn plan is developed which meets the burn objective. Experienced and trained individuals conduct the burn under the guidance of a burn plan. Neigh-bors, local law enforcement agencies, and local fire departments should be notified. Safety is always the top priority for the burn.

starts with a backfire, followed by lighting the flanks, and finished by lighting the upwind side of the burn site called the head of the site. This headfire will move rapidly towards the flanks and backfire.

A **strip head fire** burns slightly faster than a backfire, is relatively safe, and works well for burning rectangular or odd shaped parcels. It is also cost-effective. A series of strips are lit, starting at the downwind side of the site, burning only one at a time. Ideal when burning with a limited number of personnel. Remember when choosing a burn technique, your level of experience with burning, and that of your burn crew, should be a major factor in your choice.

Summary

Prescribed burning is an important management tool to

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PRIVATE LAND PARTNERSHIPS
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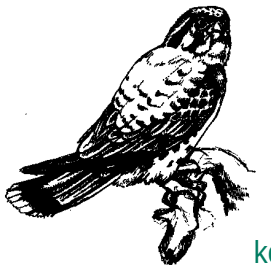
INTRODUCTION TO CROPLAND MANAGEMENT

About half of the earth's land surface has been converted to agriculture use. In some areas, including parts of Michigan, the figure is closer to 90 percent. The change of land to agriculture use began with the earliest of Euro-American settlers. After they realized the depth and richness of the prairie and savanna soils, these areas were cleared for agriculture, leaving only traces of the original plant community. Farming also occurred on cleared forest areas. Eventually some of these forest areas did begin to regenerate but were very different from earlier forests.

In 1850, the population within lower southern Michigan was mostly farmers. Farmland acres in Michigan peaked at 19 million in 1940. Since then, agricultural land has decreased to 10½ million acres. This decline is due to the increase in urban development and the loss of family farming. Nevertheless, Michigan is a key agricultural state, currently leading the nation in the production of tart cherries, blueberries, cucumbers, and dry navy, black, and cranberry beans.

Family farming for subsistence has given way to a modern mixed agriculture/industrial buisiness. As a result, opportunities for maintaining or creating wildlife habitat occur mostly on those former farmland acres taken out of production. In an effort to help keep farmers solvent by reducing crop production and raising crop prices, the U.S. Department of Agriculture has created various programs which pay landowners to set land aside--to keep it out of production. The current federal conservation programs attempt to reduce erosion by keeping soil in place, limiting the use of pesticides and fertilizers, maintaining ground and surface water quality, and recommending wildlife-friendly plantings.

About three percent of the state's agricultural land, or some 250,000 acres, is currently enrolled in the Conservation Reserve Program (CRP), which is administered by the United States Dept. of Agriculture, Farm Service Agency (FSA) through their county offices. Land typically eligible for enrollment includes croplands susceptible to erosion that fall within conservation priority areas. Cost share money is often available to establish shelterbelts, shallow wetlands, and filter strips of grass or trees.



kestrel

Information is available from USDA offices, Conservation District offices, and Michigan State University Extension offices.

Conventional Versus Conservation Tillage

Conventional crop production practices that include moldboard plowing affect wildlife in several ways. First, they reduce and isolate the amount of natural habitat so that all that remains in heavily farmed areas are scattered remnant patches, wet depressions, and linear strips in a sea of cropland. Second, few native plants and animals adapt to, or can tolerate, heavily managed croplands. Third, the practices leave little food or shelter for wildlife during the winter months. The greatest impact to wildlife is the practice of fall plowing, which is often used with conventional tillage.

Conservation tillage is a broad term referring to several tillage methods that maintain crop residue (stubble or other plants) on the field surface. These tillage methods reduce wind and water erosion, conserve soil moisture, and increase organic matter, which

red-winged blackbird

result in better soil structure. Studies have shown that conservation-tillage fields can have yields that equal or exceed conventional-tillage fields, and the practice cuts production costs considerably. The approach varies from "minimum tillage," where about 20 percent of the previous year's crop residue is left, to "no till", where at least 90 percent of the previous year's crop residue remains on the soil surface. Although not as productive for wildlife as unfarmed habitat in various stages of succession, conservation tillage is far superior than conventional tillage.

Conservation tillage causes less compaction of the soil, (compaction occurs when heavy equipment and implements cross the field over and over), which has a positive effect on the soil, allowing water to perculate into the soil instead of causing erosion and washing pesticides and fertilizers into the surface water. The soil's better permeability also favors soil invertebrates. Invertebrates account for 90 to 95 percent of all animal species, and play a critical role in soil health. Growers need insects, spiders, worms, snails, and nematodes because the invertebrates act as decomposers, pollinators, soil conditioners, food sources for higher organisms, and control agents for other organisms, which may be harmful.

Conservation tillage overall is better for wildlife than conventional tillage. Crop residues serve as mulch, safeguarding soil from wind and water erosion while conserving soil moisture. The crop residues furnish nutrients, shelter, and micro-climates that soil organisms need. Pheasants, grasshopper sparrows, and meadowlarks will nest in no-tilled fields where residue is sufficient. Migrating waterfowl, shorebirds, and songbirds such as snow buntings, Lapland longspurs, and common redpolls--along with pheasants, quail, and other winter residents--rely on waste corn, soybeans, other grains, and weed seeds for food. Vesper sparrows show a clear preference in spring and summer for foraging in fields with the most crop residue, probably because one of their favorite foods--spiders--live in the residues. Cover is also increased and song perches are elevated.

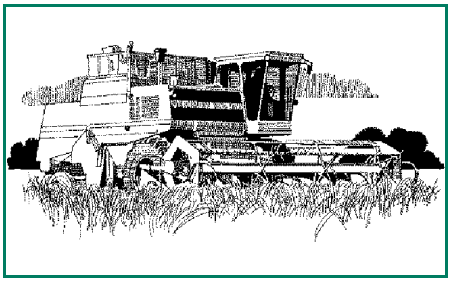
Large, open fields with no natural cover only attract a few bird species such as the brown-headed cowbird, horned lark, Vesper sparrow, and killdeer. Similarly, few mammals use these open fields, such as deer and white-footed mice, voles, and ground squirrels. Many more species--and as many as five times more birds--prefer the edge over the middle of such clear fields. Consequently, as field size increases, the proportion of field edge decreases and so does the average abundance of birds per field. Road-to-road farming operations that remove old fields, woody cover, and edge habitats can lead to a huge decline in the number and kinds of wildlife.

Other Conservation-minded Farming Practices

Most wildlife depend on a number of habitat types for food and cover. Greater wildlife abundance and diversity are possible through management of the entire ecosystem rather than management of an individual area or species. For the greatest impact, consider the total picture--how croplands, forests, and wetlands can provide good living conditions to a variety of wildlife. If some food and cover types are available on nearby areas, best results may be achieved by providing an element of the habitat that is missing. Management is also more effective when neighboring lands are involved. Greater varieties of food and cover will result in more abundant wildlife. Here are several practices to consider. In addition, the **Cropfields** chapter will have additional information.

Crop rotation is a time-honored farming practice that reduces plant diseases and increases soil nutrients and yields. When alfalfa, clover and other legumes are worked into the rotation, valuable nitrogen is produced, along with insects and nesting cover for wildlife.

Organic farming practices that rely on composting and manuring of fields may help improve the compatibility between



crop and animal production practices and wildlife conservation. Organic farmers usually use less conventional tillage, avoid manufactured fertilizers and pesticides, have greater crop diversification, rely on crop rotations, and cultivate smaller fields.

alfalfa

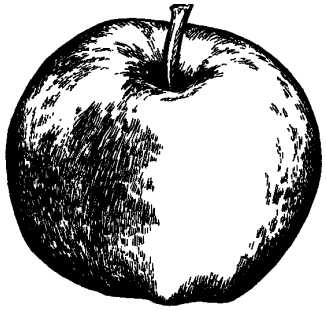
Field borders, shelterbelts, and fencerows between fields and around the perimeter of fields can help wildlife if the borders contain grasses, legumes, and fruit-bearing shrubs. The more diversity, the greater the attraction to more wildlife species. Wider is always better. At a minimum, borders should be at least 30 feet wide. Such linear borders are important for wildlife because they provide edge cover and travel lanes (corridors) between habitats. For more information see the chapter in this section on **Field Borders and Corridors.**

Hayfields will provide desirable plants used by livestock and preferred by wildlife. Lack of vigorous growth and an increasing amount of undesirable plant species that invade hayfields may be signs of low fertility, low pH, and a need for replanting. Burning, mowing, and grazing are three common practices to rejuvenate hayfields and retard natural succession. Burning and mowing should be done before April 15 or after July 15, so nesting wildlife will be spared. Separat-ing pastures into units and grazing them alternately will prevent over-use by livestock and allow wildlife to nest undisturbed in unused units. Grass areas next to ponds and other wetlands, where wildlife naturally congregate, should be fenced off to protect water quality and nesting wildlife. A minimum of 100 feet of perimeter protection is recommended.

Hayfields can be established with either native or introduced grasses and legumes. Lands that have been taken out of production are often planted with cool season grasses such as timothy or orchard grass, or legumes like ladino and sweet clover. Native, warm season grasses--switchgrass, big bluestem and Indiangrass--have their greatest growth in mid-summer and give landowners an option to continually mowing or grazing cool-season grasses and legumes. Planting a field of cool season and another with warm season grasses provides different heights and densities, which wildlife find attractive. Refer to the **Hayfield** chapter in this section for more information

fencerow

Other areas such as field corners, rocky and low-yield fields, eroded gullies, rights-of-way, and old orchards can be planted with a mixture of trees, shrubs, and grasses. Orchard fruit is a delicacy for many wildlife species. Ripe apples and pears attract grouse, quail, rabbits, raccoons, foxes, opossums, squirrels, skunks, and deer. Wherever fruit trees are found, along fencerows, next to farm buildings and homesteads, in old orchards, they become centers of activity for wildlife in fall and winter. It is important to leave some old trees, which will provide cavities for a variety of wildlife. A few rows of grain next to brushy areas increases their value during winter. The management of other areas will vary depending on what is currently there.



In summary, even though your goal may be financial, studies indicate that new crop management methods increase your overhead while helping wildlife. Indeed, cropland management can be both beneficial to the landowner and to wildlife. The following chapters in this section explain a variety of management options that do just that.

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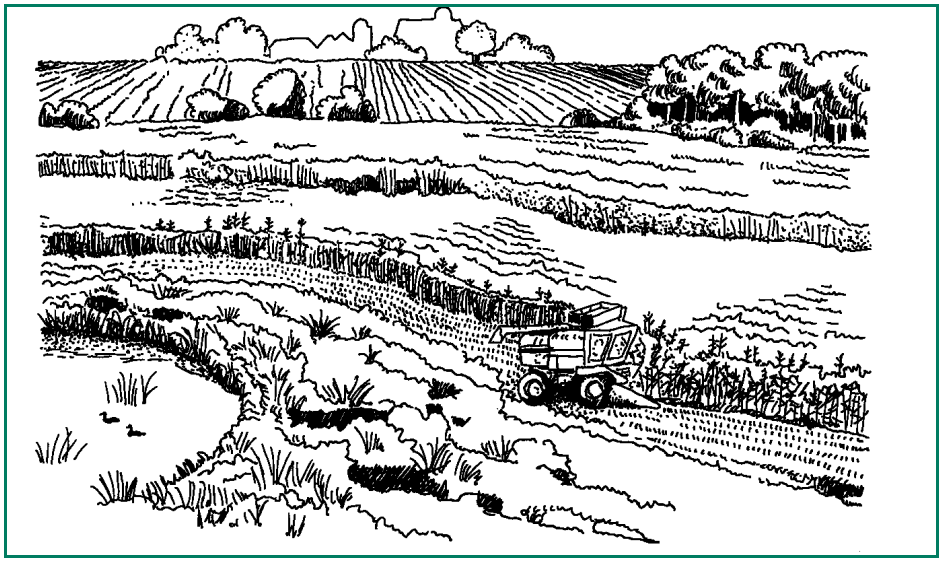
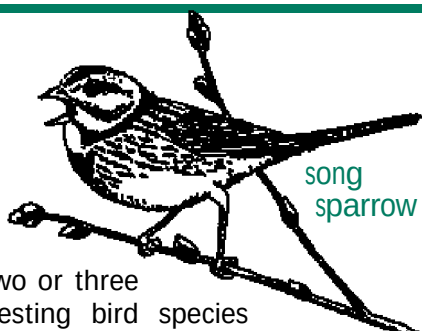
CROP FIELDS

Of all the private lands in the United States, 27 percent is in cultivated cropland, which produces an enormous variety of grains, fruits, vegetables, and other products. In Michigan, about 10 1/2 million acres, or some 30 percent of the state's land base, is active farmland. In a typical harvest year an average of seven million of these acres yield nearly 25 million tons of production.

Because of its size and scope, farming impacts wildlife perhaps more than any other land-use practice. The trend to fewer, larger, more intensively managed farms over the past several decades has been detrimental to many wildlife species. Although farm crops are eaten by deer, rabbits, pheasants, waterfowl, and many kinds of songbirds, many farming practices fragment good wildlife habitat or create open habitats used by relatively few species. Increased reliance on pesticides and herbicides, removing fencerows to create bigger fields, fall plowing, and early and late cutting of hayfields are farming methods that negatively impact wildlife. It is difficult for farmers to make sacrifices for wildlife if the sacrifices mean reduced income. However, there are some management techniques that cost nothing or increase profits, and yet are beneficial to wildlife as well as to the landowner and community. Farmland that contains good habitat will support a broad mix of wildlife, which, in turn, will provide a continuing source of beauty, inspiration, and recreation.

Four types of habitat exist in most farmland: open cropland areas, farmstead and wooded sites, haylands, and wetlands. Results have shown that rowcrop areas of corn and soybeans support only




song sparrow

two or three nesting bird species and a total of only up to 88 birds per 100 acres. Pasture and haylands support seven to 11 nesting species and a total of up to 386 birds per 100 acres. Marshland supports 13 nesting bird species and up to 702 birds per 100 acres. Croplands, then, are the biggest challenge for wildlife, and this brochure offers cropland management considerations that will lessen negative impacts.

Conservation Tillage

Conventional crop production practices that include moldboard plowing and total harvesting reduce and isolate native habitats. Unless it is plowed under, about three percent of a grain crop is left on the ground for wildlife. For example, in an area that produces 100 bushels of corn per acre, there would be three bushels available to wildlife. However, the practice of fall plowing, which is often used with conventional tillage, turns this available food resource under the ground reducing the food available to wildlife at this time of the year.

Conservation tillage is a broad term referring to several tillage methods that maintain crop residue (stubble and other plants)

on the field surface. These tillage methods are intended to control erosion, reduce compaction, conserve moisture, and increase organic matter, which result in better soil conditions. Studies show that conservation-tillage fields cut production costs overall and provide yields that approach equal or exceed conventional-tillage fields. For example, one study showed that conventionally tilled compacted soil yielded only 90 bushels per acre of corn, compared to conservation tilled uncompacted soil yields of over 120 bushels per acre.

The **conservation approach** varies from "minimum tillage," where about 20 percent of the previous year's crop residue is left, to "no till", where at least 90 percent of the previous year's crop remains on the soil surface. Although not as good as native wildlife habitat in various stages of plant succession, conservation tillage is far superior to conventional tillage for wildlife. A Michigan study, for example, showed that fields of wheat stubble contained an average of 212 pounds per acre of weed seed on the stem in October. When not plowed, such fields provide food for wildlife all winter and the following spring. U.S. Department of Agriculature, Natural Resources Conservation Service (NRCS) offices have detailed guidelines on how, when, and where to plant crops using conservation tillage methods.

Crop Rotation

Crop rotation is a time-honored farming practice that reduces plant diseases increases soil nutrients and increase yields. When alfalfa, clover, and other legumes are worked into the rotation, valuable nitrogen is produced, weeds are more easily controlled, compaction problems decrease, and insect food and nesting cover are increased for wildlife. It has been shown in previous studies that the highest yields of corn occurred when corn planting followed a grass-legume meadow. In addition, plowing down first-year sweet clover produced up to 113 pounds of nitrogen per acre. Plowing down after the second year resulted in 162 pounds of nitrogen per acre.

Periodically rotating crop fields in grass or legumes also improves soil tilth, aeration and drainage--mostly because earthworms and other invertebrates are more active under sod than in row-crop cultures. An Illinois study that measured the number of breeding birds per acre in a variety of cover types found 12.0 birds per acre in mixed covers of hay, 5.6 in ungrazed grassland, 5.0 in pastures, 3.5 in red clover, 2.2 in fallow fields and only .08 in cornfields.

Integrated Pest Management

Although conservation tillage is less harmful than conventional tillage to wildlife, it still relies on considerable chemical usage to control weeds and insects. The reduction of pesticide use can be best accomplished by crop rotation and integrated pest management. The incidence of epidemic insect damage on croplands is greatly increased when the same crop is planted on the same acreage for several years in succession. Crop rotation where no more than two

kestrel

successive years of the same row crop are planted on the same acre is recommended. This will reduce plant specific insect pests below threshold levels, making the use of prevention insecticides less necessary. The monitoring and collection of adult insect pests before egg-laying time will predict potential problems. Then and only then will insecticide use be recommended. This practice not only reduces cost of crop production, it also reduces the possibility that insect pests will not become resistant to chemicals due to their continued annual use. Likewise, the soil invertebrates, which make up 90 to 95 percent of all animal species and play such a critical role in soil health, will be spared the unintentional application of pesticides into their habitats. Growers need certain kinds of insects, spiders, worms, snails, and nematodes because the invertebrates act as decomposers, pollinators, soil conditioners, food sources for higher organisms, and control agents for other organisms which may be harmful.

Other Practices that Benefit Wildlife

The following are options to consider when managing your cropfields:

CROP FIELDS

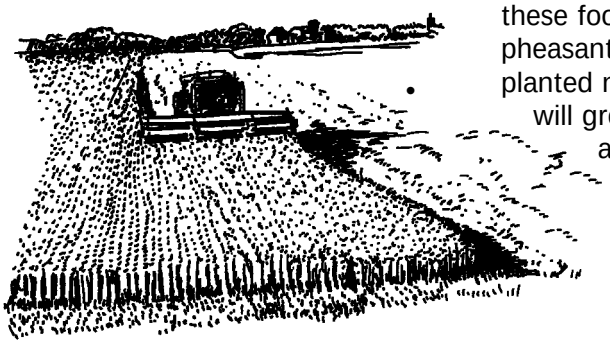
Preserve and restore wetlands on your property. Establish a minimum of 100 ft. of grassy nesting cover around each area of wetland.

• Establish 30-foot-wide borders of grass or legumes around the field along wooded borders to provide nesting cover, check erosion, and trap soil particles and nutrients. Keep these buffer zones free of chemical spraying.

• Create smaller fields by strip cropping to provide narrow fields of grain next to narrow fields of forage. You can also create smaller fields by planting shrub hedgerows and field windbreaks, which wildlife will use for food, cover, and travel lanes.

• Establish grass or legume cover on all bare fields, even if the area is planted in another cover type the following spring. This ground cover provides soil stability and erosion control, reduces evaporation, and maintains steadier soil temperatures. Plantings of crops, shrubs, or trees that follow will grow better. Winter wheat, winter barley, and annual rye are good cover crops to consider because deer and Canada geese will graze them without decreasing crop yields the following summer. When possible, space such cover plantings with croplands to create diversity.

• Leave a few rows of grain on field perimeters to help feed wildlife in winter.



• Plow across slopes (contour plowing to reduce erosion, which conserves valuable topsoil and prevents sediment from washing into unfarmed areas.

• Plant native grasses and forbs along roadsides, which may be used by 40 species of birds and animals. Mow or burn these areas only before April 15 or during the month of August.

• Maintain vegetation along roads and uncultivated strips because they provide food, shelter and travel lanes for wildlife.

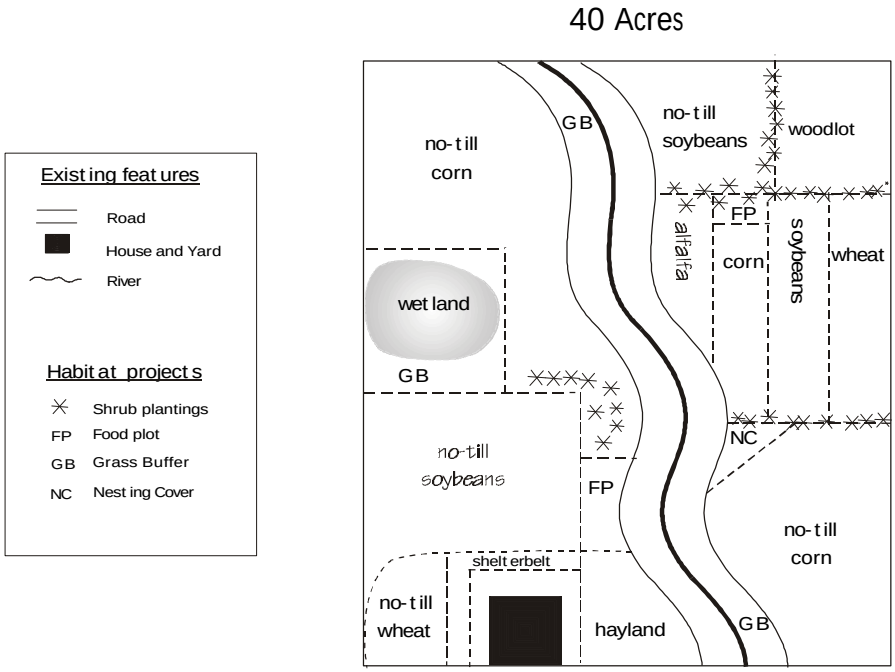
• Plant food plots of corn, grain sorghum, sunflowers, soybeans or buckwheat. Protect the food plots on their north and west sides with natural habitat such as woods, wetlands or shelterbelts. If placed near wetlands or idle grasses, these food plots will greatly benefit pheasants, songbird, and quail. If planted near woodlands, food plots will greatly benefit turkeys, deer, and squirrels.

• Plant shelterbelts around farmsteads and windbreaks around farm fields and other woody covers in odd corners and edges. Windbreaks reduce erosion and increase crop yields; shelterbelts reduce fuel costs and increase livestock production. Thick hedges or shrubby fencerows help stop wind erosion, trap snow, and can be used as livestock fences. Evergreens supply nest sites for doves and other birds and winter cover for a variety of wildlife. Gray and silky dogwood, highbush cranberry and hawthorn are recommended food-producing shrubs.

• Abandoned farmsteads and other old buildings or structures can be important habitat for rabbits, squirrels, raccoons, deer, woodchucks, red-tailed hawks, screech owls, barred owls, gopher snakes and garter snakes. They also attract crows, blue jays, various woodpeckers, cedar waxwings, brown thrashers, barn swallows, song sparrows, robins, catbirds, goldfinches and other songbirds. Although it might be necessary to remove some of the old structures, save any trees and shrubs and consider planting others.

• Plant field corners, rocky and low-yield fields, eroded gullies and other odd areas out of cultivation with a mixture of trees, shrubs and grasses. Do not disturb the areas by grazing, burning or mowing any more often than once every five to 10 years.

• You may wish to manage your entire farm for the greatest overall benefit to wildlife. Rather than trying to improve conditions in a certain area for one species, manage existing agricultural lands, forests and wetlands for the total picture. More habitat types and greater varieties of food and cover will result in more abundant wildlife. Involving your neighbors in a local



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

plan will pay dividends for all.

Agricultural Odd Areas

Low-lying areas where cropped fields drain and often form eroded trenches or gullies could be planted to native wildflowers, prairies grasses, or shrubs. Also, plant areas where natural depressions lay, usually across fields. Designed to slow water and trap soil particles and nutrients during heavy rains, these plantings also provide food to deer and geese and cover to small mammals and birds.

Plant grains or legumes on all bare fields, even if the area is planted in another cover type the following spring. This ground cover provides soil stability and erosion control, reduces evaporation, and maintains steadier soil temperatures. Legume or mixed grass-legume borders will also help to stabilize soil at field edges and provide a place to turn farm machinery. Adding buckwheat or grain sorghum to these out-of-the-way places will also provide energy food for seed eaters in fall and winter.

Field corners, rocky and low-yield fields, eroded gullies, and other odd places that cannot (and should not) be cultivated provide good wildlife habitat if planted with a mixture of trees, shrubs, and grasses or left so that plants recolonize the area -- which is less work than planting. Turn them into shelterbelts by planting alternating rows of trees and shrubs. Fruit-producing plants furnish food and cover for many species. A few rows of grain next to these grown-up odd areas increases their value during winter. Do not disturb these parcels by grazing, burning, or mowing more than once every five to 10 years, preferably treating a small segment at intervals rather than the entire piece.

In summary, there are many options available that create high producing cropfields and adequate wildlife habitat. However, remember that the poor choices you make may have detrimental effects on a variety of wildlife.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

HAYFIELDS

A hayfield is a general name given to any field which has been planted with a grass or legume or a combination of grasses and or legumes with the purpose of harvesting the plants for use as food (hay) for livestock or allowing livestock to graze in that field.

Hayfields can provide many kinds of wildlife with food and cover. Meadowlarks, bobolinks, and pheasants are examples of open-ground nesters that use hayfields. Waterfowl, rabbits, deer, and wild turkeys nest in grassland located next to woods, wetlands or brushlands. Besides providing nesting cover, hayfields:

(1) yield browse for deer and rabbits
(2) provide habitat for protein-rich insects that serve as food for songbirds and young gamebirds
(3) furnish limited winter cover for many species of wildlife.

fawn

Kestrels, foxes, skunks, and red-tailed hawks use hayfields as hunting areas for insects and small rodents such as mice and voles. Deer often use hayfields for feeding and resting sites. Does frequently place their fawns along the wooded edges of hayfields where the fawns remain hidden while their mothers feed.

Hayfields that are an integral part of the overall management plan on your property provide great value to wildlife. In conjunction with woodlands, brushlands, and wetlands, hayfields contribute to the habitat mosaic to which wildlife respond. Because hayfields and pastures are not tilled annually, they help retain moisture, reduce erosion, and aid in soil building. Depending on the type of grasses and legumes planted, some hayfields that are properly managed will last five or six years before they need to be worked up and replanted. They also help keep valuable nutrients in the topsoil where they are available for future crop use. In addition, when hayfields are part of the landowners crop rotation, less herbicides and fertilizer may be needed because of weed contol and nitrogen benefits of hayfields.

Field Size Considerations

Any wildlife management plan will help some kinds of

bobolink

wildlife and harm others, and that is why landowners should consider the impacts of their decisions. Many predominant grassland species such as pheasants, Henslow's sparrows, bobolinks, and meadowlarks do better in areas where at least 25 percent of the cropland acres are in grass. Fields larger than 40 acres are more secure to ground nesting wildlife than fields smaller than 40 acres because nesting birds are less vulnerable to predation. This is not to say that hayfields smaller than 40 acres are not important or productive to many kinds of wildlife for nesting or feeding areas. Hayfields larger than 80 acres, however, have lower nesting density for rabbits, quail, pheasants, and other wildlife that are somewhat edge dependent. Also, converting several smaller fields to one large field may require the removal of fences, which will eliminate natural travel corridors.

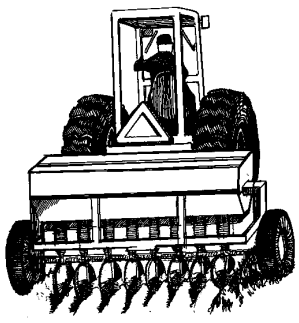
Mowing Considerations

The timing and height of hay cutting can have a dramatic impact on both wildlife and the production of your fields. With the ground bared, wildlife that use hayfields become vulnerable to predation, and the animals must move to nearby areas for cover. The size and vegetation types planted in your hayfield will also impact the types and amount of wildlife using the area.

Delaying mowing until after the primary nesting season will be the best practice for wildlife. The problem for landowners is that the best livestock forage often occurs prior to the end of the nesting season. Alfalfa is best managed for forage production when it is cut at quarter-bloom (when 25 percent of the field is blossoming). After cutting, the alfalfa will once again be at quarter-bloom in four to five weeks. The cycle of harvesting every 30 to 35 days is what spells doom for pheasants, which require a period of 40 days in which to successfully lay their eggs (about 13 days) and incubate them to hatching (23 days on average). Therefore, a landowner who mows on June 1 will likely destroy any egg clutches from hens who happened to begin nesting on April 20 or later. Although most hens attempt to renest, success is thwarted by the same set of circumstances.

Undisturbed nesting habitat is the key to the survival of wildlife who use hayfields. Nesting waterfowl, for example, may benefit even more from permanent vegetation in hayfields than upland gamebirds do. So what can landowners who need to harvest their hay crop do? One management option is to delay mowing as long as possible. Even a one-week delay, to June 8, for example, will result in higher nesting success.

Different hay crops have different peak harvest times. By having diverse hayfield plantings, some planted to pure stands of alfalfa and others planted to a grass/clover mix can alter the timing of the harvest. Some grasses and/or clovers actually produce more hay if harvested later in the spring or early summer. Planting diverse hayfields can also spread out your harvest time and effort. Also, more and more hayfields and pastures are being planted to warm season grasses such as switchgrass, big bluestem, and little bluestem. Since these grasses are not usually harvested until midsummer they provide outstanding nesting and brood rearing cover before being grazed or cut for hay. Another option is to cut your hayfield late in the fall. Nesting wildlife choose nesting sites based on spring vegetation heights. For most grassland nesting wildlife, fields with short vegetation height in the early spring are not preferred. Since these fields will not be preferred nesting sites there wil be less negative impact to wildlife when the fields are harvested.



Planting Recommendations

Solid stands of any one kind of grass or legume are not nearly as valuable to wildlife as a mixture of plants. A mixture provides the greatest diversity of growth, which in turn offers vertical and horizontal densities, a variety of plant heights, and different palatability to insects and wildlife throughout the food chain. The mixtures also establish better and adjust to different soil types across fields. They often have longer growth periods and higher yields. And, they are also less susceptible to total loss from drought, wetness and insects.

Cool season grasses such as orchard grass, redtop, and timothy grass grow most rapidly during spring and early summer and again at the end of summer and early fall when cool nights follow warm days. Mixed with clovers, they offer an outstanding variety of wildlife food and cover, provided they are not mowed aggressively. Clovers to consider are medium-red, ladino, and alsike. Cool season grasses are popular with landowners because they are easy to establish and respond to heavy fertilization. They do better in 6.0-7.0 pH soils than other cover types, and they continue to be productive for many years. Landowners increase soil pH by adding marl, lime or some other calcium-based material. Fertilizer rates and types are based on soil tests, easily obtained for a nominal fee with a soil sample kit available from Michigan State University Extension offices.

timothy

A recommended mix of cool season grasses and legumes that provide excellent nesting, and brood rearing cover would be 7 lbs. of medium red clover, 6 lbs. of timothy grass, and 2 lbs. of ladino clover per acre. This planting will produce high quality hay when cut around July 15, which is past the prime nesting season for most birds and mammals. The mix will grow well on most soil types and well to poorly drained conditions.

Warm season grasses have a shorter growing season and are usually planted for grazing or wildlife purposes, but can be used as a hay crop as well. They grow most rapidly during the peak of summer when warm nights follow hot days--especially the months of June, July and August. When soil temperatures begin to drop, growth slows dramatically. Because these warm season grass stands are used primarily as pasture or hay in the summer months, songbirds, gamebirds, and other wildlife will have completed their nesting activities before livestock is allowed into the grass stands. Warm season native grasses species are big bluestem, little bluestem, switchgrass and Indiangrass. Often mixed with wildflowers (forbs) to represent the diverse grass stands of our prairies, they are usually referred to as prairie grasses. They make more efficient use of water and soil nutrients (nitrogen, phosphorus and potassium) than do cool season grasses, and they do not require as much fertilizer. Their value to wildlife is exceptional--standing up well in snow to offer warm, secure winter shelter; providing nesting habitat diversity when mixed together; and yielding food in the form of insects and seeds.


switchgrass

Warm season grass seeds tend to be fluffy and bulky. Pure Live Seed (PLS) takes into account that a pound of warm season grass contains inert materials and seeds that will not germinate. You can use the following formula and information from the seed bag to determine the percent PLS of your seed. Percent PLS = Percent (%) pure seed muliplied by (percent germination plus percent dormant seed). For example:

% pure seed = 0.90
% germination = 0.80
% dormant = 0.10

0.90 X (0.8 + 0.1)=0.81 (%PLS)

Thus, for every 10 lbs. of bulk seed you would have 8.1 pound of pure live seed.

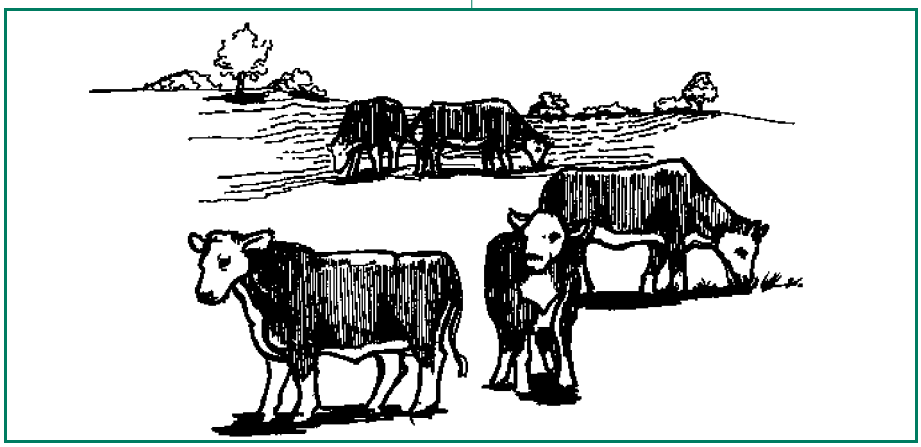
To calculate the pounds of bulk seed needed per acre, take the desired PLS divided by the percent PLS (figured above) for your seed. For example:

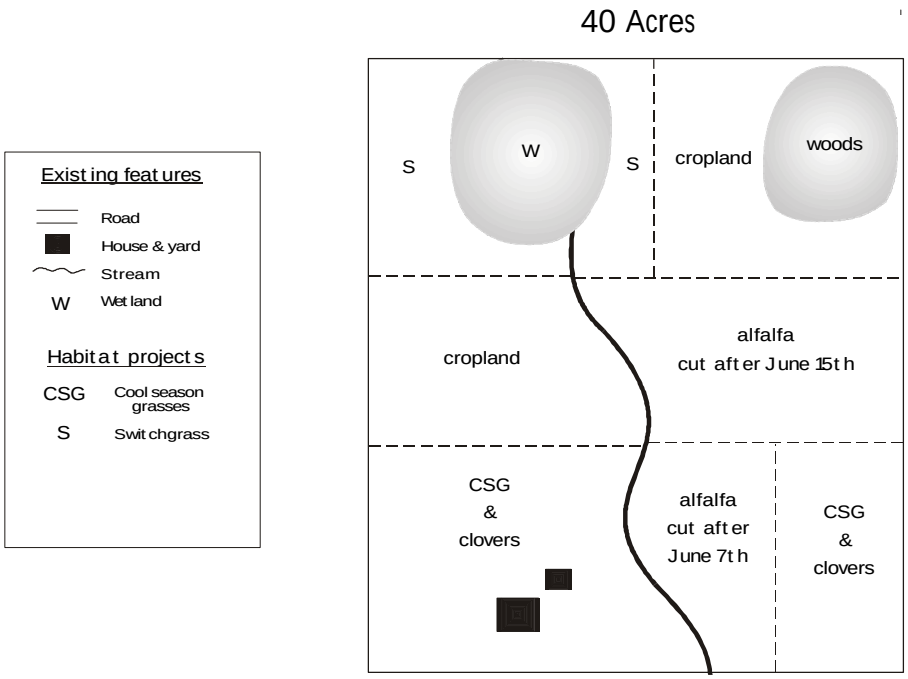
Desired plant rate = 8 lbs/acre
Percent PLS = 0.81
8/0.81 = 9.5 bulk lbs/acre

Most warm season grasses will range from 50 to 95 percent PLS per bulk pound due to the difference between each bag of seed or each grass type.

When planting warm season grasses for pasture or hay production, plant pure stands of switchgrass at 5 to 8 lbs. of pure live seed (pls) per acre or 8 lbs. of pure live seed of big bluestem or Indian grass, which would produce quality wildlife cover as well good forage for livestock. A mixed stand of warm season grasses will also produce good forage for livestock and because of the plant diversity be very attractive to wildlife. A recommended mix is 3 lbs. of big bluestem, 3 lbs. of Indiangrass, and 2 lbs. of little bluestem, all pure live seed, planted per acre.

Several stands of warm and cool season grasses, with or without legumes, provide the broadest habitat diversity. Horse fanciers, who typically harvest hay only once each year, like such a mix for its high forage value. Light grazing or rotational grazing lessens livestock's impact on wildlife. When mowing or grazing, warm season grasses should not be cropped lower than eight inches to allow for rapid regrowth. By comparison, cool season grasses are typically cropped as close as four to six inches. For more information on planting, maintenance and management

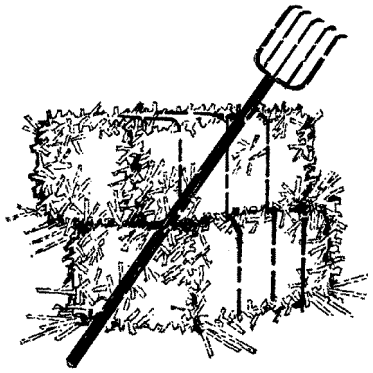




This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

see the respective **Warm** and **Cool Season Grass** chapters in the Grassland Management section. Also refer to the **Wildflowers** chapter in the Backyards section.

In summary, hayfields are essentially grasses and/or legumes that are planted for livestock. However, while providing food for livestock, hayfields can also provide food and cover for a variety of wildlife. The most critical management option is to mow hayfields before April 15 or after July 15 to ensure successful nesting and brood rearing.



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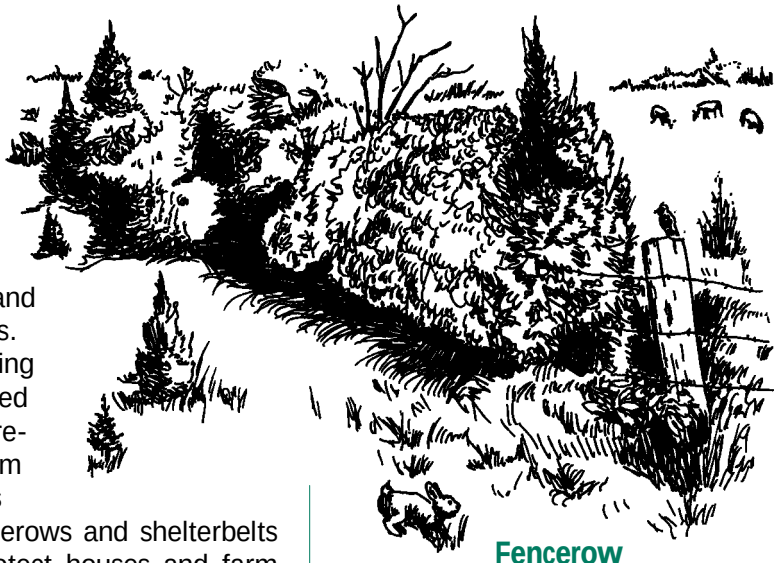
FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

FIELD BORDERS AND CORRIDORS

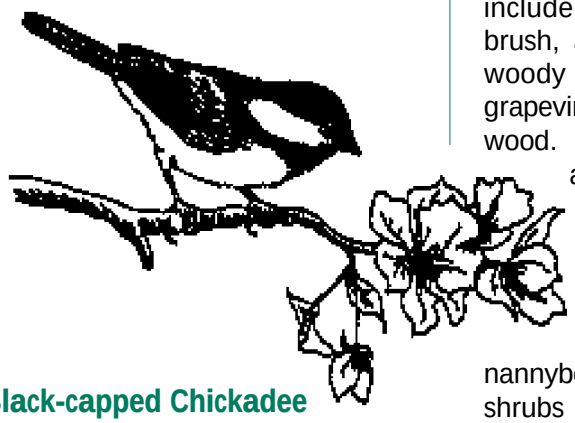
Vegetated fencerows, farm lanes, field borders, roadsides, ditch banks, shelter belts, and other linear features of the rural landscape can provide key habitat for many species of wildlife. These strip-type covers often lie next to large nesting and feeding areas, they provide edge habitat, and they give wildlife secure travel lanes between unconnected habitats. Pheasants and rabbits escape into the thickets that often grow there. Wild turkeys, ruffed grouse, cardinals, and chickadees regularly feed on the fruits and seeds found along fencerows.

Naturalized field margins are species-rich sanctuaries for worms and other invertebrates and are important for the conservation of overall species diversity in croplands. Tree corridors improve habitat for birds, both as breeding territories and as feeding zones for migrants and residents. Corridors also serve as environmental filters, windbreaks, and streambank stabilizers. When snow is driven by west winds, fencerows and buffer stips that are oriented north and south keep snow on the land and out of ditches. Gradual melting of accumulated snow later prevents soil from drying out as quickly. Fencerows and shelterbelts may also protect houses and farm buildings from harsh weather conditions, decreasing energy needed to heat in winter and cool in summer.



Fencerow

If you have such field borders and corridors on your property, consider enhancing them for wildlife. As travel lanes, the best fencerows are at least 30 to 50 feet wide and contain a mix of fruitbearing shrubs, conifers, and ground covers such as goldenrod, and aster along with weeds such as foxtail, ragweed, and smartweed. Other corridors may include sumac stands, piles of brush, and other micro-habitats of woody vegetation such as grapevines, blackberry, and dogwood. Wider is usually better, but any corridor is better than none at all. Selective cutting, prescribed burning, and planting of low-growing trees, highbush cranberry, silky and gray dogwood, nannyberry, crabapples and other shrubs can rejuvenate fencerows. These and other plants can be puchased through your county Conservation District and local nurseries.



Black-capped Chickadee

Fencerows

In heavily farmed areas of Michigan, such as the thumb region, fencerows offer one of the last traces of wildlife habitat. Clear farming practices have removed fencerows or reduced their width and eliminated their weedy and shrubby vegetation. Many people do not realize how important fencerows are to wildlife. Result show that 12 different bird species use herbaceous fencerows. When the fencerows contained scattered trees and shrubs, the number of bird species increased to 38. Those planted to continuous trees and shrubs attracted 48 species. Similarly, Michigan researchers found the density and diversity of bird nests increased as the number

of fencerow shrubs increased because the shrubs added habitat variety through layers of understory structure.

Vegetated fencerows that are 30 feet or wider lessen the impact of predation, especially on ground-nesting birds, and increase the opportunity for habitat diversity. Selective mowing, cutting and burning can increase the habitat mosaic, giving wildlife varying heights and densities of vegetation, especially grass. On the other hand, protecting the fencerow from grazing or burning encourages development of shrubs. Piling rocks and stones from adjacent fields along the fencerow gives reptiles and small mammals a place to hide. Planting or preserving trees provides opportunities for birds to nest and to rest. They also give hawks and owls perches. The management practices you employ will either encourage or discourage certain wildlife species, and that is why the wise landowner has an overall management plan.

Hedgerows

Hedgerows, which may contain trees, shrubs, or a mixture of both, grow naturally along fences that are protected. Where there are no fences, hedgerows can be created. Set fence posts in a line or staggered every 20 feet down the center of a plowed strip. String wire or twine about three feet high between the posts so they can serve as bird perches. Bird droppings are usually full of viable seed, and the plants from such deposits will often grow as fast as those from rootstock. Hedgerows protect farm fields from wind and water erosion, they provide borders for farmland that may be adjacent to your property, and they attract wildlife by providing secure travel corridors. Some people plant hedgerows to draw deer and other wildlife to their backyards where they can be observed.

If hedgerows do not already exist on your property, create them by planting shrubs or a shrub-conifer mixture. Consider locating the hedgerows across big, open fields, along present fencerows, in gullies, along streams, and around ponds, springs, food patches, nesting and breeding grounds, and other well-used wildlife sites. After site preparation, plant shrubs eight to ten feet apart. Plant evergreens (conifers) at the rate of one per every eight to twelve feet. Shrub rows should be spaced eight feet apart and conifer rows 10 feet apart to provide contiguous cover in eight to 12 years. A hedgerow with one row of conifers and two of fruitbearing shrubs will provide a strip that is 20 to 25 feet wide. Plan on thinning the conifers at 10 to 15 years of age. For hedgerows containing shrubs only, at least four rows spaced eight to ten feet apart should be planted in early spring and weed control should be used for the first three years. Control the weeds manually or with a selective herbicide or use mulches or clippings. Protect from fire and grazing.

Some of the most effective hedgerows are those planted on south-facing slopes. For a second choice consider east- or west-facing slopes. On level ditch banks, planting the north and west edges will be most effective. If your plan is to divide a large field, exposure to the southeast works best. On slopes exceeding four percent, separate hedgerow and row crops with a six-foot wide border of sod. When planted across a natural waterway, space the shrubs and trees wide enough to allow a vigorous understory of grass and forbs to develop.

Roadsides

Roadsides offer one of the best opportunities for habitat management because at least 40 species of wildlife use the associated grasslands. Species include pheasants, quail, mallards, goldfinches, meadowlarks, mourning doves, cottontails, and woodchucks. Although the acreage of roadside along a mile of road may seem small, collectively the figure in Michigan is at least several hundred thousand acres.

Hedgerows may contain a mixture of trees and shrubs.

Unfortunately, such habitat becomes a death trap for many nesting birds and mammals since most landowners mow or spray their roadsides throughout the nesting season.

The key is to curtail mowing, at least until July 15 when birds have had a chance to complete nesting and brood rearing broods. When weed control is necessary, use spot mowing or spot spraying. To improve visibility for drivers, highway shoulders should be mowed 12 feet wide or not past the ditch. After July 15, clipping the grass to a height of 10 or 12 inches will leave nesting cover for the following spring. To establish grasslands along roadsides, consider planting a mixture of native warm season grasses (little bluestem, big bluestem, switchgrass, Indiangrass) or a cool season grass mixture (timothy, orchardgrass).

Shelterbelts

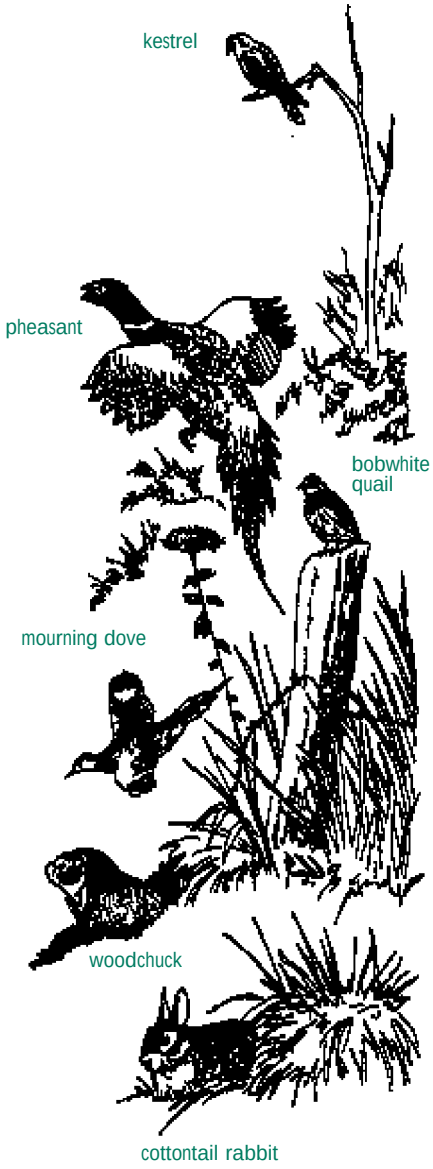
Creating shelterbelts around farm homes and outbuildings keeps snow out, cuts wind erosion, and provides a cooler environment in the summer and warmer environment in the winter. They also reduce livestock feed costs and increase crop production. Wildlife benefits include nesting, rearing, roosting, and escape cover. Mourning doves and other songbirds nest in evergreens of the shelterbelt, which also provide food and protection from predators. A study found an average of 22 bird nests per shelterbelt, which averaged less than two acres each in size. Species, which are native to Michigan, included grackles, mourning doves, robins, gray catbirds, chipping sparrows, blue jays, black-billed cuckoos, Brewer's blackbirds, indigo buntings, brown thrashers, goldfinches, yellowthroats, and red-winged blackbirds.

The porosity of a shelterbelt determines how effective the shelterbelt is. Wind that encounters resistance either sifts through the resistance or sweeps up and over or both. Once it reaches the other side of the resistance, the wind begins to gather strength again. How densely you plant shrubs and trees in the shelterbelt itself determines how effective it will be at stopping wind and checking drifting snow. Shelterbelts with close-growing trees and shrubs contribute to unnecessary drifting in the farmyard. They also have a shorter life span than more porous designs.

Four rows each of deciduous trees (non-evergreens) and conifers (evergreens) make good shelterbelts when planted 20 feet apart in rows that are 20 feet apart. Locating the taller deciduous trees on the outside (windward side) of the shelterbelt will help achieve the primary purposes of protection and long life. Placing two additional rows of black cherry, black walnut, butternut, chokecherry, hawthorn, hickory or oak in the center (between rows 3 and 4 and 4 and 5) will help provide wildlife food and homes. To provide even more food and cover, add one to three rows of chokecherry, red-osier dogwood, gray dogwood, Juneberry, highbush cranberry, elderberry, crabapple and American or beaked hazel.

Keep several features in mind as you develop a farmstead shelterbelt:

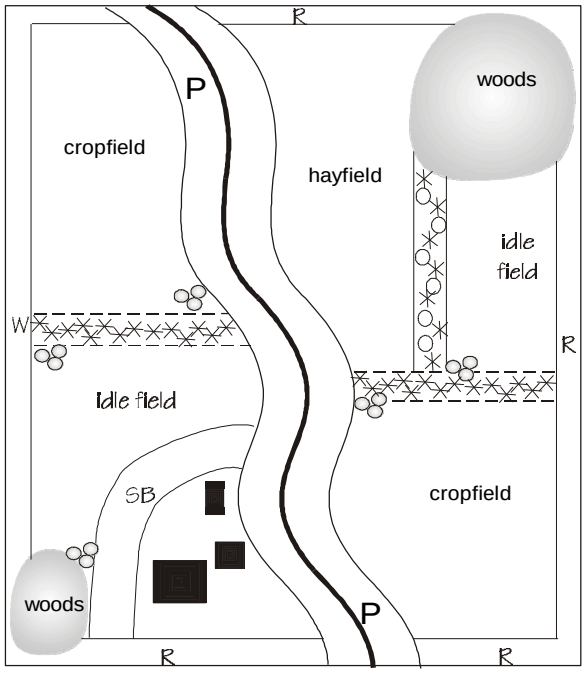
- The innermost row should not be too close to the house, barn or feedlot. Close spacing can cause problems with drifting snow and reduce other benefits. Your county Natural Resource Conservation Service office (NRCS) has detailed advice to consider, including what tree and shrub species are best suited to the soils and special conditions on your land. NRCS personnel can also advise you on proper spacing of trees and shrubs.



Varying heights and densities of vegetation attract a variety of wildlife.

FIELD BORDERS AND CORRIDORS

40 acres



Existing features

- Road
- House & yard
- Stream
- P — Permanent grass strip

Habitat projects

- SB — Shelter belt
- W — Windbreak
- R — Roadside for wildlife (wider, no mowing)
- Rockpile
- Fencerow (grass,trees, shrubs)
- Hedgerow (shrubs, conifers)

This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

•Avoid planting under or near powerlines or other utilities. If this plan is not possible, consider using shorter-growing trees and shrubs.

•Do not create driving hazards or other obstructions that will deposit snow on highways or blind corners. Locate the downwind row of any shelterbelt no closer than 100 feet north or west of a road or rights-of-way.

•The shelterbelts should extend at least 50 feet and preferably 100 feet beyond the last main building at the east and south ends of the farmstead to provide maximum protection from snow drifting. Rows of trees should be spaced 20 feet apart. In order to be effective, a farmstead shelterbelt may require an area from 200 to 225 feet wide.

•You can simplify the establishment of a new shelterbelt by maintaining conifer seedlings in plastic containers for a couple years until they are at least two feet tall. When planted, they will compete better with weeds and save initial herbicide costs. Also, container stock grows two to three times faster, when planted properly, than bare root stock.

•Order about five percent more trees and shrubs than are needed. Excess plants that aren't used for replacement can be planted elsewhere and transplanted back into the shelterbelt later if needed.

In summary, field borders and corridors not only provide a variety of benefits to wildlife, but also provide numerous benefits to you, the landowner. Enjoy watching and helping wildlife thrive in these areas around your home.

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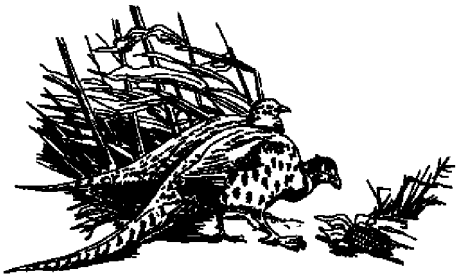
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

GRAIN PLOT PLANTING



Pheasants use grain plot plantings for food and cover.

Annual grain crops such as corn, sunflowers, buckwheat, millet, wheat, and grain sorghum can provide food for wildlife in late fall, winter, and early spring. This chapter explains how to plan and design effective grain plots, how to choose sites and prepare them for seeding, and how to plant and manage them for maximum benefit to wildlife.

Limiting Factors

Many landowners mistakenly believe that grain plots provide everything that wildlife need. On the contrary, small plantings of grain are the last part of the habitat puzzle because all wildlife also need water, cover, and space to survive. Unless quality secure cover is available next to the grain plot, it could become hunting grounds for predators, especially in winter. In addition, another type of food needs to be available during the spring, summer, and early fall. Another myth is that grain crops need only be planted and then can be forgotten. Fertilizer and weed control are also necessary for success of most grain crops.

In many parts of Michigan, deer consume grain crops more than any other wildlife species. Unless you want to attract deer, arrange grain plots away from woods, swamps and other deer cover, or plant the crop so that it is perpendicular--and not parallel--to the deer habitat. On the other hand, plots of grain can be used successfully to lure wildlife from a more valuable crop. Some farmers, for example, plant buckwheat between forested areas and valuable cashcrop fields of beans. Foraging deer eat the buckwheat and have less impact on the beans.

To be suitable for wildlife, food must be nourishing, readily available, and near cover. A grain crop such as corn that stands above the snow is especially valuable in winter. Although nutritional needs and preferences of different species change season by season, winter is the most critical period for most wildlife. For example, a pheasant will eat an average of 4 ounces of corn daily for a total of 23 pounds over 90 days. A deer will eat 6 pounds of corn daily for a total of 540 pounds over the same period.

Because grains are an annual crop, their value to wildlife is generally one year. However, if allowed to lie idle a second year, the decaying grain stalks and weeds that grow will help attract insects, which supply valuable protein to young-of-the-year pheasants, songbirds, quail and wild turkeys. The idle fields also offer protective cover. The most effective grain crops are located next to these idled, weedy fields.

Planning and Design

Careful planning can make the difference between projects that are buried by the first winter blizzard and those that will help wildlife make it through and beyond the storm. Size, location, and shape are key considerations. If grain plots are part of your management plan, allocate no more than 10 percent of your property to them. The ideal size of each plot is 1/2 acre to 1 1/2 acres. Larger plantings of 5 to 10 acres help lessen the impact of predators, but smaller sites attract less-mobile wildlife. The reason is because smaller plots can often be incorporated within or adjacent to secure winter cover, such as switchgrass, brushlands, or timber. Songbirds, for example, rarely venture to food sites more than a quarter-mile from secure winter cover.

Location, therefore, is at least as important as size. Shape is also a key consideration. The most effective food plots are square or rectangular in design and at least 60 feet wide.

If your property is long and narrow, a grain crop 60 feet wide by 700 feet long takes up only one acre of land. Such plantings make food readily available.

Seed	Planting Rate/acre	Planting Time	Planting Depth (Inches)
Corn	12 - 15#	4/15 - 5/15	2 - 3
Grain - Sorghum	6 - 10#	5/1 - 6/1	1 - 2
Buckwheat	50 - 60#	5/15 - 7/1	1 - 2
Japanese Millet	10 - 15#	5/15 - 7/1	1 - 2
Winter Wheat or Barley	120#	9/1 - 10/1	1 - 2
Rye	55 - 75#	9/1 - 10/1	1 - 2
Sunflowers	6 - 10#	5/1 - 6/1	1 - 2

Several types of grain have value to Michigan birds and mammals. Most wildlife managers put corn at the top of their priority list. Other grains, in order of their overall value, are sunflowers, buckwheat, millet, wheat, grain sorghum, and soybeans. Each food type has advantages and disadvantages. **Corn**, for example, stands well above snow and is available through the winter and well into spring.

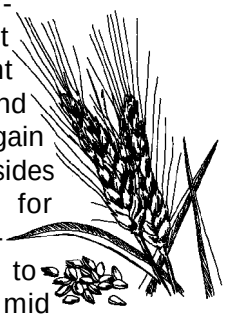
When planted from late April through mid-May and treated properly with fertilizer and herbicide, a field of corn should produce 100 bushels or 5,600 pounds per acre. Because it is a row crop, corn will often require weed control before or after planting.

The black oil variety of **sunflowers** provides an outstanding source of fall food for songbirds, upland birds, mice, and other small mammals. Drought-tolerant and early maturing, the four to six feet tall plants are so highly favored that--on the negative side--little or no seeds are left when winter arrives. Also, sunflowers compete well with weeds. Broadcast or drill at the rate of 5 to 10 pounds per acre in May. A typical yield of sunflowers is 40 bushels or 2000 pounds per acre.

Buckwheat needs little or no fertilizer or weed control because its roots produce its own toxins. But, it does not stand up well to snow. A good yield is 30 bushels per acre or 1500 pounds per acre. Buckwheat is able to produce a mature crop in 65 days. Thus, it can be planted as late as July 1 and produce a crop of mature seed by September 6. It is ideal for a wet site or a site prepared for another crop that was not planted because of wet weather.

Millets grow 1 1/2 to 3 feet tall and do better than other grains in moist soils although they are not prime winter foods for wildlife because they do not stand up to snow. Varieties include Japanese, red proso, white proso and German foxtail. Japanese millet actually favors damp lowlands, mud flats, water courses and river bottoms. When solid-seeded, millet is usually able to compete with weeds if they are controlled before planting. Plant from mid-May to early July at 8 to 10 pounds per acre. Expect to get 30 bushels per acre.

Wheat and winter barley grow best in areas of moderate moisture with cool weather for early growth and sunny, warm days when the grain is ripening. Planted in fall, winter barley and wheat becomes dormant in winter and begins to grow again in spring. Besides green browse for deer, grain becomes available to songbirds by mid summer, and provides fall roosting sites for pheasants. Winter food and cover value are reduced when snow covers the ground. Plant from September to October at the rate of 120 pounds per acre; a good yield is 50 bushel/ acre or 3,000 pounds/acre.



Grain sorghum has excellent drought resistance, grows well in hot dry conditions, and stands well in snow. Its key drawback is that it is not well-suited to Michigan, except for the extreme southern counties. Grain heads are two to four feet high, and the small seeds produced attract pheasants, quail, songbirds and deer. Like corn, grain sorghum needs about 100-120 days to mature; plant it according to the same schedule. A good yield is 70 bushels or 3,920 pounds per acre.

Although "pure" stands of the above grains are easier to plant, fertilize and control weeds, certain grain mixes--especially those containing buckwheat and Japanese

millet--are growing in favor among wildlife managers. Research to determine ideal combinations of grains is ongoing. Check with your county Conservation District (CD) for current information.

Choosing and Preparing Planting Sites

Site conditions to consider before planting include potential weed problems, drainage, erosion potential, and soil type, depth, texture, and fertility. Plant grains on the best soils you have, avoiding dry or wet sites. Eliminate from consideration any slopes greater than six percent to avoid erosion problems. Level, fertile sites are not only easiest to manage, they will produce the greatest amount of seed and forage per acre. Your local Conservation District office will have a county soil survey map, which will include your property, and may help you decide what to plant where. Also, for more information, refer to the **Crop Fields** chapter in this section.

Proper soil pH and fertility are necessary for the intended crop. A soil test will determine pH needs and recommend rates of nutrient application. Your county Michigan State University Extension office has soil-test kits available for a nominal charge and can analyze samples for you. Before planting any grain plot, the soil pH should be between 5.5 and 7.0. If lime is needed to raise the pH level, apply it in the fall before your planting season or at least three to six months before planting.

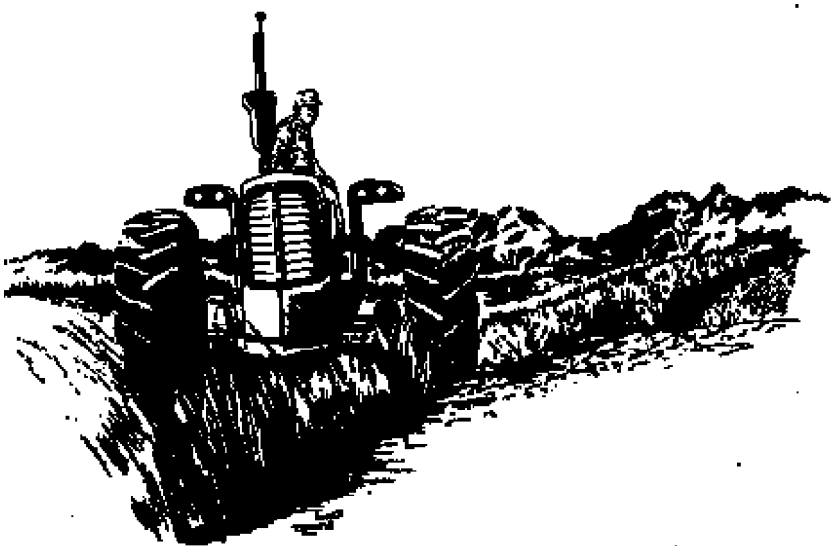
Planting and Managing

If your planting site is an old field, pasture, or was recently grass, mow it first. Use a relatively safe, broad-spectrum herbicide such as glyphosate (Roundup), at least ten days before soil work is to begin to kill all vegetation and give the grain crop a chance to compete against weeds. Be sure to read and follow label directions. If you are using conventional tillage, plow and disk the field and plant. Planting equipment includes three choices: a corn planter, grain drill, or broadcast planter. If the field is small, you may want to spread seed by hand or use a crank broadcaster. After broadcast planting, lightly disk or drag the field to barely cover the seed, or go over the field with a cultipacker or roller.

If you are using conservation tillage (usually referred to as "no-till"), you can eliminate the steps of plowing, disking, and rolling. Whatever method you choose, however, row-crop grain plantings will need additional broadleaf weed control. Provide control through another application of selective herbicide and/or cultivation. Perfectly clean rows, however, are not critical because weeds do have value for wildlife--adding diversity to cover and providing protein-rich seeds such as smartweed, ragweed and millet for food. As a general rule, if weeds have taken over only 10 to 30 percent of your food plot, do not be concerned. Slightly reduced yields of 60 to 80 bushel/acre corn and 40 to 50 bushel/acre grain sorghum that result from some weed competition are still acceptable for wildlife value.

Plantings of clovers and/or grasses can also provide valuable wildlife food for wildlife. For more information see the chapters in the **Grassland Management** section.

In summary, grain plots can make a big difference toward improving your property's appeal for many wildlife species. Careful planning, attention to detail, and not expecting the plots to provide all wildlife habitat needs are key considerations. Grain plots are just one piece of the overall "puzzle".



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INTRODUCTION TO BACKYARD MANAGEMENT

The area around your home, including the backyard, is the perfect location to enhance wildlife habitat. One reason is that you are already managing the property--growing and mowing grass, tending to trees and shrubs, and planting flower and vegetable gardens. You can use these management strategies to enhance wildlife habitat. Another reason the backyard should be managed for wildlife is that your backyard is probably an edge to another type of habitat such as a cropland, grassland, woodlot, brushland, fencerow, hedge, or other land boundary. With a little management, wildlife that inhabit these edges will most likely frequent your yard. Further, what better place to enjoy wildlife than in your own backyard? Also, developing a wildlife management plan for your backyard can enhance the natural beauty of your home and actually increase its value.

Before you can develop a management plan, you should know what wildlife need to survive, and thus what will attract them to your yard. Wildlife cannot exist without the four components that comprise habitat: food, water, cover, and space. When their habitat is fragmented or destroyed, these components become limited. Remove or fail to provide any one of these components and wildlife will not survive. These conditions put wildlife at risk, including vulnerability to predators, accidents, and starvation. Because some types of wildlife are not very mobile, local populations may be easily lost when habitat is destroyed. Also, different kinds of wildlife need different combinations of food, water, cover, and space.

Your property may not be large enough to provide all of the habitat needs for the kinds of wildlife you wish to attract. However, you can offer one or more components of habitat and still attract a variety of wildlife to your yard. Usually, a management plan with the widest range of plantings and artificial structures and features will attract the greatest assortment and number of birds, mammals, butterflies, moths, amphibians, and reptiles. Working with neighbors on an overall management plan is a good way to increase both of your properties' appeal to wildlife. Patience is important because some wildlife species may require several years to find the habitat and use it.

Backyard Habitat Components

Food for wildlife is easy to supply. Besides planting natural foods, you can supplement with a variety of products, especially for seed-eating birds. Although wildlife can't survive in your backyard on food alone, you can attract migrant birds and nearby resident species. The ideal backyard plan supplies as much diversity in food items as possible through plantings of shrubs, trees, flowers, and grasses. Carefully choosing these plants can provide food directly in the form of fruits, berries, nuts, seeds, and nectar. Indirectly, they provide habitat for other sources of food such as insects, spiders, grubs, and worms. Features such as small ponds and piles of rocks, brush, and leaves improve both the variety and quantity of available food.

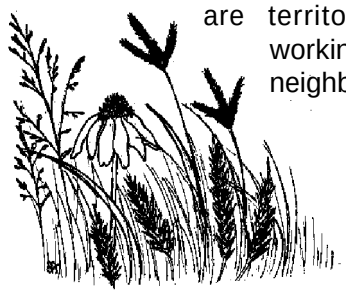
Wildlife need **water**, for both drinking and bathing. You can provide water in a birdbath, recirculating waterfall, shallow dish, or dripping hose. Most desirable is a small, shallow pond with an area large enough to support plants that grow in water and around the edge. The pond will become the center of activity for a wide range of wildlife species. Turtles and frogs will sun there and make use of the pond's cover as a nursery area for their young. Insects will use the pond for reproduction, greatly enhancing the food chain.

Cover helps shield wildlife from harmful weather and protects them from predators. Different kinds of cover serve the sheltering

needs of different wildlife species. Rock piles or piles of wood, for example, help keep chipmunks safe from hawks and cats.

Brush piles protect rabbits, toads, and salamanders. Dense shrubs shelter chickadees and cardinals. Painted turtles and leopard frogs hide under submerged logs when threatened. Cavities in trees offer safe places for squirrels. The farther an animal must venture from shelter, the more vulnerable it is to predation, and that is why plants that provide both food and cover are an important consideration. Placing trees, shrubs, flowers, or grasses in clumps creates a natural community and provides diversity. Also, adding specific wildlife houses to your property may attract bats, wood ducks, and a wide variety of songbirds.

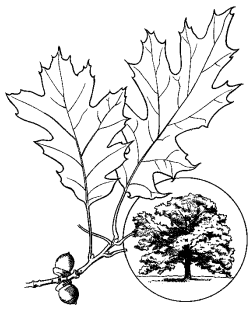
All wildlife need **space** and some species--in particular most nesting birds--are highly territorial. Space and territorial needs vary with each wildlife species. By understanding how much space is necessary for each species, you can learn what wildlife is attracted to your property. Bluebirds, for instance, are territorial and need about five acres per pair. In contrast, purple martins are not territorial, and need only small areas. You can create a larger area for those species that are territorial by working with neighbors.



The greater the diversity of habitat, the greater the variety and number of wildlife species attracted to the habitat. Some of the best backyard habitats are those comprised of trees bordered by tall shrubs and low shrubs, which are next to wildflowers or native grasses bordered by a small amount of lawn. Each border provides a different kind of "edge". What follows is a summary of management ideas for your property. Each consideration is more fully explained in the chapters in this Backyard Section.

Trees and Shrubs

Trees and shrubs add color to landscapes, provide shade in summer, protection from wind in winter, and offer texture to the area around your home. Planting trees and shrubs in your yard will reduce the area of lawn, which will reduce mowing and maintenance giving you more time to enjoy your property. In the long run it will also save you money as you will no longer need fertilizers, pesticides, or irrigation. Plantings that serve a dual-purpose--providing food for wildlife and aesthetic beauty for your home, for example--increase in home value, and therefore deserve strong consideration in backyard planning.



The wildlife habitat components that trees and shrubs create include cover for nesting and rearing young, secure winter cover, and summer, fall, and winter foods. For example, dense pines and spruces provide roosting sites and escape cover for mourning doves, chickadees, and other songbirds. Gray dogwood and American mountain-ash offer fall fruits to migrating birds. Tall oaks and hickories provide hard mast (nuts) to squirrels and blue jays in winter and cool shade on hot summer days.

When choosing trees and shrubs for your property, considering color, texture, and height will help you to provide a pleasing landscape. Early blossoming shrubs such as crabapples, lilacs, and redbud offer spring color. Silky dogwood and red elder give summer color, and red elder, serviceberry, and red-osier dogwood provide a palette of beauty in late summer and early fall. Fall-fruiting shrubs and the leaves of maple, birch, aspen, and other deciduous trees furnish an array of color in fall. Red-osier dogwoods show a striking red, and conifers give a pleasing green to a bleak winter landscape.

Pyramidal-shaped American mountain-ash and spruces, round-shaped crabapples and dogwoods, and flat junipers all add different shapes and sizes to your property. The fine textures of hemlock, white pine, and serviceberry can be a sharp contrast to rough-textured plants such as hawthorn and jack pine. Trees and shrubs come in all heights. Choosing a variety assures nesting and feeding sites for birds with strong preferences for specific elevations,providing visual screens, and adding to landscape diversity.

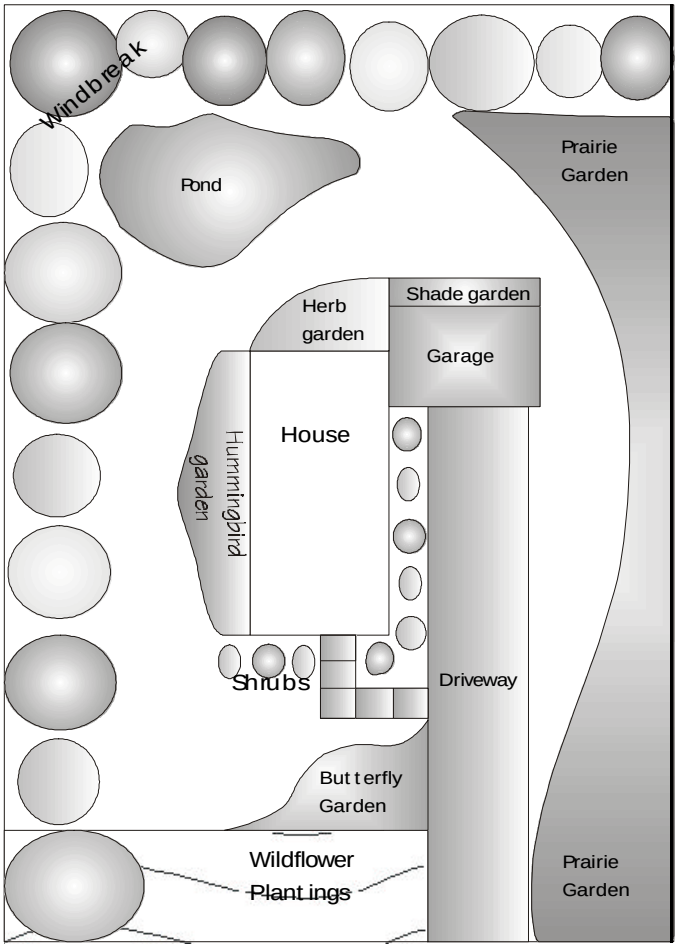
Grasses and Ground Covers

Mowed lawns require time and money to maintain, and they provide little habitat for wildlife.

Canada wild-rye

Monocultures of weed-free grass demand water, fertilizers, herbicides, and frequent mowing, and they are easily stressed by extreme drought or wet conditions. An estimated 70 percent of pesticide use occurs on the nation's lawns, but those with diverse wildflowers, groundcovers, and native grasses provide for a healthier, environmentally friendly lawn, which does not need chemicals. For these reasons, consider reducing the mowed areas in your yard to as little as possible.

Areas with tall, unmowed, or infrequently mowed grasses can provide outstanding wildlife habitat such as nesting and brooding areas, insect-foraging sites, and green foraging areas for deer and rabbits. Brown thrashers, bluebirds, pheasants, and wild turkeys are among several types of birds that also use such unmowed areas. These can be places where you let the grass go wild or where you plant to a specific grass type to create a meadow, prairie, or wildflower viewing spot. Mixing flowers with grasses is a good choice as they will furnish a nectar source for bees, butterflies, and hummingbirds.



A landscape providing the four wildlife habitat components: food, water, cover, and space.

Ground covers offer an ideal opportunity to reduce the mowed lawn surface and to develop low-maintenance wildlife habitat. Examples include wild ginger, wintergreen,and bearberry. They provide nest sites for ground-nesting songbirds, brood-rearing areas for pheasants and quail, and protective cover for rabbits and chipmunks. Such plantings can provide more formal settings for wildlife landscaping projects.

Special Feature Gardens

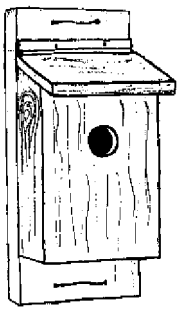
Everyone loves a garden. Specialty gardens serve to enhance viewing pleasure and attract certain kinds of wildlife. Butterfly, hummingbird, and native prairie gardens are well suited to this purpose. Besides adding beauty to the landscape, gardens that are creatively designed and well-tended can increase the value of your property. On larger properties these special-feature gardens break up the monotony of your lawn and reduce mowing time. If you do not own property, you can still enjoy a small-scale garden by arranging planters and potted flowers on the balcony or deck of your apartment, townhouse, or condominium.

Wildflowers

Michigan has a wide variety of native wildflowers that offer spectacular color and are well-suited to a number of locations. What better way to create beauty and wildlife habitat, along with contributing to our state's natural heritage, than by planting native wildflowers on your property? Once established, wildflowers enhance the attractiveness of the landscape, help control erosion, furnish food and cover for wildlife, and provide maximum enjoyment with minimal care. An increasing number of property owners are converting portions of their large, high-maintenance lawns to plantings of wildflowers. After the initial cost to establish them, you will save money and time by not having to fertilize, mow, and rake your lawn. Wildflower stands are also showing up in increasing numbers on public property, such as highway rights-of-way, corporate industrial parks, and various recreational areas.

Homes and Feeders for Wildlife

Planting trees and shrub thickets give some birds roosting shelters, food sources, and places to build their nests. Leaving leaf litter, rotting logs, and fallen branches in a woodland setting provides homes for salamanders and snakes. Standing dead or dying trees (snags) attract woodpeckers, squirrels, screech owls, and other cavity nesters. Restoring or protecting wetlands helps furnish homes for waterfowl and other wetland birds, turtles, snakes, frogs, toads, and salamanders. In addition to creating natural homes for wildlife, consider building nest boxes and feeding stations and placing them in your backyard to enhance viewing pleasure.



In summary, your backyard is the ideal place to create wildlife habitat. Once established, you will reduce the amount of maintenance, saving time and money. In addition, you will have attracted many kinds of wildlife to watch and enjoy.

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WILDFLOWERS

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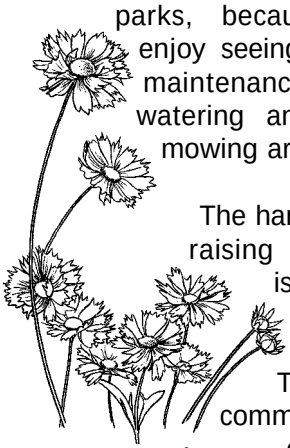

coreopsis

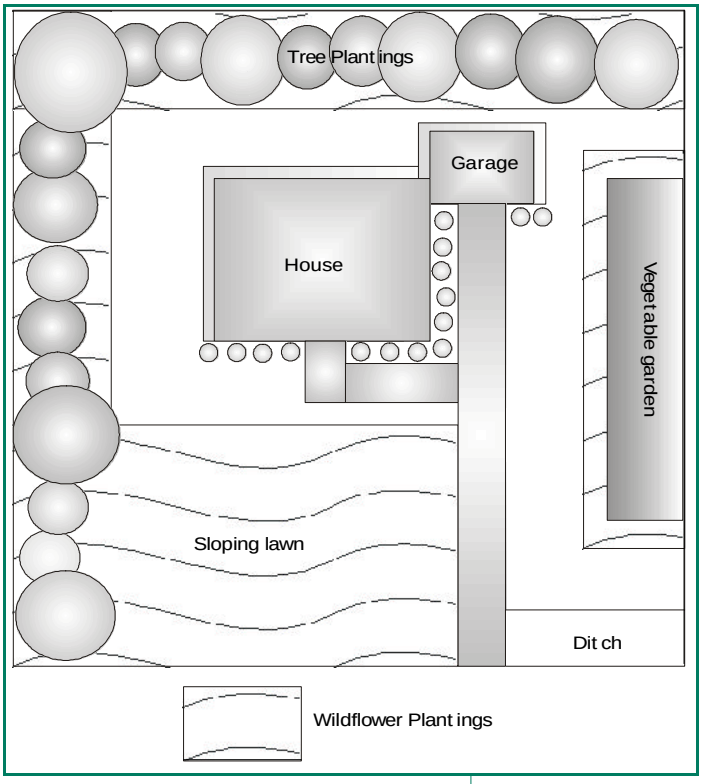
The hardest part of raising wildflowers is successfully establishing them. There is a common misconception that wildflowers are easily grown from seed. On the contrary, all wildflowers require specific soil and temperature conditions, a considerable amount of early attention, and most of all patience. When converting grass to wildflowers, you may have to till sod or perhaps, in the case of a well-established lawn, remove it. Under ideal conditions, most native wildflower plantings take at least two years to be fully developed. Therefore, you should not expect to see blooms the first year, or even the second year with some species. Most plantings take three to five years to become established firmly enough to reduce weedy competition. But the reward is well worth the work and the wait.

Expect to see lots of butterflies, moths, bees, and hummingbirds in the summer and many songbirds , such as golfinches, in the fall. Enjoy the panorama of color in spring, summer, and fall that you created through careful planning. You can do this as you take a well-deserved break from your previously manicured lawn maintenance.

Where to Plant

Wildflower plantings can be as small as a few square feet of border around the vegetable garden or as large as several acres. You may want to consider locations that are difficult to mow on a regular basis, such as ditches, around trees, near woodlots, or in wet areas. Because a wildflower stand does not require the same intensive maintenance as a lawn, you may want to plant anywhere you are simply tired of mowing. For best results, choose an area that is well-drained and that has a limited population of weeds. Weed seeds lie in undisturbed soil, and you should expect some weeds to germinate whenever the soil is disturbed. If the area you have chosen is void of plants, chances are it won't grow wildflowers either. Be sure to pick a location that you can water if rainfall is inadequate during germination and establishment. The size of the wildflower planting should only be a major concern when time and expense are large factors. Whether or not you have a large area or one or more small scattered areas, you can bring color, diversity, and wildlife to your backyard.

All plants have certain requirements for sunlight, moisture, and nutrients. Some species require a great deal of sunshine, at least eight hours per day, while many other species will tolerate partial shade. Be aware that sun-loving plants placed in shade will produce spindly plants with very few blooms. Common planting locations include dry areas, moist to wet areas, areas of moderate nutrition and moisture, and in or at the edges of woodlots. However, some wildflowers will not grow well on very compacted, wet clay or extremely droughty, infertile soils. Therefore, it is essential that you determine the drainage and soil type of the area where the wild-



flowers will be planted. A soil survey map can give you that information and should be available at the Conservation District office in your county. This map indicates the soil type and the percent slope of your land, along with detailed explanations. This information is imperative to a successful wildflower planting. If you wish to know the pH of your soil, your county extension office can perform a soil test to measure pH and nutrient levels. In order to receive this information you must remove soil from the area and take it to the extension office for analysis. For more details about how to take a soil sample, refer to the chapter **Knowing Your Soils** in the Habitat Planning section.

What to Plant

Where you decide to plant the wildflowers will determine which species to plant. Michigan has a wide variety of native wildflowers that offer spectacular color and are well-suited to a number of locations.

Wildflowers may be annuals, perennials, or biennials. Annual plants are those that go from seed to flower to seed within a single growing season. Each year roots, stems, and leaves of the plant die and only dormant seeds are left to regenerate the following year, most of which are not successful. Examples of annuals that are beneficial to butterflies, moths, bees, and hummingbirds include marigold, scarlet petunia, tobacco flower, scarlet sage, and zinnia. These are exotic species, but they are not aggressive and do not present threats to the success of native plants. They are good supplements to your perennial garden and as colorful borders. However, you should incorporate only small amounts of them to cut down on annual costs.

Perennials, such as butterfly-weed, tickseed, purple coneflower, and shasta daisy, live for many growing seasons, and keep their roots year-round. When started from seed, perennial wildflowers will not bloom until the second year after planting. After that, they will bloom every year and you will not have to replace them as you do annuals. However, depending on soil and climate conditions, some wildflowers act as annuals or perennials--for example, black-eyed Susan behaves as an annual in Louisiana but in Michigan is a perennial. For best success and greatest benefit, choose perennial wildflowers native to Michigan. If possible, buy seed from plants actually grown in Michigan, and even better, from a local seed source.

In combination with native perennial wildflowers, you may wish to plant native grasses. Common types that should do well on most sites (except in woodlots) are big bluestem, little bluestem, Indiangrass and switchgrass. These are clump grasses that provide open spaces for wildflowers to grow as well as good nesting, rearing, and winter cover for wildlife. In backyard settings they add beauty and diversity, especially in winter. For more information see the chapters on **Warm Season Grasses and Prairie Restoration** in the Grassland Management section.

Biennials need two years to complete their life cycle. First-season growth produces a small rosette of leaves near the soil surface. During the second year the plant grows a stem, flowers, produces seed, and then dies. Biennials include sweet clover, mullein, curly dock, wild mustard (yellow rocket), shepherd's purse, black mustard, foxglove, and the thistles. Many of the species listed here are exotics and may present problems to wildflower plantings for the first couple years. Because they are biennials, they should die off after the first two years and the planted wildflowers will then be able to flourish. However, to ensure success of your wildflowers, you can control them by spot treating with herbicides or cutting them by hand.

The accompanying tables of perennial, native wildflowers should be helpful for choosing the

Wildflowers for Moist to Wet Soils

Common Name	Scientific Name	Color	Sunlight Needs	Height	Blooming Season
Blue Vervain	Verbena hastata	Blue/Purple	f - p	2 - 4 ft.	July-September
Boneset	Eupatorium perfoliatum	White	f - p	3 - 4 ft.	July-August
Cardinal flower	Lobelia cardinalis	Red	f- p	2 - 4 ft.	July-September
Great blue lobelia	Lobelia siphilitica	Blue-Violet	f - p	1 - 4 ft.	August-Sept.
Marsh marigold	Caltha palustris	Yellow	f	1 - 2 ft.	April-June
New England aster	Aster novae-angliae	Rose/Purple	f - p - s	1 - 4 ft.	Sept.-October
Prairie dock	Silphium terebinthinaceum	Yellow	f	2 - 6 ft.	August-September
Spotted Joe-pye-weed	Eupatorium maculatum	Rose	f	2 - 6 ft.	July-September
Swamp milkweed	Asclepias incarnata	Lavender	f	2 - 4 ft.	June-August
Sweet black-eyed Susan	Rudbeckia subtomentosa	Yellow/Brown	f	2 - 4 ft.	July-August
Wild bergamot	Monarda fistulosa	Lavender	f	2 - 3 ft.	June-July
Wild iris	Iris shrevei	Purple	f	2 - 3 ft.	June

f = full sun p = partial sun s = shade

Wildflowers for Dry to Moderate Soils

Common Name	Scientific Name	Color	Sunlight Needs	Height	Blooming Season
Black-eyed Susan	Rudbeckia hirta	Yellow/brown	f - p	1 - 3 ft.	June-August
Butterfly weed	Asclepias tuberosa	Orange	f - p	2 - 3 ft.	July-August
Common milkweed	Asclepias syriaca	Rose-purple	f- p - s	3 - 5 ft.	June-August
Gray-headed coneflower	Ratibida pinnata	Yellow	f	3 - 5 ft.	July-September
Hairy Beardstongue	Penstemon hirsutus	White/lavender	f - p	1 - 2 ft.	May-July
Lance-leaved coreopsis	Coreopsis lanceolata	Yellow	f	1 - 2 ft.	May-August
Leadplant	Amorpha canescens	Violet	f	2 - 4 ft.	June-July
Maximillian sunflower	Helianthus maximilliani	Yellow	f	2 - 5 ft.	August-October
Purple coneflower	Echinacea pupurea	Purple	f - p	2 - 4 ft.	July-August
Rattlesnake master	Eryngium yuccifolium	White	f	3 - 5 ft.	July-September
Rough blazingstar	Liatrus aspera	Purple	f - p	2 - 4 ft.	July-September
Round headed bushclover	Lespedeza capitata	White	f - p	2 - 3 ft.	August-Sept.
Showy goldenrod	Solidago speciosa	Yellow	f	2 - 5 ft.	August-Sept.
Smooth aster	Aster laevis	Lavender	f	2 - 3 ft.	August-Sept.
Stiff goldenrod	Solidago rigida	Yellow	f	2 - 5 ft.	August-Sept.
Western sunflower	Helianthus occidentalis	Yellow	f	1 - 3 ft.	July-August
Wild bergamot	Monarda fistulosa	Pink-lavender	f	2 - 3 ft.	June-July
Wild indigo	Baptisia tinctoria	Yellow	f	1 - 3 ft.	May-Sept.
Wild lupine	Lupinus perennis	Blue/lavender	f - p - s	1 - 2 ft.	June-July
Wild Senna	Cassia hebecarpa	Yellow	f	3 - 5 ft.	July-August

f = full sun p = partial sun s = shade

Wildflowers for Woodlands (shaded sites)

Common Name	Scientific Name	Color	Sunlight Needs	Height	Blooming Season
Common milkweed	Ascelepias syriaca	Rose-purple	f - p - s	3 - 5 ft.	June-August
Dutchman's breeches	Dicentra cucullaria	White	s	5-9 in.	April-May
Hepatica	Hepatica spp.	White, to blue	p - s	4 - 12 in.	March-May
Jack-in-the-pulpit	Arisaema triphyllum	Green-purple	p - s	12 - 2 ft.	April-June
Large-flowered trillium	Trillium grandiflorum	White-pink	p - s	1 ft.	April-June
May-apple	Podophyllum peltatum	White	s	1 ft.	April-June
Meadow-rue	Thalictrum dioicum	White	s	1-2 ft.	April-May
Pale touch-me-not	Impatiens pallida	Yellow	s	3 - 5 ft.	July-October
Spotted touch-me-not	Impatiens biflora or capensis	Orange	p - s	2 - 5 ft.	July-September
Spring beauty	Claytonia virginica	White-pink	p . s	1 ft.	March-May
Solomon's seal	Polygonatum biflorum	Yellow	p - s	1 - 3 ft.	April-June
Squirrel corn	Dicentra canadensis	White	s	6-12 in.	April-May
Turk's-cap lily	Lilium michiganense	Orange	f - p	3 ft.	July-August
Trout lily	Erythronium americanum	Yellow	p - s	4-10 in.	March-May
Violet	Viola spp.	Violet - blue	s	4-6 in.	April-July
Wild bleeding heart	Dicentra eximia	Pink-red	p - s	1 ft.	May-Aug.
Wild columbine	Aquilega canadensis	Red	f - p	1 - 2 ft.	May-June
Wild ginger (low vine)	Asarum canadense	Purple-brown	p - s	1 ft.	March-May
For woodland/grassland edges					
Butterfly weed	Asciepias tuberosa	Orange	f - p	2 - 3 ft.	July-August
False Solomon's seal	Smilacina racemosa	White	p - s	1 - 3 ft.	April-June
Fireweed	Epilobium angustifolium	Pink	f - p	2 - 4 ft.	July-August
Wild bergamot	Monarda fistulosa	Pink-lavender	f	2 - 3 ft.	May-July
Wild columbine	Aquilega canadensis	Red	f - p	1 - 2 ft.	April-July
Wild geranium	Geranium maculatum	Lavender	p - s	1 - 2 ft.	April-May
Wild lupine	Lupinus perennis	Blue/lavender	f - p - s	1 - 2 ft.	June-July
Woodland sunflower	Helianthus divaricatus	Yellow	f - p	2 - 6 ft.	July-September

f = full sun p = partial sun s = shade

best plants for your area. While color and height are important, you should also consider the blooming season. Spread your blooming season throughout the spring, summer, and fall for the butterflies, moths, bees, and hummingbirds that will feed on the pollen and nectar, the birds that will eat the seeds after bloom, and your personal viewing pleasure.

Remember, patience is important as establishing a planting of wildflowers from seed will take three to five years. For small areas you may wish to use plants instead of seeds. You can also fill in the area with a few annual plants until the perennials bloom. Many wildflower suppliers offer annual mixes for this purpose. Check these mixes carefully for weeds that may cause serious problems, such as queen Anne's lace and chickory. However, you should expect a weed problem the first year. Avoid the temptation to pull them because you may damage the fragile wildflower seedlings. For more information refer to the chapter on **Wildflower Planting** in this section.

FOR ADDITIONAL CHAPTERS CONTACT:
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MUCC

Private Land Partnerships: This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information, and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this manual provides you with the knowledge and the motivation to make positive changes for our environment.

FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

WILDFLOWER PLANTING

Once established, wildflowers enhance the attractiveness of your landscape, help control erosion, furnish food and cover for wildlife, and provide maximum enjoyment with minimal care. The plantings can be as small as a few square feet of border around the vegetable garden or individual trees, or as large as several acres. Even small areas of wildflowers, especially when coupled with grass, tree, and shrub plantings, can shelter chipmunks, and migrating birds and can be used as a travel corridor by many wildlife species. Many landowners are saving money and labor by converting their high-maintenance lawns to wildflower plantings.

This chapter explains how to establish wildflowers on your property and how to maintain them for long-term wildlife habitat and viewing pleasure. Key factors are careful site selection, preparation, and maintenance. This can include choosing plants that are suited to the soil, picking the right method and time of installation, controlling weeds before and after planting, and managing for long-term success. There is an important emphasis placed on planting native wildflowers. Native refers to those species that historically occurred naturally in an area (i.e. was not introduced). These native species are important to the Michigan ecosystem and its continued existence.

purple coneflower

Site Consideration

If the area you have selected is capable of growing a healthy lawn, it will most likely support the establishment of wildflowers. However, you must match the wildflowers you choose with the type of soil you have, the soil moisture, and the amount of light that the area receives. For wildflowers needing direct sunlight, the location should receive a minimum of eight hours per day. Also, be sure to pick a location for maximum viewing pleasure. In sites with less sunlight, such as wooded areas, you should look for plants that are tolerant of shade.

Knowing your soil type is essential for successful establishment of wildflowers. Information on soil types is available from county wide soil survey maps that are available at your local Natural Resources Conservation Service and sometimes from your Michigan State University County Extension office. You can also take a soil

poppy

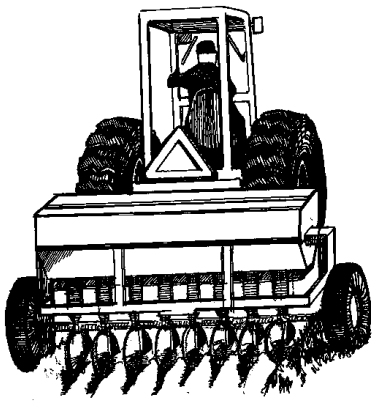
sample to the county extension office to find out the pH level and nutrient contents of your soils. For more information refer to the chapter **Knowing Your Soils** in the Habitat Planning Section. As a general rule, adding topsoil or fertilizer is not recommended as it will increase weedy competition. Topsoil usually contains dormant weed seeds, and heavy doses of fertilizer will enable them to grow and compete more heavily with wildflowers.

Soil moisture is equally important in deciding what wildflower species to plant. Moist soils have a generous amount of water in the subsoil throughout the growing season. Clues are periods of standing water in spring and fall. Dry soils include sandy and gravelly soils that drain readily and never have standing water, even after a heavy rain. Moderate or mesic soils include well-drained loams and clays. These soils may have standing water for short periods after a hard rain. To see which types of

wildflowers grow best in which environments, refer to the tables that accompany the **Wildflowers** chapter in this section.

Site Preparation

It is very important to remove all existing vegetation before planting wildflowers. If this vegetation is not properly eliminated, you will have limited success with your plantings. There are many ways to eliminate existing vegetation, either singly or in combination. Smothering the soil surface with plywood, a thick layer of leaves, or a sheet of black plastic will kill many existing plants if the covering is left in place for one full growing season. This practice is commonly used for areas less than 1,000 square feet. For more aggressive species, such as quack grass and Canada thistle, you may have to leave the covering for a longer period of time. A low toxicity, non-persistent herbicide such as Roundup is another efficient method. Be sure to read and follow all labeled directions. A third technique is to cultivate with a rototiller, plow, or disk. Commercial companies often remove old grass with a sod cutter. What works best depends on the size of the area and the vegetation currently growing there. The most effective way to remove existing vegetation is to mow, apply herbicide, and cultivate repeatedly until vegetation is controlled.



Converting Lawns

One of the best ways to prepare a lawn for wildflower planting is to remove the top three inches of grass and soil, using a commercial sod cutter on big sites and a hand shovel on smaller sites. A second method is to apply herbicide in spring or fall when lawns are actively growing. In about two weeks or after the area has turned brown, cultivate once with a rototiller or disc, taking care not to disturb the soil deeper than two inches (to discourage deeper-soil weeds from sprouting). After one week cultivate again. If weeds continue to germinate after a week, you may need to spray again.

Converting Old Fields

Converting an old field to wildflowers requires at least one full growing season to prepare the site. Burn or mow in early spring to remove the previous year's growth. Apply herbicide three times during the season: mid-spring, mid-summer, and early fall. This schedule allows you to attack different weeds which have peak growing activities at different times. Cultivate every two to three weeks to a depth of four or five inches. Be very consistent because it is important to rid the area of weeds before planting, especially grasses such as quack grass and reed canary grass.

Converting Crop Fields

Good soils are more weed-prone than poor soils. For existing crop fields, spray with herbicide either after harvest in fall or after green up in spring. Similar to old fields, using cultivation and subsequent application of herbicide, work the soil all spring and summer. Once vegetation is fully removed, prepare the final seedbed by lightly tilling or discing, followed by dragging or raking. Caution: Do not plant wildflowers in fields treated with Atrazine within the last two years because wildflowers cannot tolerate this herbicide. A smother (or cover) crop of corn or sorghum will hold the soil from erosion for a year and control unwanted weeds until the Atrazine breaks down.

On sites prone to erosion, do not leave the soil unvegetated for any length of time, and keep cultivation to a minimum. Plant the site as soon as it is ready or, if ready in the fall, plant a cover crop of oats at the rate of 100 pounds per acre or annual rye at the rate of one bushel per acre. When you are ready to plant the wildflowers in the spring, till the cover crop under. It is critical to use certified seed when planting cover crops so as to not introduce more weeds.

Seeding

Once you have the site properly prepared, seeding can commence. If the soil is loose, roll or press with an ordinary lawn roller to firm it up. Sow the seeds with a whirlwind mechanical seeder or cast by hand. If you hand cast, consider mixing the tiny seeds with a slightly dampened inert material such as vermiculite, sawdust, or peat moss so the seed will stick to it. For a planting of 1,000 square feet, two-thirds of a bushel basket of inert material is plenty. For an area 1/10 acre in size (about 4,400 square feet) two bushel baskets will suffice. Mix the seed into the inert material. Evenly spread half of the total mixture over the area,

then cast the other half while walking in a perpendicular manner to your first pass.

If the seed has not already been mixed by your supplier, consider sowing each type of flower in small clumps or drifts throughout the area, which will mimic natural colonization. If planting in combination with native grass, sow the grass seed separately. Lightly rake and/or roll the site, taking care not to cover the seeds more than their average diameter (about 1/16th inch). Therefore, expect some seeds to be visible. Mulching may be necessary on potentially erosive slopes. If mulching, use only light material such as clean oat or wheat straw and cover no more than half of the bare soil. If necessary, water for four to six weeks, just enough to moisten the seeds with each application.

Follow the supplier's instructions as to seeding rates. Wildflowers are generally planted at the rate of four to five pounds per acre although some seed supply companies recommend rates of six to eight pounds per acre. When seeding with native grasses, you may only need one pound wildflowers per acre, depending on the desired density of wildflowers. If using transplants, follow the supplier's planting instructions.

Consider a large broadcaster or no-till grain drill for planting large areas. Because wildflower seeds are so small, adding a bag of cracked oats to the drill will help ensure even distribution of seeds, which will settle below the larger oats in the drill. Also, be sure to count the number of passes necessary to cover the field and then divide the seed into an equal number of passes. Fill the drill hopper after each pass with the correct amount of seed and oats.

Post-planting

Most native wildflower seeds take at least three weeks to germinate. Do not expect to see blooms the first or possibly even the second year. Supplementing your planting with a few annual wildflowers will give you a show of color the first year. Many seed suppliers mix annuals with perennials for this reason. Be sure to check for aggressive exotic species in the mix to avoid problems.

Expect a weed problem in the first year. Avoid the temptation to pull the weeds, because the wildflower seedlings may be dislodged. Instead, mow to a height of six to eight inches throughout the summer and into early fall (wildflowers do not usually grow taller than six inches the first year). This mowing will remove the seed heads of weeds before they are mature, which will prevent them from regenerating. If the planting was supplemented with annuals, however, mowing will sacrifice them unless you wait until the blooming period has passed. Consider spot mowing problem areas or over rough terrain with a stringed power weed trimmer. Mature establishment of perennial wildflowers will occur in three to five years. Weeds should not be a problem by then.

Long-term Management

In the early spring of the second year, mow the planting to the ground and rake off the cuttings. If weeds remain a problem in the second year, mow again in late spring or early summer. To avoid damaging desirable plants, do not mow after new plant growth has reached

black-eyed Susan

one foot or more. If you mow too late in the fall, you may destroy the seedheads of coneflowers and coreopsis, which feed birds in winter. Also, mowing too late in the season will remove vital nesting cover for early spring, as well as remove the aesthetic value of snow on native grasses and wildflower stalks in winter. By the third year weeds should be minimal.

Burning, which is also a valuable management tool for long-term success, can be started at the beginning of the third growing season. Burning removes the accumulated plant litter from the previous year's growth and exposes the soil surface to warming rays of the sun. It also encourages the growth, flowering, and seed production of native flowers and grasses. Conducting a burn right after snowmelt produces a slow, cool burn, which benefit wildflowers the most. A mid-spring burn, from three weeks after snowmelt to about 60 percent greenup, is most beneficial to prairie grasses because it helps set back undesirable cool season plants that begin their growth early in the season.

Never initiate burning after new plant growth has reached one foot or taller, and be sure to check with local fire authorities for permits and

Wildflower Planting Plan

Year	Plan	Methods
1	Evaluate Site	Know soil type through soil survey maps. Decide on location as it determines what plants will be able to grow
	Remove Vegetation	Smothering, using herbicides, cultivation, and burning are all ways to remove vegetation, and are dependent on the site's location.
	Seeding	Use a lawn roller, and either cast with a seeder or by hand. Expect a 3 week germination period before any results are seen.
	Avoid Pulling Weeds	Instead of weeding, mow at 6-8 inches off the ground in late summer/early fall. Spot mow in trouble areas.
2	Mow in Spring	Mow close to the ground, and rake the cuttings. Let it grow the rest of the year.
3	Burn in Spring	Burn at the beginning of growing season (3 weeks after snowmelt) every 3-4 years.
Beyond 3	Burn in Sections	Consider burning 1/3 parcel every year to add diversity.
		Always check with authorities for regulations on burning.

other regulations. Plan to burn every three to five years. Splitting large parcels into thirds and burning or mowing one-third each year will help provide habitat diversity. If you have more than one planting area, burn or mow one planting per year.

Factors That Cause Poor Results

Nothing is more frustrating than spending money and time on establishing wildflowers only to have the planting fall short of expectations. The following 10 factors are common reasons why some landowners experience poor results or, in some cases, failure.

1. Unsuitable site conditions for the species of wildflowers being planted.

2. Not enough weed control -- before or after planting.

3. Disturbance of soil deeper than two inches during site preparation.

4. Planting at the wrong time of year (late summer or fall).

5. Ignoring recommended seeding rates.

6. Covering the seed too deep beneath the soil surface.

7. Not enough sunlight.

8. Inadequate rainfall after seed germination.

9. Extreme weather conditions.

10. Impatience.

Thus, to ensure a successful planting, it is important to educate yourself about proper procedures. Stick to the methods described here and you should reap wonderful rewards.

FOR ADDITIONAL CHAPTERS CONTACT:
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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

TREES & SHRUBS

Trees and shrubs can help provide a wide variety of backyard landscape designs while creating valuable wildlife habitat. Planting trees and shrubs offers a variety of benefits to your home. They add color to landscapes, provide shade in summer, protection from wind in winter, and offer texture to the area around your home. These plantings reduce the size of your lawn, which saves you time and money as you will not need as much mowing, fertilizers, or pesticides. They may also increase the value of your home.

The wildlife habitat that trees and shrubs create includes sites for nesting and rearing young, secure winter cover, and summer, fall, and winter foods. For example, dense pines and spruces provide roosting sites and escape cover for mourning doves, chickadees, and other songbirds. Gray dogwood and American mountain-ash offer fall fruits to migrating birds, and oaks and hickories provide hard mast (nuts) to squirrels and blue jays in winter and cool shade on hot summer days.

There are four factors to consider when choosing trees and shrubs for your backyard: (1) your landscaping goals, (2) wildlife values of the trees and shrubs, (3) their aesthetic characteristics (color, texture, height), and (4) your landscape's characteristics (soils, slope, location). Plants that serve multiple purposes, such as providing both food for wildlife and aesthetic beauty for your home, deserve the strongest consideration.

Landscaping Goals

Before deciding what to plant, you must determine what goals you have for landscaping. Are you interested in creating a colorful backyard? Do you want to develop visual barriers from neighbors or sound barriers from a noisy street? Is providing shade important? Is your goal to protect your home from winter winds? To help you determine your goals, refer to the chapter **Setting Goals and Considering Alternatives** in the Habitat Planning section.

Oaks, hickories, maples, and other large deciduous trees planted on the south side of your home can provide relieving shade in summer and allow the winter sun to furnish warmth. Conifers mixed with tall and medium shrubs provide a privacy screen. Medium and short shrubs mixed with perennial flowering plants can furnish color and serve as attractive foundation plantings around the base of your home, as well as backgrounds to formal flower plantings and borders around trees, fences, and other structures.

A mixture of deciduous plants (whose leaves drop in fall) and conifers (evergreens) is highly effective for creating shade, shelterbelts or windbreaks, and visual barriers. Locate them on the windward side of the area to be protected and plant them a distance from your home of three to four times the mature height of the tallest plant. In other words, if the tallest tree in the windbreak is 50 feet, plant the windbreak 150 to 200 feet from your home.

Wildlife Values

You should also choose trees and shrubs based on their value to wildlife. Food production and cover are the two most important values that trees and shrubs have for wildlife. Both of these habitat components are critical during all months of the year.

Trees and shrubs provide pollen and nectar in the spring and throughout the summer. Butterflies, moths, and bees especially rely on these trees and shrubs at these times as they play an important role for pollinating insects. Basswood and maple, for example, are key pollen sources in

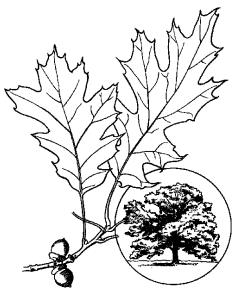
early spring. Crabapple, hawthorn, dogwoods, American mountain-ash, and nannyberry have beautiful springtime flowers that also provide a pollen sources. Birches, aspens, willow, hackberry, butterfly bush, and the various cherries and oaks provide important food habitat for butterflies and caterpillars. Coralberry, snowberry, and spicebush are also valuable to moths. Cherries, apples, plums, peach, pussy willows, lilacs, coralberry, snowberry, and wolfberry are critical sources of pollen for bees.

Plantings that provide food in summer help juvenile birds as well as early migrants to develop early winter energy reserves. Wild plum, serviceberry, red elder, hazelnut, mulberry, and the cherry species (choke, nanking, and pin) all provide important late-summer foods. The dogwoods (red-osier, silky, and gray), winterberry, American mountain-ash, hawthorn, crabapple, nannyberry, bearberry, buffaloberry, and arrowwood are all shrubs that provide valuable fall fruits. Nut-producing trees such as oak, hickory, butternut, and black walnut are also key fall foods for both migratory and resident wildlife.

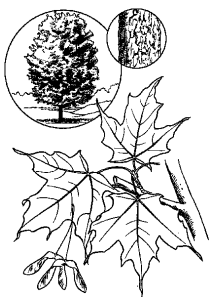
Shrubs and trees must have persistent fruits in order to have winter value. The better ones are not palatable earlier in the year nor are highly preferred. Winter thaws and cold weather may make them more desirable to wildlife later in the year. Black chokecherry, crabapples, snowberry, staghorn sumac, hawthorn, American mountain-ash, nannyberry, and American highbush cranberry all have persistent winter fruits. Maple, ash, white pine, and white cedar are important sources of winter browse for deer and rabbits.

Many of these species provide cover for wildlife. Conifers are important sources of thermal and nesting cover for many species of wildlife, especially songbirds. Red and white cedar, hemlock, balsam fir, and the many kinds of spruce provide crucial winter cover because of their dense boughs. All trees and shrubs can provide nesting cover for some type of songbird, but plants that offer high quality nesting cover include hawthorns, cedars, crabapples, hemlocks, dogwoods, and spruces. Cavity-producing trees such as older beech and white oak provide homes for squirrels, screech owls, wood ducks, and many songbirds including chickadees. Therefore, dead and dying trees (snags) should be kept, if possible.

The following shrubs and shrub families should be highly considered as they are well adapted to Michigan's soil and climate conditions and offer valuable year-round wildlife habitat components:



red oak



sugar maple

American Highbush Cranberry is a widely available viburnum that is an upright, tall (8 to 12 feet) shrub adaptable to most soil types. It fruits well on sunny sites and its bright red berries remain on the bush well into winter. It is used for nesting by brown thrashers, catbirds, and many other songbirds. An excellent wildlife shrub on moist sites, it will also grow on sandy soil, although more slowly.

Dogwoods are used intensively by wildlife. In Michigan, the most popular varieties include silky dogwood, gray dogwood, and red-osier dogwood. They all produce flowers in the spring and fruits in the fall, and adapt to a variety of soils. Red-osier dogwood is so named as its bark is a bright to deep red when in full sun areas. It thrives on moist areas as well as sandy sites and can easily be used to form dense hedges.

Elderberry is often overlooked as a shrub for wildlife. Growing on a variety of sites in both sun and shade, it fruits best in sunny, moist areas to attract many songbird species in late summer and fall. Black elderberry is found on lowland sites, while red elderberry is found on upland sites.

Junipers and cedars provide good cover, nest sites, and food for songbirds. Scattered among deciduous shrubs, they enhance habitat diversity and can be used effectively in windbreaks and other strip covers. One drawback is that eastern red cedar is the alternate host for cedar-apple rust, which results in blemishes on the fruit and leaves of apple, crabapple, and hawthorns. For this reason do not plant it close to apple orchards.

Hawthorns are small thornapple trees that bear persistent fruits and are excellent nesting sites for songbirds. Washington Hawthorn is a common variety. Although difficult to transplant, hawthorns survive well on upland and lowland sites. They do best when planted at regular, well-spaced intervals among other low-growing trees and shrubs.

Crabapples come in many varieties from nurseries and grow from 10 to 30 feet tall. Like hawthorns, they provide nest sites for robins and other songbirds. They also have stunning flowers in the spring and fruits in the fall that are persistent through winter. If possible, choose disease resistant varieties.

American mountain-ash

Popular species of trees and shrubs to consider planting in your backyard.

SPECIES	SOIL S=sand L=loam C=clay M=muck	MOISTURE D=dry M=moist W=wet	SUN-SHADE S=sun Sh=shade	HEIGHT S=small M=medium T=tall
SHRUBS				
Crabapples	S-L-C-M	D-M	S	S-M
Hawthorn	L-C	D-M-W	S-S, Sh	S-M
Dogwood	L-C-M	M-W	S-S, Sh	S
Highbush-cranberry	L-C-M	M-W	S-S, Sh	S
Nannyberry	L-C-M	M-W	S-S, Sh	S
Elderberry	L-C-M	D-M-W	S-S, Sh	S
American mountain-ash	L-C	D-M	S-S, Sh	M
CONIFERS				
White Spruce	S-L-C	D-M	S-S, Sh	T
Balsam Fir	S-L-C	D-M	S-S, Sh	T
Hemlock	L-C-M	M-W	S-S, Sh	T
White Pine	S-L	D-M	S	T
White Cedar	S-L	M-W	S-S, Sh	T
DECIDUOUS TREES				
White Oak	S-L-C	D-M	S-S, Sh	T
Red Oak	S-L-C	M	S-S, Sh	T
Am. Beech	S-L-C	D-M	S-S, Sh	T
Red Maple	L-C-M	M-W	S-S, Sh	T
Quaking Aspen	S-L-M	M-W	S-S, Sh	T
Black Cherry	S-L	D	S-S, Sh	T
Shagbark Hickory	S-L	D-M	S-S, Sh	T

Wild plums are growing in popularity among wildlife biologists as an alternative to planting exotic species. They have showy flowers and produce fruits that humans may also use. They spread by suckers to form clumps.

Nannyberry is a tall shrub or small tree that is used as an ornamental for its attractive flowers. It provides fruits in the fall for many species of wildlife. This shrub spreads by suckers and may be difficult to control near lawns and gardens.

See the accompanying panel for popular species of conifer and deciduous trees to consider planting in your backyard.

Aesthetic Characteristics

When choosing trees and shrubs for your property, considering their characteristics such as color, texture, and height, which will help you to provide a pleasing landscape. Early blossoming shrubs such as crabapples, lilacs, serviceberry, and redbuds offer spring color. Silky dogwood and red elder give summer color, and red elder, sumac, and red-osier dogwood provide a palette of beauty in late summer and early fall.

Fall-fruiting shrubs and the leaves of maple, birch, aspen, and other deciduous trees furnish an array of color in fall. Red-osier dogwoods show a striking red, and conifers give a pleasing green to a bleak winter landscape.

Pyramid-shaped American mountain-ash, tamarack, and spruces, round-shaped crabapples and dogwoods, and flat junipers all add different shapes and forms to your property. The fine textures of hemlock, white pine, and serviceberry can be a sharp contrast to rough-textured plants such as hawthorn and jack pine.

Trees and shrubs come in many heights. Choosing a variety of heights assures nesting and feeding sites for birds with strong preferences for specific elevations. It also provides visual screens and adds to landscape diversity. To develop a "feathering" or "staircase" effect, which is highly beneficial for wildlife, plant oaks, hickories, and tall conifers at property borders. As you move closer to your home, add serviceberry, American mountain-ash, and medium-height shrubs such as dogwoods and crabapples. Low-growing shrubs such as bearberry and coralberry, will complete the staircase effect to your lawn. Beyond this, you may want to plant grasses or wildflowers to further increase your yard's value to wildlife.

Landscape Characteristics

Another important factor to consider before selecting trees and shrubs is the characteristics of your property, which may include soil types and locations of your plantings. Before planting, it's a good idea to determine the pH and available nutrients in your soil. For example, you should not plant a shrub that is needs moist, acidic soils on a dry, sandy site. Even though the shrub may fit all of your landscape goals (color, texture, wildlife value), it may not fit in with your landscape characteristics. Therefore, it will most likely not grow on your property and you will have wasted your time and money. For a nominal fee your county's Michigan State University Extension office will analyze soil samples from your yard. Refer to the chapter **Knowing Your Soils** in the Habitat Planning section for more information.

Another thing to consider is the location of your planting. You may not want a nut producing tree in an area where the nuts will be a problem, such as near a pool. Another example of location problems is seen with mulberry trees. These trees should be planted along property boundaries and away from porches, decks, and cars because its fruit and droppings from birds eating mulberries will stain.

Another thing to remember with location is the height that the trees and shrubs will grow. Be careful that they will not grow too tall and encroach on other backyard projects. For instance, a tree is planted in a spot where it is not currently shading a garden. However, if the height of the tree is not checked, in a few years it may cast a much larger shadow than expected. Therefore, be sure to plant the trees and shrubs far enough from each other and any other areas where they may cause problems.

In summary, there are many trees and shrubs that can not only create valuable habitat for wildlife, but also enhance the value of your home. When selecting trees and shrubs for your yard, it is important to consider your landscaping goals, the wildlife values and aesthetic characteristics of the plants, and the characteristics of the current landscape. With these in mind you will create a beautiful landscape that will also benefit wildlife. Refer to the chapter **Tree & Shrub Planting** in this section for more information.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

TREE & SHRUB PLANTING

Trees and shrubs are an important part of Michigan's natural ecosystem. About 50 percent of the state is forestland. The plants that make up our forests provide food in the form of fruits, berries, and hard mast (nuts) for a wide variety of wildlife; browse for rabbits and deer; nectar and pollen production for bees and butterflies; and leaves for caterpillars and other insect larvae. They also offer critical cover for wildlife to nest, rest, hide from predators, and seek shelter from heat, cold, and moisture.

The **Trees and Shrubs** chapter in the Backyard Management section explains the wildlife value of key plant species, and considers landscaping goals and site selection. The **Knowing Your Soils** chapter in the Habitat Planning section will help you understand how to identify soil types and to know what plants will grow best on your property. This chapter focuses on how to purchase healthy trees and shrubs, plant them properly, and manage them successfully. Considerations include site selection and preparation, plant selection and pre-planting care, planting techniques, and post-planting care.

Site Selection and Preparation

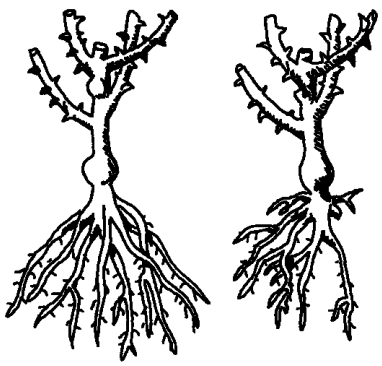
The decision to plant shrubs and trees should be made months in advance of their arrival at the nursery or at your local county Conservation District. For best success, plan in the spring or summer before planting (including soil testing), prepare the site for planting in fall, order stock in winter, and plant upon arrival in early spring. Place your order early or you may have to choose from leftover stock or receive your seedlings past prime planting time. Lack of planning is one of the main reasons why some landowners fail to grow healthy trees and shrubs. Select plant species that are adapted to the soil texture, drainage, and amount of shade at your site. Do not plant a shade intolerant tree in the shade of other trees as they will die. Slopes greater than 6 percent, odd-shaped fields, ditch banks, property boundaries and wetland and forest edges all make ideal shrub-planting sites. The local Conservation District office, nursery, public library or Michigan State University Extension offices will have information on specific plant requirements.

Trees and shrubs produce food and cover for a variety of wildlife.

Site preparation includes reducing weedy competition and any logging debris, and improves soil conditions for tree growth. Most planting failures can be traced to poor weed control, so this step is very important. Because weeds compete directly with seedlings for water, nutrients, and sunlight, they must be controlled before (and after) planting. In the fall before planting, place a weed-barrier cloth or apply a general emergent herbicide like Roundup. Be sure to read and follow all label directions. Individual planting sites should be 36 inches across. When planting in rows, prepare a 36 inch wide strip. All vegetation within the area must be killed. If weeds are growing again in spring when it is time to plant, apply an emergent herbicide once again. "Emergent" herbicides kill only those plants already growing. Mechanical treatments such as disking or plowing will also help to control weeds. Many tree planters even scrape the sod off the planting site at the time of planting to reduce weed competition.

Plant Selection and Pre-Planting Care

You may purchase trees and shrubs as transplants or seedlings. Transplants are plants that were uprooted and planted in another



The trees you choose should have at least six lateral roots that are equal in length to the stem.

location, while seedlings are young plants grown in one location. Both are available in bare-root form or come with soil either in containers or balled and burlapped. Seedlings are less expensive when bought in large amounts. They are also easier to plant with a tree planter because of their small roots. Transplanted stock is more expensive than seedlings, but survival and growth rates after planting are often better. In addition, larger transplant stock grows more quickly into recognizable trees or shrubs. When only a small number of trees and shrubs are needed, purchasing them with soil attached is a good idea because planting success rates are higher due to decreased shock to the plant. If possible, it is best to choose plants that were grown from a local source.

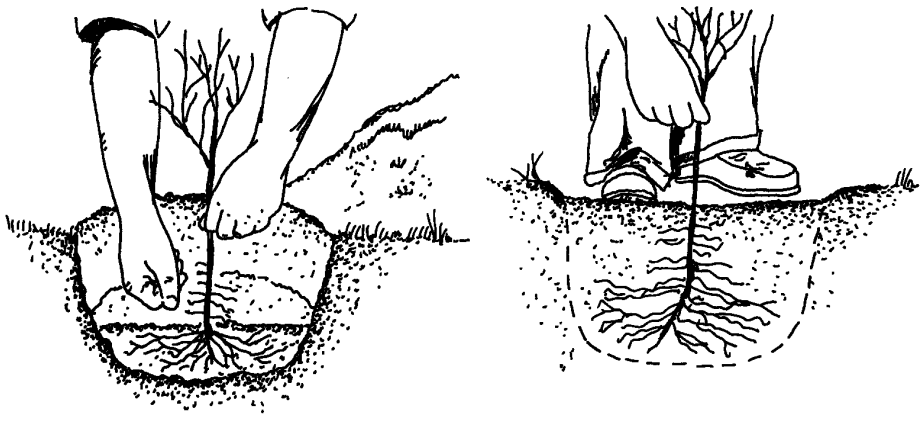
Seedlings can be one, two, or three years old and are designated as 1-0, 2-0, or 3-0 stock. Transplants are usually three to five years of age, and the last number in the sequence tells how long they have been in the transplant beds. For example, stock designated as 2-1 is three years old total, the last year of which was spent as a transplant. In addition to age, some seedlings and transplants are sold by height class, which has the advantage of establishing a plantation that should develop uniformly. Seedling sizes may range from six to 12 inches. Buy the biggest or oldest seedlings you can afford. Avoid small, spindly stock less than six inches tall. Hardwood saplings should have a trunk diameter (also called a stem caliper) of at least 3/8 inch and at least six vigorous lateral roots that should be equal in length to the stem. Avoid hardwood stock with a single large taproot.

How stock is handled at the nursery and in transit often determines its health. Signs of mishandling include dry roots, white-tipped roots, excess soil on the roots, swollen or burst buds, presence of mold on needles or stems, broken stems or stripped roots, and containers that are ripped or crushed.

Choose trees that appear healthy, with evenly distributed branches.

Bare-root plants, regardless of whether they are seedlings or transplants, need to be kept moist before and during planting. Keep the shipping package moist or place the plants in a pail with an inch or two of water (over-watering can kill the plants). The best option is to mix peat moss, dirt, and water in a pail to make a slurry. Put the little trees or shrubs in the slurry and keep them in a cool place (35 degrees Farenheit if possible) until you are ready to plant, which should be within 48 hours.

Plants sold in containers should have soil and roots joined tightly. Pruned roots should be cut cleanly and be no wider than an



When planting bare root stock, make the hole large enough to spread the roots out naturally; add soil around the roots; fill hole completely; tap firmly to fill in air gaps.

average finger. Check for the absence of large, circling roots by feeling down into the top 3 or 4 inches of the pot. Stock that has been balled and burlapped should have a firm root ball near the trunk. Size of the ball should be about 1 foot for each inch of trunk diameter.

Planting Techniques

It is best to plant in early spring or late fall when the plants are dormant. However, in heavy soils such as clay, planting in fall is discouraged as the plants may be frost heaved from the ground before roots can become established. When planting, keep the young plants moist and out of direct sun, if possible. If the roots of the trees were not pruned to an eight-inch length at the nursery, do so with clippers or a sharp ax. Root pruning makes planting easier and increases survival rates. The depth of the planting hole and length of roots should be about the same but not less than 8 inches, and the root collar (small swelling where the ground level was at the nursery) should be an inch deeper than the new surface.

When planting bare root stock by hand, use a shovel to dig a hole large enough to spread the roots in a natural, uncrowded way, add soil around the roots to the root collar, and tap firmly to exclude air. You can also use a planting bar, or dibble, to make a vertical slit in the soil and to repack the soil around the tree after planting. Be careful not to crowd the roots, and make sure the soil is firmly replaced. If possible, water the trees after planting.

When planting trees and shrubs with soil attached by hand, slope the sides of the hole away from the plant and dig or deeply rototill to a depth of 12 inches around the hole. Before placing plants in the hole, loosen the roots from the soil. This extra preparation will lessen the shock of transplant and give roots a chance to spread in a wide periphery while in softer soil. How wide an area to dig depends upon the amount of space available, whether roots of other trees will be damaged, and soil compaction (the more dense the soil, the wider the area). The usual range to consider is two to five times the diameter of the root ball. Wet the bottom of the hole before planting, place the tree or shrub upright, pack soil firmly, and water if possible.

When planting trees and shrubs with soil attached to the roots, slope the sides of the hole away from the plant and dig deeply around the hole to prevent excessive shock to the plant.

Planting machines are usually used when planting large numbers of trees or shrubs. Bare root stock is usually used. The planting machine makes a slit in the soil where the operator places the tree. The machine then closes the slit and packs soil around the roots. Typically pulled behind a tractor, some planting implements have a furrowing attachment to clear away debris and vegetation. Others have spray attachments for applying herbicide. Check with your county Conservation District office or nursery for availability.

One person can plant 40 to 60 trees or shrubs per hour by hand or 200 to 300 per hour with a machine planter. Hand planting may be the only method on steep or rough terrain, and it is better for walnut and various oaks, which have long taproots. If you are planting conifers, the typical rate is 600 to 1,000 trees per acre. Hardwoods are typically planted at 300 to 500 trees per acre. Windbreaks of hardwoods and/or conifers should have at least three staggered rows. Tree spacing to reach these recommended densities is included in the

Distance Apart	Number of trees per acre
6 X 10	726
7 X 7	889
7 X 10	622
8 X 8	681
9 X 9	538
10 X 10	436
12 X 12	302

accompanying panel. Do not plant stems and rows too close together. Eight to 10 feet apart is usually sufficient. This may look like a long way when the stems are 10 inches tall, but when they are eight feet tall you will know why you should plant them with ample space.

Post-planting Care

Watering at intervals will help newly planted trees and shrubs to become established and grow successfully. Mulching with bark, peat moss, or straw retains soil moisture and holds down competing weeds or grass. Support stakes and wires will help taller trees if necessary. Protect the tree from browsing by deer or rabbits, if necessary, by installing plastic tubes or wire cages.

After the first year, some maintenance is usually needed. Eliminate competing vegetation within a 3-foot circle for a period of at least three years. Hand pulling weeds, hoeing or relying on a selective herbicide are all good methods whether applied singly or in combination. Using weed whackers or whips is not a good idea because they can injure young plants. Mowing is not usually effective weed control either. Pruning may also be needed annually to help growth.

In summary, successful tree and shrub planting requires thorough planning, careful selection and planting, and proper maintenance. Poor maintenance may delay the growth of your trees and cause them to die or require replanting. However, if done correctly the reward is added beauty to the landscape and invaluable habitat for wildlife.

Keep a watchful eye out for wildlife eating your new plantings for lunch.

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PRIVATE LAND PARTNERSHIPS
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GRASSES & GROUND COVERS

Lawns are practical and acceptable landscapes that beautify homes and provide pleasure to homeowners. However, recent building trends that have resulted in larger homes on larger properties give cause for concern. In increasing numbers, Michigan landowners are moving from smaller lots to residential sites to rural estates of 10 to 40 acres in size. Lawn sizes have also increased dramatically. This increase in rural estates contributes to habitat fragmentation. This presents a problem for wildlife as extensive lawns of mowed grass have much less benefit to wildlife than an area of similar size with a diversity of plants. However, some wildlife can benefit from small amounts of mowed lawns. Cowbirds, flickers, and robins forage in the short grasses for food. Canada geese, moles, and 13-lined ground squirrels also frequent lawns, but can create nuisance problems with their droppings or burrows.

There are many important reasons to have as small a mowed lawn as possible. Pesticides and fertilizers used to grow grass can contaminate ground and surface water killing valuable plants and insects. Excessive mowing takes extensive time and fuel. Also, other alternatives to mowed grass may be better for the environment and provide more valuable wildlife habitat. Therefore, having a smaller mowed lawn is an important wildlife management consideration. This chapter explains how to manage and maintain mowed and unmowed areas of lawn as well as how to develop alternative ground covers of higher quality for wildlife.

Mowed Lawns

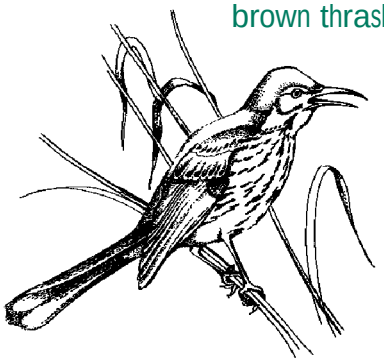
Mowed lawns require time and money to maintain. Monocultures of weed-free grass demand a large amount of water, fertilizer, pesticides, and time. They provide less wildlife habitat than do unmowed lawns, and they are easily stressed by extreme drought or wet conditions.

To maintain your lawn in a less-intensive and more environmentally friendly manner, consider accepting a variety of grasses and non-grasses, or remove weeds by hand instead of using herbicides over the entire lawn. Instead of fertilizing, leave the clippings, which will provide nitrogen. Mowing at heights of 2 to 3 inches helps protect roots from summer heat and promotes better grass growth. Another tip: keep mower blades sharp so they cut the grass cleanly and do not tear the plants.

robin

An estimated 70 percent of pesticide use in the United States occurs on the nation's lawns. You can help reduce this number by planting diverse forbs and other plants to provide for a healthier, environmentally friendly lawn, which needs few or no chemicals. Although weeds such as dandelions, plantain, black medic, spurge, orange and yellow hawkweed, and white clover are not acceptable to some landowners that strive to create a uniform lawn, such plants attract a variety of wildlife. Rabbits and deer love clover and will frequent lawns that contain it. Birds use dried stalks of weeds and other plants to build nests and feed on the seeds of some common weeds.

How much lawn you mow should depend on the size and shape, and uses of your property. For example, if you need an area for playing ball or exercising a dog, a long rectangular area may suffice. However, if the only activity on portions of your lawn is mowing, consider converting those areas to an unmowed parcel or wildlife-friendly planting. A wet area, for example, can be



brown thrasher

restored to a wet meadow or wildlife pond. Mixing in areas of trees, shrubs, perennial and annual flowers, unmowed grasses, and prairie grasses will not only add wildlife value but will help contribute to a beautiful landscape that requires less upkeep. Another way to improve value for wildlife is to keep the lawn in an irregular shape, which will provide more edge than a square or rectangular design.

Grasses

Areas with tall, unmowed or infrequently mowed grasses can provide outstanding wildlife habitat such as nesting areas, brooding areas, insect-feeding areas and foraging areas for songbirds, gamebirds, and rabbits. You can create places where you let the grass go wild or where you plant a specific grass type to create a meadow, prairie, or wildflower viewing spot. The flowers will furnish a nectar source for bees and butterflies.

white clover

Grasses such as timothy, orchard grass, red top, or blue grass can be planted to develop a grass meadow two to five feet in height. Adding clovers such as ladino, alsike, white, or medium-red will increase the wildlife value and decrease the overall vegetative height. Clovers help to promote healthy lawns as they are able to fix nitrogen. Planting clovers will develop a meadow that is one to three feet in height. They will create a green open space and allow a pleasing view to the edge of your property. Once a year in late August, mow the mix of grasses and clovers to help maintain the stand and to check the invasion of woody plants. For additional information please refer to the chapter on **Cool Season Grasses** in the Grassland Management section.

Another alternative is to plant a part of your yard to prairie grasses and/or wildflowers. Because native prairie grasses (big bluestem, little bluestem, Indiangrass, and switchgrass) have deep root systems and short underground stems (rhizomes), they help water to percolate through the soil. The process of percolation is important for recharging ground water and supplying plants with adequate water. A manicured lawn, for example, will stop percolating after a half-inch of rain. On the other hand, a native prairie will percolate up to six inches of rain per hour.

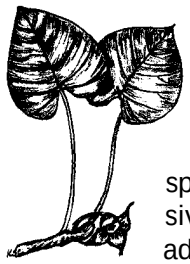
Mixing wildflowers in with the prairie grasses adds diversity. Wildflower types to plant include coneflower, black-eyed Susan, leadplant, coreopsis, aster, and blazing star. Prairie grasses and forbs provide forage for deer, rabbits, and woodchucks; nesting sites for pheasants, bobolinks, and field sparrows; feeding areas for songbirds and wild turkeys, and winter cover for resident wildlife. The wildflowers offer brilliant colors in summer and fall, and the stiff stems and golden-to-rust colors of the prairie grasses make for attractive winter gardens. For additional information please refer to the following chapters: **Wildflowers** and **Wildflower Plantings** in this section, and **Warm Season Grasses** in the Grassland Management section.

Ground Covers

Ground covers offer an ideal opportunity to reduce the amount of mowed lawn surface and to develop low-maintenance wildlife habitat. They provide nest sites for ground-nesting songbirds, and protective cover for rabbits and chipmunks. Such plantings can provide a more manicured appearance while increasing habitat value and reducing maintenance.

A wide variety of species can be used. Preferred plants will depend upon the soil type and the amount of sun or shade the area receives. Shaded areas on clay soils, for example, call for one type of ground cover, while dry areas with all-day sun will need a different kind of ground cover. Native shade-tolerant species include wild ginger, wintergreen, and bearberry. There are many other species of groundcover that are often seen in backyards such as spotted nettle, lily of the valley, vinca,

little bluestem



wild ginger

. myrtle, crown vetch, birdsfoot trefoil, and euonymus. However, these species will aggressively spread into adjacent areas and will need extensive management and control to reduce their impact to adjacent sites. Therefore, they must be used with caution.

Plant ground covers around homes, trees, swimming pools, and other fragmented habitats. Readily available from nurseries as plugs or plants, they are usually listed by their scientific names, which are included in the accompanying table.

Wet Areas

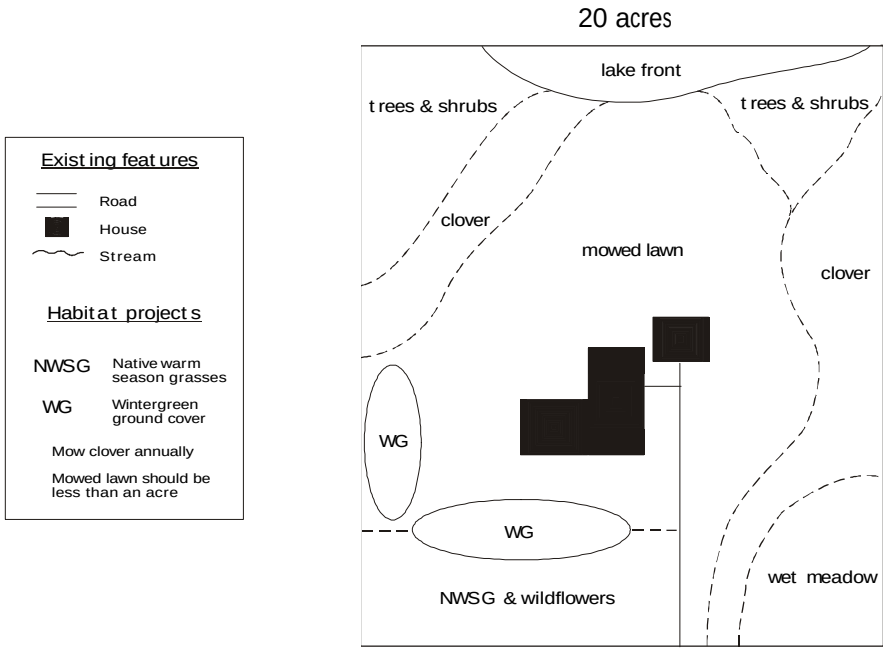
If your property includes frontage on a lake, river, pond, or wetland, special habitat considerations apply. Leave a buffer strip of unmowed vegetation between your lawn and the wetland or water's edge 100 feet or more in width. The buffer will filter out sediments and lawn fertilizers before they enter the water, and it will provide important niche habitat for a variety of birds, mammals, amphibians, and reptiles. To beautify the buffer strip and enhance wildlife habitat, plant wildflowers and grasses, or add trees, shrubs, and ground cover.

If you use your lake or pond for swimming, clear an area only large enough for this purpose. Remember, removing or adding soil, sand, or gravel may be subject to regulation -- check with the Michigan Department of Environmental Quality's (DEQ) Land and Water Management Division before making alterations. Maintain aquatic vegetation in all or a portion of the water frontage. Although control of purple loosestrife, Eurasian watermilfoil, and other aggressive exotic plants may be necessary, retain a mixture of submerged, floating and emergent plants such as wild celery, pondweeds, waterlilies, cattails, and pickerelweed. These plants also help to reduce toxins in the water and increase oxygen and provide the structure and greenery to support snails, insects, and other aquatic food organisms important to fish, turtles, snakes, salamanders, frogs, and toads. If you plan to use a herbicide to control aquatic plants or algae, check with DEQ's Land and Water Management Division to see if a permit is re-quired and always follow product label directions. To protect water quality and reduce the likelihood of excess algae and plant growth, do not dispose of grass clippings, leaves, charcoal briquettes or ashes, or other refuse in the water. In addition, it is important to use little or no fertilizer on your lawn, or switch to a phosphorus-free or low phosphorous brand.

cattail

Common Name	Scientific Name	Origin	Sunlight	Height (ft.)
Wildflowers				
Aster	Aster spp.	Native	Full	4
Rough blazing star	Liatris aspera	Native	Full/Partial Shade	3
Black-eyed Susan	Rudbeckia hirta	Native	Full/Partial Shade	3
Purple coneflowers	Echinacea purpurea	Native	Full/Partial Shade	4
Tall coreopsis	Coreopsis tripteris	Native	Full	3
Lead plant	Amorpha canescens	Native	Full	3
Warm season grasses				
Big-bluestem	Andropogon gerardi	Native	Full	8
Indiangrass	Sorgastrum nutans	Native	Full	6
Little-bluestem	Schizachyrium scoparium	Native	Full	3
Switch grass	Panicum virgatum	Native	Full	5
Cool season grasses				
Canada wild-rye	Elymus canadensis	Native	Full	4
Redtop	Agrostis gigantea	Native	Full	4
Orchard grass	Dactylis glomerata	Not Native	Full	4
Timothy	Phleum pratense	Not Native	Full	3.5
Legumes				
White clover	Trifolium repens	Native	Full/partial	0.5
Ladino	Trifolium var.	Not Native	Full/partial	0.5
Alsike	Trifolium fucatum	Not Native	Full/partial	0.5
Ground Covers				
Bearberry	Arctostaphylos uva-ursi	Native	Full/partial	0.5
Wild Ginger	Asarum canadense	Native	Full/partial	0.5
Wintergreen	Gaultheria procumbens	Native	Full/partial	0.5

GRASSES & GROUND COVERS

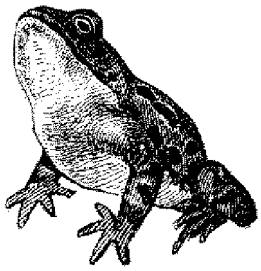


This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

Trees along the waterfront provide nesting, resting, and feeding areas for birds and small mammals. When trimming trees, leave enough branches to maintain wildlife habitat and privacy for your home while allowing a view of the water. Enhance the waterfront's habitat value and aesthetic appeal by planting flowering and fruiting shrubs as well as ground cover at the base of trees. Grasses for moist areas include redtop, switchgrass, and prairie cordgrass. Attractive wildflowers that grow in moist areas are cardinal flowers, blue lobelia, and Jack-in-the-Pulpit.

Leave dead trees (snags) that do not create a safety hazard to humans, for woodpeckers and squirrels. Remember, that logs, stumps, and fallen branches are critical wildlife habitat for amphibians and reptiles. See the chapter on **Frogs, Turtles and Snakes** in the Species Management Section for more details.

In conclusion, by using a variety of vegetative types such as tall grasses, ground covers, trees, and shrubs, you can create a beautiful yard and reduce your work load. You will also create a better environment for a variety of wildlife and yourself. These diverse plantings improve critical wildlife habitat that attracts songbirds, chipmunks, rabbits, squirrels, toads, frogs, snakes, and turtles.



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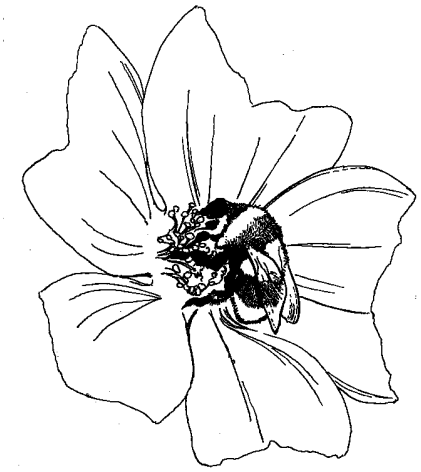
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

SPECIAL FEATURE GARDENS



Besides adding beauty to the landscape, gardens that are creatively designed and well-tended can increase the value of property. Some gardens provide food for the table and others furnish cut flowers for indoor enjoyment. On larger properties these special feature gardens break up the monotony of lawn and reduce mowing time. Blending your garden into the surrounding landscape will also help to minimize habitat fragmentation effects.

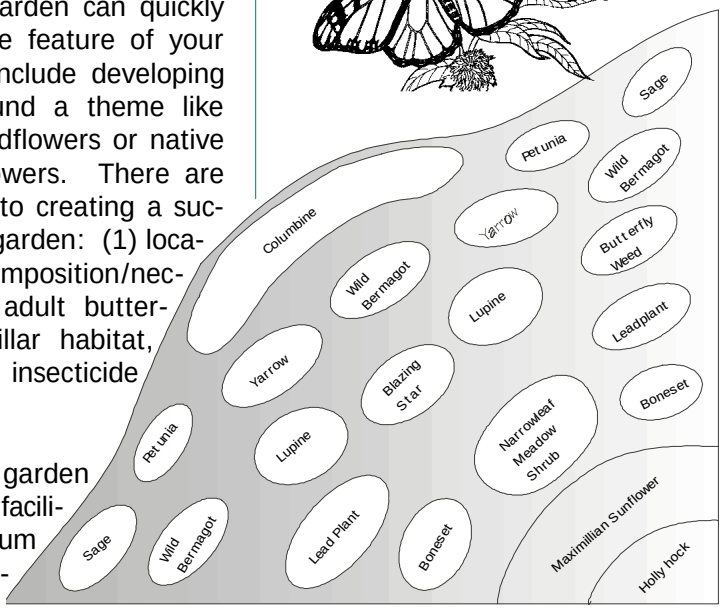
If you do not own property, you can still enjoy a small-scale garden by arranging planters and potted flowers on the balcony or deck of your apartment, townhouse, or condominium. Specialty gardens attract certain kinds of wildlife, which serve to enhance viewing pleasure. Butterfly, hummingbird, and native prairie gardens are well suited to this purpose. This chapter will offer suggestions on how to create them.

Butterfly Gardens

North America is home to more than 700 species of butterflies. At least 200 of them occur in Michigan and the Midwest including swallowtails, skippers, satyrs, sulphurs, and cabbage butterflies along with the monarch, painted lady, comma, red-spotted purple, and red admiral. Adult butterflies are most attracted to red, yellow, orange, pink, and purple flowers that grow in sunny locations and that offer an easy source of nectar. Butterfly caterpillars will use at least 175 kinds of Midwest plants, nearly 50 of which are also excellent for attracting bees. Several kinds of moths, including hummingbird clearwings, night- and day-flying sphinx species, prometheas, and cecropias, are also regularly attracted to butterfly gardens.

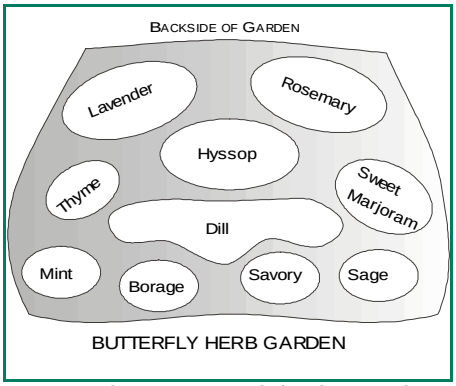
A butterfly garden can quickly become the prize feature of your yard. Options include developing the garden around a theme like native prairie wildflowers or native woodland wildflowers. There are four key factors to creating a successful butterfly garden: (1) location, (2) plant composition/nectar sources for adult butterflies, (3) caterpillar habitat, and (4) avoiding insecticide use.

1. Locate the garden in a spot that facilitates maxi-mum viewing opportunities. The best location is one that receives sun from mid-morning to mid-afternoon because adults generally feed only in the sun. If sunny spots are limited in your yard, consider planting a small area of your vegetable garden to herbs. Many of the best bee and butterfly plants are herbs, including borage, hyssop, lavender, lovage, lemon balm, sweet marjoram, rose-mary, sage, dill, winter savory, parsley, thyme, and the mints.



BUTTERFLY GARDEN

BACKSIDE OF GARDEN



2. Plant perennial plants that provide excellent sources of nectar. Perennials will lessen your overall cost as they do not need to be replaced each year. When choosing plants, consider their blooming season, and select some that bloom early and others that do not bloom until late summer or fall. However, for earliest results and to add diversity to the garden, plant a few annual flowers. Also consider the mature height of plants and place the taller plants toward the back and work down in height toward the front. For open gardens that will be seen from all sides, establish the tallest plants in the center and work downward with the smallest plants at the edge. If you are using climbing plants be sure to use a climbing structure such as a lattice, fence, or building for backdrop.

Plants with a flat-topped towering head, like stiff goldenrod and zinnias, are excellent butterfly plants because the nectar is richer and more easily accessible. See the accompanying table for a list of plants that will provide good to excellent sources of nectar for butterflies, bees, and moths. Latin names are included to help you find stock at nurseries and garden centers.

3. Providing habitat for caterpillars as well as adult butterflies is essential to a successful butterfly garden. Most butterfly caterpillars do not cause the leaf damage associated with moth caterpillars. Oaks, aspens, birches, boxelders, and spice bushes can provide the feeding habitat that butterfly caterpillars need. Some species feed specifically on certain plants. For example, monarchs use milkweed for both stages of life --adults visit the flowers for nectar and caterpillars feed on the leaves. The larvae of mourning cloaks eat nettles, and black swallowtails feed on parsley.

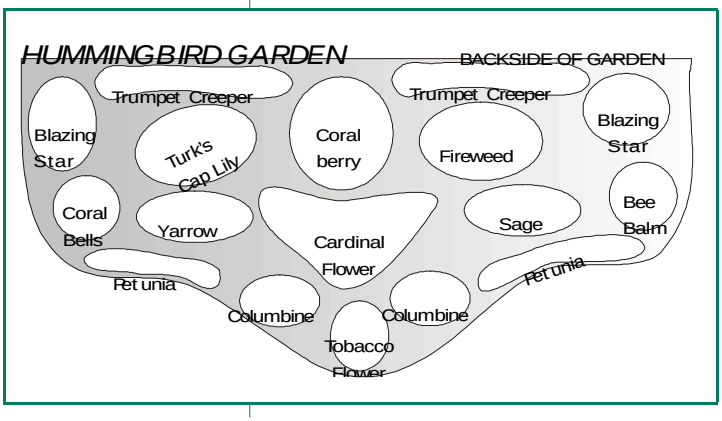
4. Most insecticides are lethal to butterflies in both larvae and adult stages. Avoid use of insecticides in or near the butterfly garden and on key caterpillar habitat. Pesticide use has had a major impact on butterfly numbers in recent years.

Hummingbird Gardens

Hummingbirds pollinate more than 160 native North American plants. Because of their extremely high metabolism, hummingbirds consume daily up to one-half their body weight in food and as much as eight times their body weight in fluids. Besides feeding on flower nectar, the ruby-throated hummingbird (the only hummingbird species found in Michigan) also eats small insects. Usually attracted to red, tubular flowers, hummingbirds also use a wide variety of other flowers. Thus, you can add both diversity and color to your yard while providing excellent sources of nectar and small insects for hummingbirds. Incidentally, because orioles use many of the same plants as hummingbirds, your hummingbird garden may provide additional habitat for them and increase your viewing pleasure.

Unlike butterflies, hummingbirds find sources of food regardless of sun or shade. However, the plants themselves can have specific sunlight requirements. So, when planning the location of your hummingbird garden, consider the sunlight requirements or limitations of the plants you wish to highlight there. You may also want to consider visibillity. Because hummingbirds are highly territorial, you might want to locate plants throughout your yard, in addition to the specialized garden.

You may also want to supplement natural nectar with hummingbird feeders near the garden and around the house. Place feeders in the shade and change the mixture of one part sugar (do not use honey) to four parts boiling water every three to five days. Cool the mixture before filling the feeder, and store the excess in the refrigerator. If the mixture in the feeder



Plant Species for Butterfly and Hummingbird Gardens

Common Name	Scientific Name	Type[1]	Origin	Sunlight[2]	B/H	Height[2]	Blooming Season[2]
American columbine	Aquilega canadensis	P	native	F/P	B/H	1-2 ft	May-June
Bee Balm	Monarda didyma	P	native	F/P	H	3 ft	June-July
Blazing Star	Liatrus spp.	P	native	F/P	B/H	2-4 ft	July-Sept.
Boneset	Eupatorium perfoliatum	P	native	F/P	B	3-4 ft	July-Aug.
Butterflybush	Buddleia davidii	P	exotic	F/P	B	3-8 ft*	June-Aug.
Butterflyweed	Asclepias tuberosa	P	native	F/P	B	2-3 ft	July-Aug.
Cardinal flower	Lobelia cardinalis	P	nativc	F/P	H	3 ft	July-Sept.
Coral bells	Heuchera sanguinea	P	exotic	F/P	H	2.5 ft	May-July
Coralberry	Symphoricarpos orbiculatus	S	native	F/P	B/H	3 ft	
Fireweed	Epilobium angustifolium	P	native	F/P	B/H	2-4 ft	July-Aug.
Foxglove (Gerardia)	Agalinis pediculana	P	native	F/P	H	3-5 ft	June-July
Gaillardia (firewheel)	Gaillardia pulchella	P	native	F	B/H	3 ft	June-Aug.
Hollyhock	Althaea rosa	P	native	F/P	B/H	5-8 ft	June-Aug.
Joe-pye-weed	Eupatorium purpureum	P	native	F/P	B	2-6 ft	July-Sept.
Leadplant	Amorpha canescens	P	native	F	B/H	2-4 ft	June-July
Lupine	Lupinus perennis	P	native	F/P	B/H	2 ft	June-July
Maximillian sunflower	Helianthus maximiliani	P	native	F	B/H	5 ft	Aug.-Sep.
Narrowleaf meadowsweet	Spirea alba	S	native	F	B/H	4 ft	June-July
Oxeye sunflower	Heliopsis helianthoides	P	native	F	B/H	2.5-3 ft	July-Sept.
Purple conefower	Echinacea purpurea	P	native	F/P	B/H	2-4 ft	July-Aug.
Scarlet petunia	Petunia spp.	A	exotic	F/P	H	1 ft	through summer
Scarlet sage	Salvia spendens	A	exotic	F/P	H	2.5 ft	until frost
Swamp milkweed	Asclepias incarnata	P	native	F/P	B	2-4 ft	June-Aug.
Tobacco flower	Nicotiana sanderae	A	exotic	F	H	1-2 ft	through summer
Trumpet creeper	Campsis radicans	V	native	F/P	H	climbing	July-Aug.
Turk's cap lily	Lilium michiganese	P	native	F/P	H	3 ft	July-Aug.
Western sunflower	Helianthus occidentalis	P	native	F	B/H	2 ft	July-Aug.
Wild Bergamot	Monarda fistula	P	native	F	B/H	2 ft	June-July
Yarrow	Achilea millefolium	P	native	F	B	2 ft	June-Aug.

[1]A = annual; P = perennial; S = shrub; V = vine
[2]F = full sun, P = partial shade; Sun requirements, height, and blooming season may vary with individual cultivars.
*Butterflybush will die back in the winter
B = for butterflies H = for hummingbirds

has spoiled (a black fungus or very cloudy water are clues), clean it with a small amount of vinegar mixed with water, then allow to dry thoroughly before refilling. Because they are migratory species, you only have to keep the sugar solution available from April to September.

In addition to sunlight requirements, be aware of other characteristics of your plant choices. Trumpet creeper, for example, is an attractive plant to hummingbirds, but it requires a fence or other structure on which to climb. Place vines and shrubs to the back, working down in height toward the front of the garden. Spread your blooming season as much as possible. Adding a few annuals to the variety of early- to late-blooming perennials will give the garden a head start. Refer to the accompanying list of plants that will provide both nectar and insects for hummingbirds. Also, realize insecticides not only kill the small insects that hummingbirds use for food, but large

Plant Species for Prairie Gardens

Common Name	Scientific Name	Type	Height	Blooming Season
Big bluestem	Andropogon gerardii	G	3-6 ft	
Indian grass	Sorghastrum nutans	G	3-5 ft	
Little bluestem	Schizachyrium scoparium	G	2-3 ft	
Switchgrass	Panicum virgatum	G	3-5 ft	
American columbine	Aquilega canadensis	P	1-2 ft	May-June
Black-eyed Susan	Rudbeckia hirta	P	1-3 ft	June-Aug.
Gray-headed prairie coneflower	Ratibida pinnata	P	3-5 ft	July-Sept.
Maximillian sunflower	Helianthus maximilliani	P	5 ft	Aug.-Oct.
New England aster	Aster nova angliae	P	1-4 ft	Sept.-Oct.
Prairie blazing star	Liatrus pycnostachya	P	4 ft	August
Prairie coreopsis	Coreopsis palmata	P	1-3 ft	July
Prairie dock	Silphium terebinthinaceum	P	2-6 ft	Aug.-Sept.
Prairie milkweed	Asclepias sullivanti	P	2 ft	June-July
Purple coneflower	Echinacea purpurea	P	2-4 ft	July-Aug.
Wild bergamot	Monarda fistulosa	P	2 ft	July-Aug.
Wild indigo	Baptisia tincitoria	P	3 ft	June-July
Yarrow	Achilea millefolium	P	2 ft	June-Aug.

[1]G = Grass; P = Perennial

doses of insecticides can be directly lethal to the birds themselves.

Native Prairie Gardens

Native prairie grasses and wildflowers are a shrinking resource in Michigan, and they attract a large number of wildlife species. In fact, there are many species that can only survive on native grasses and wildflowers. Wildlife benefit most when the mixture of warm season grasses and wildflowers occurs in stands of 40 acres or more. However, even small plantings in backyard gardens can help wildlife and are also attractive. Native prairie gardens, as well as the other gardens mentioned above, reduce mowing time and add visual enjoyment, even in winter as the grasses stand up to snow. Some wildflowers, such as coreopsis, provide winter seed for goldfinches and other birds.

Because most native grasses and wildflowers do best on upland sites, locate this garden in a sunny to partly shaded, well-drained location. The accompanying panel is a list of good plants to consider. If the site you have in mind is moist, big bluestem and switchgrass will likely establish without problems but you might also want to add prairie and curly dock, swamp milkweed, native impatiens, sedges, and mints. A nursery expert should be able to help you with your plant selections.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

BIRD AND OTHER WILDLIFE FEEDERS

Wildlife can not exist without the four components that comprise their habitat: food, water, shelter, and space. Your property may not be large enough to provide all of the habitat needs for the kind of wildlife you wish to attract. However, you can offer one or more of these habitat components, even in a small backyard environment. Providing a variety of feeding stations will give wildlife, both residential and migratory, added incentive to visit your property. The more habitat components you provide, the more wildlife species you will likely attract. Wildlife feeders provide a supplement to the natural foods already available from nearby trees, shrubs, and flowers. Therefore, planting trees, shrubs, grasses, wildflowers, and groundcovers will increase the chances that wildlife will frequent your yard. For example, a bird feeder that is next to a sheltering evergreen shrub will attract more species than one that is not. This chapter explains how to provide feeding stations for wildlife in your backyard. For information on providing cover for wildlife in your backyard refer to the chapter on **Homes for Wildlife,** and the other chapters in this section.

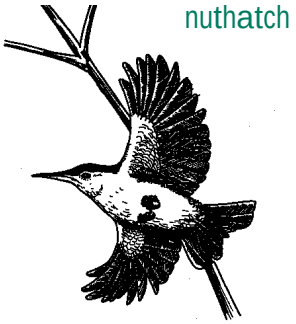

cardinal

Wildlife feeders can provide an opportunity to view wildlife from the comfort of your home. The most popular types of wildlife feeders are those for backyard birds. Because this is the most common type of wildlife feeding, there are a wide variety of feeders to choose from. However, feeders can also be provided for other species such as pheasants, bobwhite quail, white-tailed deer, squirrels, chipmunks, rabbits, raccoons, butterflies, and moths. When food supplies are scarce, such as in the very early spring or during bouts of severe weather, wildlife will rely more on your feeders. Do not worry that the animals will become dependent on your feeders. If you have to stop feeding for a month or so, they will find alternate sources.

Backyard Birds

Location

The combination of habitat diversity and the quality of available food are what will attract and keep songbirds at your backyard feeders. Pick a location that can be seen from your house, where the seed hulls and bird droppings won't be a problem, and that you can easily access year-round for filling and cleaning. If possible, locate the feeders near shelter such as evergreen or deciduous shrubbery that will provide protection from


nuthatch

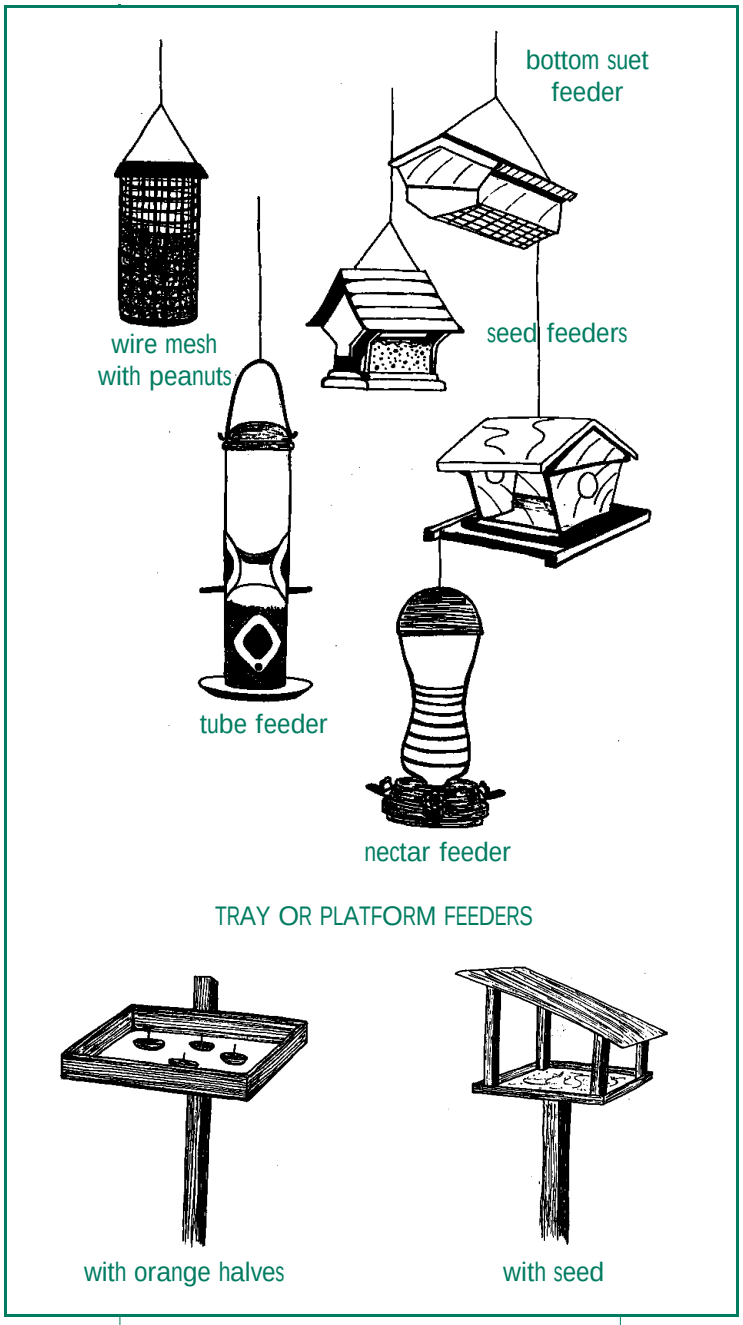
predators and winter winds. Placing a discarded Christmas tree near the feeding stations may help with this winter component. It is best to place hanging bird feeders on a metal pole rather than on a tree limb, as this will help you to deter squirrel problems. Locating feeding stations in several areas in the yard reduces crowding and lessens the chance for avian diseases that can kill birds. Providing a water source in addition to feeders will also help to attract birds to an area. Water that is dripping or splashing is especially attractive to birds. There is no best time to start feeding birds. Once food is presented and the birds find it, they will visit year-round.

Feeders and Food

Bird feeders are made of many different kinds of materials. They range from the simple disposable bag feeders to elaborate steel, plastic, or glass feeders. Disposable feeders are made of cloth, nylon, vinyl, and metal netting. These feeders are inexpensive, but they do not protect the seed from the elements. Other more durable feeders are made of

materials such as plastic tubes; ceramic and terra cotta; woods such as redwood, cedar, birch, pine, and plywood; metal sheets, glass tubes, and bottles. Most of these will keep seed dry, but you should make sure that there are holes in the bottoms to ensure drainage. If the feeders have trays, look for shallow trays that will catch the seed but not collect water. Ultimately the feeder that you choose will depend on the types of birds you want to attract.

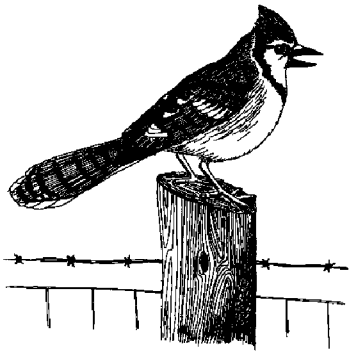
You should begin by determining which species are likely to frequent your yard. This is based on the type of habitat that surrounds your house. What you feed and how you present it will determine what kinds of birds, and how many, will visit your feeders. You can offer a variety of preferred foods based on what species you want to attract. Offering commercially prepared mixed bird seed is not as effective as preparing foods customized to the birds you want to attract. Most seeds in commercial mixes get thrown out of the feeder as the birds search for their favorite seed. This favorite is the black oil sunflower seed. It can be used in commercial feeders, tray or platform feeders, and tube feeders. It is generally a safe choice as it is the favorite of most birds that visit these types of feeders. The most effective way to attract the largest variety of birds is to provide separate feeders for each food. Below is a description of the more specific types of feeders and foods, along with the species that each would attract.



Tube feeders are cylindrical tubes with several slots for feeding. When filled with *black oil sunflower seeds*, the tube feeders will attract goldfinches, chickadees, purple and house finches, woodpeckers, nuthatches, titmice, redpolls, and pine siskins. Adding a tray to this feeder will attract larger species that can not perch on the small feeding holes, such as cardinals, jays, crossbills, mourning doves, and white-throated and white-crowned sparrows. A tube feeder containing *Niger thistle seed* with a tray will attract goldfinches, chickadees, redpolls, pine siskins, purple and house finches, white-throated sparrows, song sparrows, and dark-eyed juncos. In addition, if the tube feeder is an upside-down feeder (has feeding holes below the perches), only goldfinches will use it. When filled with *peanuts*, a tube feeder with a tray will attract cardinals, chickadees, grackles, house finches, titmice, house sparrows, starlings, mourning doves, white-throated sparrows, jays, and juncos.

Tray or platform feeders are open feeders that can either be on the ground or raised up on a stand, and have a lip around the edges to help hold seed on the tray. This type of feeder provides easy access for many species of birds. When filled with *black oil sunflower seed* it is a very general feeder and will attract most backyard bird species. When filled with *millet* the platform feeder will attract doves, house sparrows, blackbirds, juncos, cowbirds, towhees, chipping, field, and tree sparrows, and white-throated and white-crowned sparrows. When filled with *corn* the platform feeder may attract starlings, house

BIRD & OTHER WILDLIFE FEEDERS



blue jay

sparrows, grackles, jays, juncos, doves, white-throated sparrows, bobwhite quail, pheasants, and grouse. When filled with *peanuts* the platform feeder will attract the same species as those attracted to a tube feeder of peanuts mentioned above. Adding grit to platform feeders will aid birds in digestion as they use it in their crop for grinding food.

Suet feeders contain suet cakes that are made from animal fat generally derived from beef, pork, or deer. It can be set out as just suet, or mixed with seed, dried fruit, or other foods. Suet is most commonly used in the winter as it is a high energy food used in those times when food is the most scarce. There are several ways of displaying suet. It can be placed in a simple hanging bag such as an old onion or potato sack. Or, it can be placed in a feeder that is rectangular and has a grid-like pattern across it for feeding access. This feeder can either be laid out, or suspended. Suet feeders will attract chickadees, downy woodpeckers, hairy woodpeckers, red-bellied woodpeckers, white- and red-breasted nuthatches, and pileated woodpeckers. A hanging suet feeder will also attract wrens, kinglets, thrashers, creepers, cardinals, and starlings. A feeder containing *peanut butter suet* will attract woodpeckers, junkos, thrushes, kinglets, wrens, starlings, goldfinches, cardinals, jays, and bluebirds. Suet feeders with access only through the bottom will make it difficult for starlings to feed as they can not hang up-side-down very well.

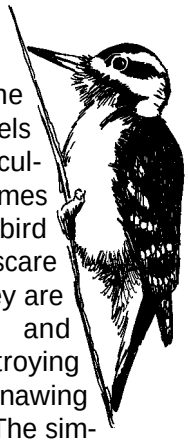
Nectar feeders are glass and plastic feeders that contain a sugar water solution that can be made at home (four parts boiling water to one part sugar), or purchased commercially. These feeders are most popularly used to attract hummingbirds. However, other birds that have been known to feed on nectar include orioles, tanagers, cardinals, finches, woodpeckers, and thrushes. These birds will not eat out of feeders made specifically for hummingbirds, as they need larger perches. However, there are also feeders made with these perches.

Many birds will feed on **fruit**, such as an orange half, if it is simply placed out on a ledge or speared on a tree limb. Birds that are attracted to fruit are orioles, tanagers, mockingbirds, thrashers, bluebirds, cardinals, woodpeckers, jays, starlings, thrushes, cedar waxwings, and yellow-breasted chats. These birds may also eat grape jelly if it is placed out on small trays. Feeding with fruit is usually done in the summer.

oriole

Potential Problems

After you have set up your feeders you may find that you have unwanted guests. One such problem is that of other animals eating out of, and sometimes monopolizing, the feeders. Squirrels are the biggest culprits when it comes to taking over bird feeders, as they scare off birds when they are at the feeders, and often end up destroying the feeder by gnawing right through it. The simplest solution to the squirrel problem is to place the feeder on a pole away from houses and nearby tree limbs, and place a baffle on the pole. A baffle is a smooth metal sleeve or cone that prevents climbing. The most effective squirrel-proof feeder is the pole-mounted metal house type with a perch that closes the feeder when something as heavy as a squirrel sits on it. You may also want to place feeders specifically for squirrels among your other feeders, as this will deter them from the bird feeders. Other seed snatchers include chipmunks, rats, and mice. Reducing seed spillage under the feeder by avoiding mixed bird seed will deter them. Also, storing your seed in metal garbage cans will eliminate consumption of stored food.



downy woodpecker

Another problem encountered at feeders is that of predators. Avoid placing the feeders in an area that has a lot of ground cover as this provides good places for mammalian predators to hide. Cats pose a serious threat to backyard birds, especially to nestlings, fledglings, and roosting birds, as they are not natural predators. When a cat is present in your yard you are not likely to see many birds at your feeders. If possible, keep cats indoors, or use a belled collar to warn birds. Other predators that

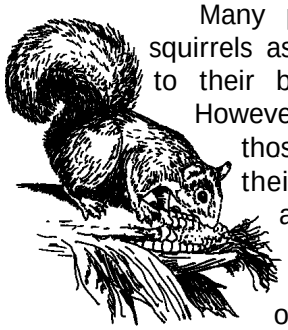
BIRD & OTHER WILDLIFE FEEDERS

you may see that do not present a problem are the Cooper's hawk and the sharp-shinned hawk. These birds are natural predators and play an important part in the natural community. Do not be concerned about the occasional kill these birds may make. Observing all birds in their natural behaviors is one of the joys of feeding them.

A serious problem encountered at many feeders that can easily be avoided, is that of avian diseases. When feeders are not properly maintained they become havens for bacteria. Several precautions can be taken to ensure that the birds visiting your feeders remain healthy. Avoid crowding the birds in a small space, as overcrowding facilitates the spread of diseases. Keep the feeders clean of waste and food droppings. Feeders should be cleaned once or twice a month with a mixture of warm soapy water and a capful or two of household bleach. Clean more often during humid summer months and cool, wet weather to avoid food spoilage.

Other Wildlife Feeders

Spike Corn Feeders



Many people view squirrels as a nuisance to their bird feeders. However, there are those that enjoy their playful antics and would like to see more of them in their yards. Squirrels can be fed by placing ears of corn on spikes that are fastened to trees or platforms. If the ears are not attached, the squirrels will carry them away. Pheasants and deer may also use this type of feeder, especially if you live near agricultural land.

Log and Stump Feeders

A log or a large diameter branch laid horizontally, either on the ground or slightly raised can be used as a feeding station for squirrels, chipmunks, raccoons, deer, and various birds. One way to present food on this feeder is to create hollowed spots on the top side of the log and fill them with seed, corn, peanuts, or suet. Other options include placing spiked corn cobs or fruit on the top of the log. These methods can also be used in the same way on the top of a tree stump. Drilled holes on the side of a dead tree that are filed with suet may attract woodpeckers.

Butterfly and Moth Feeders

You will attract many butterflies and moths by planting wildflowers. However, supplimental feeders will increase the likelihood that they will frequent your area. Butterflies can be fed by simply placing a small plastic kitchen sponge in a sugar solution in a shallow bowl. They will land on the sponge and lap the solution through the holes just as they would from a flower. Moths are slightly more difficult to feed. There are several "brews" that when painted on a tree at night will attract moths. One such brew calls for mashed fermented peaches and sugar. Another such brew calls for four pounds sugar, one bottle of stale beer, and some cheap rum. A third recipe consists of fermented bananas, dried apricots, and brown sugar. Checking the trees at night with a flashlight will allow you to spot the moths.

In summary, the more habitat components you have available in your yard, the more wildlife species you will attract. There are many ways that you can add the important habitat component of food to your yard. To supplement the natural food components in your area, you can add wildlife feeders to your yard. These feeders, if properly implemented and maintained, will provide you with the opportunity to view wildlife and learn about their natural behaviors.

FOR ADDITIONAL CHAPTERS CONTACT:
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FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

HOMES FOR WILDLIFE

Wildlife depends on four habitat components for survival: food, water, cover, and space. Depending on the species, the amount and type of each of these components varies. This chapter will focus on one of these components, that of cover. Cover types could vary from woodlands to grasslands to wetlands. After assessing what cover types are available on your property, you can determine what species you will be able to attract. If cover is not present, but other habitat components for a species are, then adding cover may make your yard more attractive to certain species of wildlife. By planting trees, shrubs, grasses, and flowers, you can provide cover and attract even more wildlife. In doing so, you will provide a more diverse habitat, and increase the likelihood of attracting wildlife by meeting all four of the habitat components.

Providing homes for wildlife will help fulfill their cover requirements. Wildlife homes can be either vegetative (grasses, shrubs, trees) or structural (stones, underground dens, brush piles, nest boxes, cylinders). These homes offer protection from not only predators, but also weather elements such as cold winter winds or hot summer days. Birds use these homes for shelter, nesting, and brood rearing. This chapter explains what homes can be provided for wildlife to enhance the cover on your property. The supplemental chapter **Homes for Wildlife II** provides the plans for the homes described here. Refer to the chapter on **Bird and Other Wildlife Feeders** for information on how to provide the habitat component of food to your backyard.

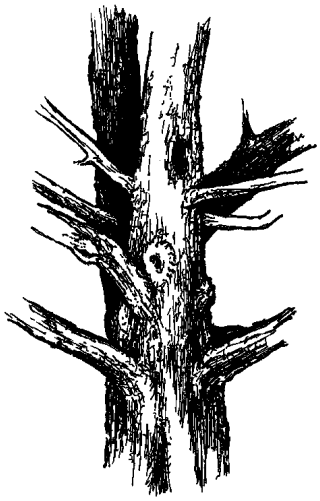
Vegetative Homes

There are many types of natural homes that you can provide for wildlife on your property. In addition to planting trees, shrubs, and grasses that provide a variety of wildlife with places to nest, seek shelter, and raise their young, there may also be other natural homes that could be created on your land that also provide cover for wildlife.

Snags

Snags are standing, dead, or dying trees, which provide excellent natural homes for a variety of wildlife. Wildlife that inhabit these snags, such as woodpeckers, nuthatches, bluebirds, squirrels, and raccoons, are called cavity nesters. The type of wildlife that inhabit these snags will also depend on the kind, size, and location of the snag.

There are two basic kinds of snags: hard or soft. Hard snags have rotten centers with a solid exterior and a few limbs. These usually make the best den trees as the center can be easily excavated to form a home. Trees that usually form good cavities are large hardwoods that decay slowly such as sugar maple, elm, black and white oak, hickory, and butternut. Soft snags have softer exterior wood, and usually have no limbs. These snags usually make good foraging sites for insect-eating birds, as well as nesting sites for woodpeckers, chickadees, and nuthatches. Trees that often form soft snags have short life spans, and rot quickly. These too are important to wildlife as they produce cavities more quickly than harder wood, as well as habitat for many insects that provide food for birds, mammals, amphibians, and reptiles. Coniferous snags do not usually last as long as hardwoods, and are usually not used for den trees. One exception to this is northern white cedar, as it makes an excellent cavity tree. Other conifers, such as white pine and tamarack, make excellent nest and perch sites for eagles and osprey when located next to water.



In general, regardless of the kind of snag, the larger it is the more wildlife it can support. The best den trees, live or dead, are over 15 inches diameter at breast height (DBH) with a den opening of four inches or more. Keep an eye out for trees that appear to be potential snags. These trees have large, sprawling

branches, and often are fruit and nut producers. Missing or bare branches, fungal growth, wounds, and discolored bark are all signs of a dying tree. Also, look for woodpecker holes, which usually indicate a rotting core.

If you do not have any snags on your property, consider creating some. Remember that it will take a while before newly created snags will be suitable for wildlife. Therefore, to speed up the process, try to pick trees that appear to be dying, and that are over a foot in diameter. With an axe, cut away a two inch band of bark around the entire circumference of the trunk, removing the bark and cutting into the sapwood. This is known as girdling, and will kill the tree as it disrupts the flow of nutrients. To simply create a den, cut off a four to six inch limb about six inches from the trunk. This will wound the tree and allow the decaying process to start, eventually forming a cavity where the limb was cut.

The kinds of wildlife your snag will attract will also depend on where it is located. Snags are most commonly associated with forests. Many forest mammals, such as bats, bobcats, bears, pine martens, porcupines, red squirrels, and gray foxes, use snags for dens and lookouts. Forest birds also frequently use these snags; woodpeckers are usually the primary excavators. Other birds, such as the saw-whet owl, black-capped chickadee, nuthatch, and great-crested flycatcher, move in once the home is vacated. A snag located on a waterway or wetland will attract a different variety of wildlife. Wood ducks, hooded mergansers, common goldeneyes, and buffleheads use cavities for nesting, while herons, egrets, eagles, and osprey use tall snags for nesting and lookouts. Snags in open fields will provide lookouts for some types of hawks and owls, and homes for flickers, kestrels, and eastern bluebirds. A snag in a backyard setting will provide homes for house wrens, black-capped chickadees, red-bellied woodpeckers, and flying squirrels.

Fallen Logs

Fallen logs are snags that have toppled over or healthy trees that were felled, usually by windthrow. Once these trees fall to the ground, they do not lose their value to wildlife. On the contrary, they are highly beneficial. Fallen logs in or near water provide cover for various species of fish. Male ruffed grouse use fallen logs in their attempts to attract females with their springtime courtship drumming. Chipmunks use fallen logs as runways through the forest. Hollow logs will be used by a number of species for dens, especially in the winter. If the log is big enough, foxes and even bears will use it for this purpose. As the log becomes more decayed it becomes home to salamanders, moles, shrews, earthworms, and many kinds of insects. Eventually, these fallen logs will regenerate the forest as they return to the soil, providing rich nutrients for new plants to grow from.

Structural Homes

Vegetative homes may take several years to become suitable for wildlife. Therefore, you may want to create structural homes for wildlife that may be more quickly occupied. Structural homes are those that are not grown, but are instead arranged in some manner to create cover for wildlife. This could mean that the structure was arranged naturally, such as a natural brush or rock pile. Providing structural homes will help to diversify your yard, as it will supply a ready-to-use home for wildlife.

Brush Piles

Brush piles, which consist of dead limbs and brush, will provide many species, such as rabbits, chipmunks, ground-nesting birds, amphibians, and reptiles, with escape cover. Brush piles are most beneficial when placed along habitat edges and near food sources. However, do not place a brush pile at the base of a snag, as this will promote predation. The base of the brush pile should consist of larger materials such as logs or rocks, so as to provide tunnels and openings at ground level. The pile should be six to eight feet tall and at least 15 feet wide. "Living" brush piles can be constructed by cutting into small, trees and shrubs so that the tops fall to the ground, while enough of the tree is uncut so it remains alive, forming a base for a larger brush pile. A brush pile that is buried underground forms a hibernation mound for snakes. Refer to the chapters on **Rabbits**, and **Frogs, Turtles and Snakes** for further information.

Rock Piles

Rock piles provide another form of cover for several species. Rock piles near wet areas or in gardens are especially appealing to those species that require moist, shaded areas such as frogs, snakes, sala-

manders, and insects. In areas near habitat edges, species such as rabbits and chipmunks will use the piles as escape cover.

Nest boxes

Artificial houses provide nesting sites for many species of birds and mammals. These nest boxes are usually wooden rectangular boxes of various sizes. Different species also require different sized entrance holes. Making the house for a specific species will lessen competition for nesting sites. A hinged side or roof should be provided, as it will allow for easy access for cleaning. Also, avoid houses made of metal as they overheat in warm weather, killing bird eggs. Do not use birdhouses with perches as this promotes invasion by exotic bird species such as house sparrows and starlings. These birds are not federally protected, and should be removed whenever possible as they will kill native birds and take over nest boxes.

A nest box that is 5 1½ x 11 1½ inches in size will attract house wrens, black-capped chickadees, white-breasted nuthatches, mice, and flying squirrels. **House wrens** nest in wooded, shrubby habitats and are one of the most common backyard birds. Their nest boxes are best placed five to 20 feet above the ground, and in a tree or under the eaves of a building. The entrance should be one inch in diameter. Wren houses can be free hanging and should not have a perch. Mice will also use these sized houses for winter dens. Beware that this may prevent birds from using the house when they return in the spring. **Black-capped chickadees** will nest in these boxes in areas that have mature trees. Their nest boxes should be mounted 5 to 10 feet high in areas that have both sun and shade, have an entrance hole of 1 1/8 inch diameter, and should not have a perch. **White-breasted nuthatches** will nest in areas similar to that of the black-capped chickadee. These boxes should be placed in wooded areas about 12 to 20 feet above ground. They require an entrance hole of 1 1¼ inch diameter. This box will also be used by flying squirrels.

A box that is about 5 1½ x 10 inches in size, and with an entrance hole that is oblong in shape (1 3/8 inches x 2 1¼ inches), will be used by **tree swallows** and **bluebirds**. These boxes should be placed in pairs approximately 25 feet apart to reduce competition between these two species. The entrance to the box should be placed so that it is facing east. These species will nest in areas comprised of a mix of hardwood forests and grasslands, and tree swallows are more abundant near water. These boxes are often placed on fencerows, and can actually be made in a fence post. Refer to the chapter on **Bluebirds** in the Species Management section for information on how to build this type of nest box.

Purple martins will nest in community houses, as they are not territorial species. This house is large, with many housing compartments in it. The entrance holes are located on all sides of the house, and an empty central space is important. These houses should be eight to 10 ft high and placed at least 30 feet from trees.

Northern flickers nest in farm groves, orchards, woodlots, and in urban areas. They will use nest boxes made of 1 1½ inch thick boards that are filled to the top with saw dust. The sawdust simulates the soft interior of a dead tree and will be excavated by the flicker. The entrance hole should be 2 1½ inches in diameter. The sawdust will need to be placed in the box every year before April 1 to be ready for the flicker's arrival.

Bats, those beneficial mosquito catchers, will live together in communities in bat houses near wet areas. Bat houses can be various sizes, but the common feature is a bottom entry made by several slats placed one inch apart. The inner surfaces of the house should be roughened to facilitate climbing, and rough outer surfaces are also helpful. Bat houses should be kept at a temperature of about 80 to 90 degrees. This can be done by covering the top with tarpaper, or by painting the house black. The houses should be placed on a tree trunk, metal pole, or the side of a building, preferably facing east, about 10-12 feet above the ground. If placed on a tree, it should be a fairly isolated one with a sheet of tin around the tree and under the house to deter raccoons. Otherwise, the bats will be heavily preyed upon. Refer to the chapter on **Bats** in the Species

Management section for information on how to build a bat house.

Boxes that are larger, about 9 x 15 inches, will house squirrels and kestrels. **Squirrels** are abundant in back yards, woodlots, and farm groves. The entrance to a squirrel box should be three inches in diameter and is located on the side of the box instead of in the front. A piece of wood can be nailed inside the box just below the entrance hole to provide an observation perch. Squirrel boxes should be placed facing either east or south at least 15 feet above ground in trees at least 10 inches in diameter. **Kestrels** are abundant in agricultural areas with scattered trees. Kestrel houses are the same as squirrel houses except for the entrance hole placement. These houses should be placed on a 10 to 30 feet high post or tree that is near grassy areas. They should have a sheet of tin secured around the tree under the house to prevent squirrels from using it.

Raccoon houses are large (12 inches x 24 inches), with an entrance hole of 4 11/42 inches in diameter. This box should be placed on live or dead trees of at least 12 inches in diameter, at a height of 10 to 20 feet.

Wood duck houses have greatly benefited this species. These houses are 9 11/44 x 18 inches with an oval entrance hole that is three inches high and four inches wide. This hole will exclude most raccoons. These houses should be placed on an isolated tree or post 16 feet high, and with a tin sheet secured under the house to prevent squirrel use and raccoon predation. Watch for starling occupation in these boxes, and remove any suspect nests.

Shelves and baskets

Robins, Barn swallows, and Eastern Phoebes will utilize nesting shelves. These shelves are open to the front, but covered on the sides and top. **Robins** are often seen in backyards, and their shelves can be placed about six to 10 feet above ground on a wall by a window or on a tree trunk. **Barn swallows** are common on farmsteads, and usually use a mud nest stuck to the sides of a building. Therefore, nesting shelves should be placed on a house or barn at least 10 to 20 feet away from doorways. **Eastern phoebes** are the most common shelf nest builders. Their shelves should be placed under the eaves of houses near lakes, rivers, or most wooded areas.

Mourning doves and mallards will nest in baskets. These baskets can be made of wire mesh formed into a cone. Both baskets are similar, but vary in size. **Mourning doves** will nest in a basket that is 12 inches in diameter and placed in the crotch of a tree limb six to 16 feet above ground as far from the trunk as possible. **Mallards** will nest in larger baskets. Their baskets have a 26 inch diameter, and are placed over water on a seven to eight foot support pipe. Placing nesting materials in these baskets will facilitate use by these species.

Other structures

An underground den for rabbits can be made by placing a wooden box with two side entrances into the ground and covering it with brush. Each entrance should have three to four field tiles that lead above ground. This den should not be placed in areas that are not well drained.

A squirrel den can be made from discarded automobile tires. The tire den should be placed 15 to 30 feet above ground in a tree with the entrance hole facing the trunk. This is not as aesthetically pleasing as wooden boxes, but it is highly functional and a good way to recycle your tires.

In summary, there are many ways to add the habitat component of cover to your property. Providing homes, either vegetative or structural, is a good way to help fulfill this requirement in your backyard. Observing the wildlife that use the homes you have provided is not only fun, but educational.

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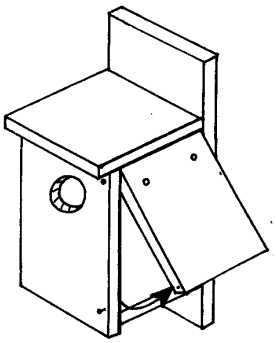
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

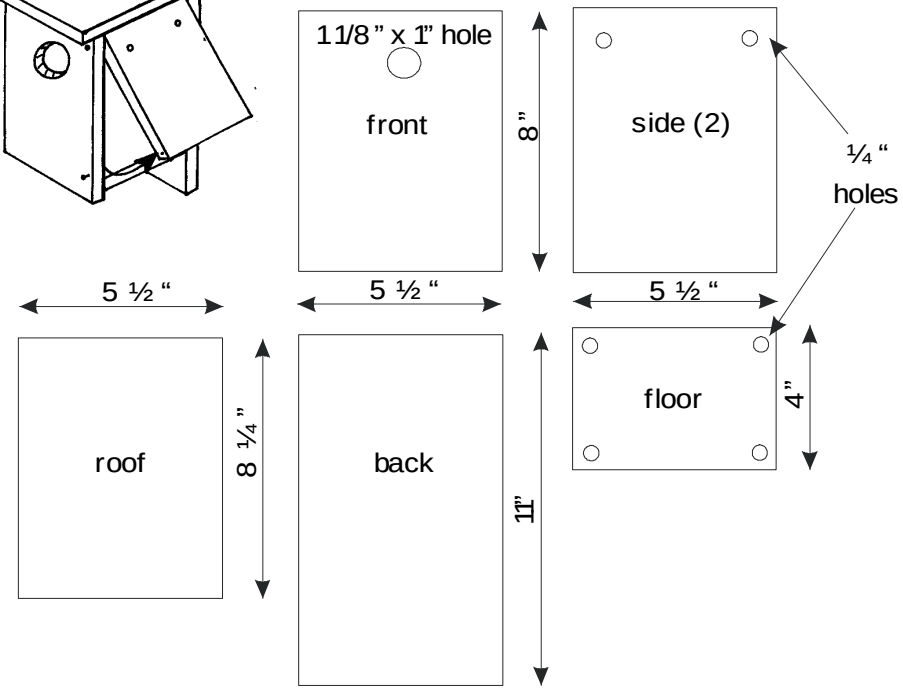
HOMES FOR WILDLIFE II PLANS

It is essential to provide wildlife with the habitat components of cover, food, space, and water. Providing homes will help provide cover and will aid in attracting a variety of wildlife to your backyard. This chapter furnishes plans for the previous **Homes for Wildlife** chapter. Most of the plans here are for birds, but there are also structures for squirrels and rabbits. The plans for the bluebird house and bat house can be found in their respective chapters in the **Species Management** section. All birdhouses are made from $^{31}/_{44}$" wood; do not use metal. Also, to prevent rain from seeping into the cracks enclose the floor with the sides instead of nailing the sides to the top of the floor. Attach birdhouses to a support post, building, or tree. All nest boxes should be predator-proofed to prevent threats from climbing predators such as housecats, raccoons, and squirrels. In most cases this can be done by placing a metal cone or a sheet of tin on poles or around trees underneath the nest box.

Flying Sqirrel

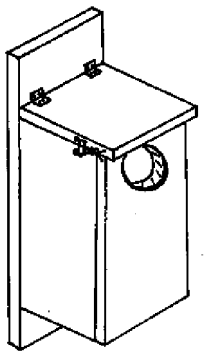
House Wren, Black-capped Chickadee, Nuthatches, Flying Squirrel, Deer Mouse, White-footed Mouse Nest Box

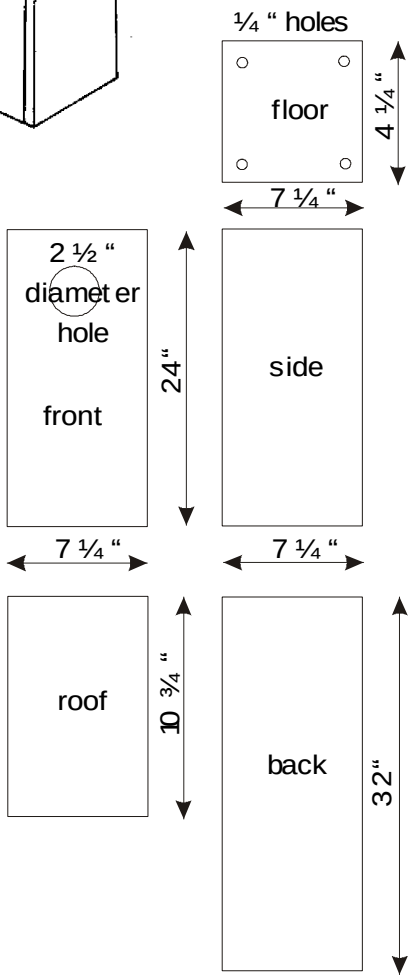




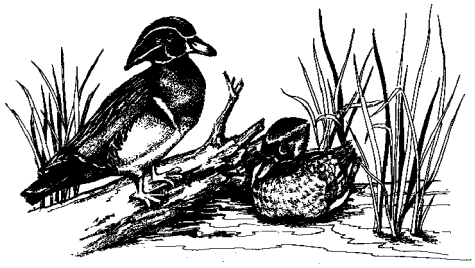
Two "pivot" nails, one top front and one top back, allow side to swing out for cleaning. Use one nail or screw at bottom to hold side closed. Nuthatches and flying squirrels require an entrance hole that is 1¼" in diameter. Also, remember that a hole larger than 1 1/8 " in diameter will admit house sparrows.

Northern Flicker



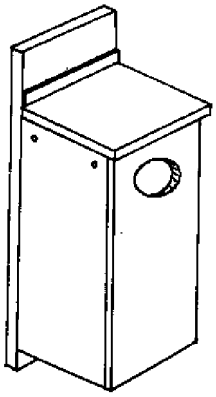


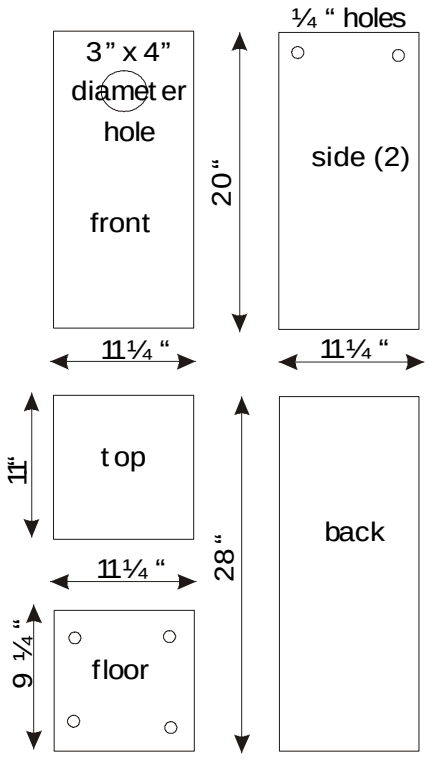
Hinge roof for cleaning, and use a wire to keep the box shut. Place body of box 5" from the top of the back. Fill the box to the top with sawdust.



Wood Duck

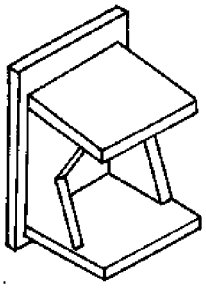
Wood Duck

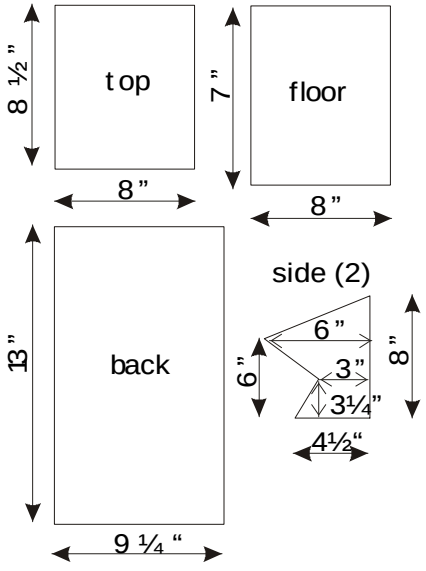




Hinge roof for cleaning, and use a wire to keep box shut.

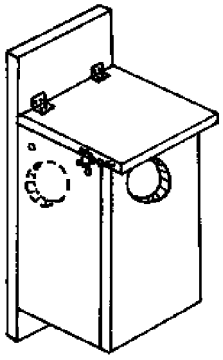
American Robin, Barn Swallow, and Eastern Phoebe Nest Shelf

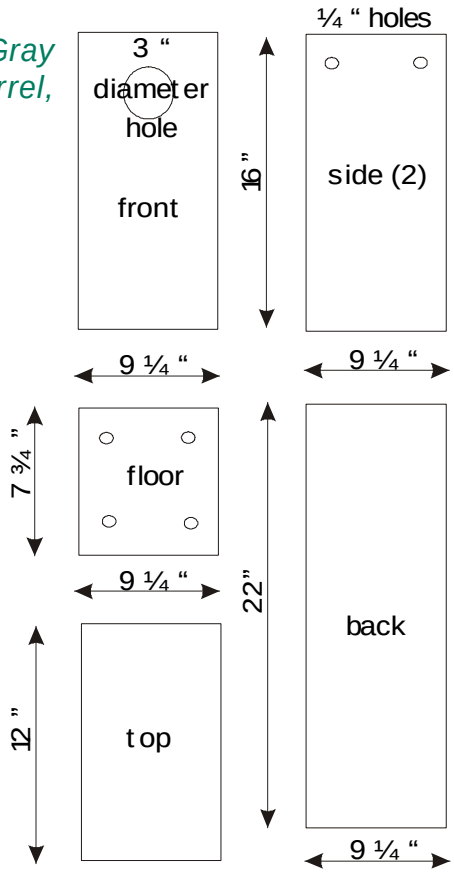




Place body of shelf 2" from top of back.

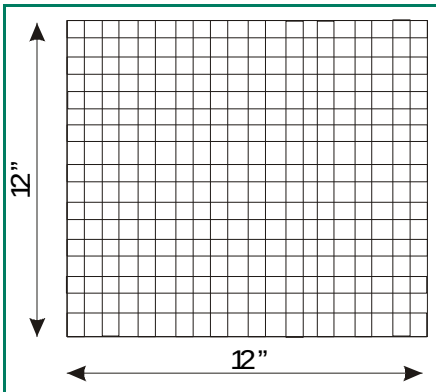
American Kestrel, Gray Squirrel, Red Squirrel, and Fox Squirrel

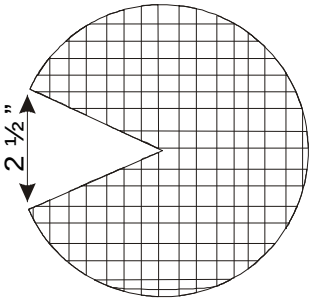


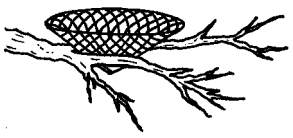


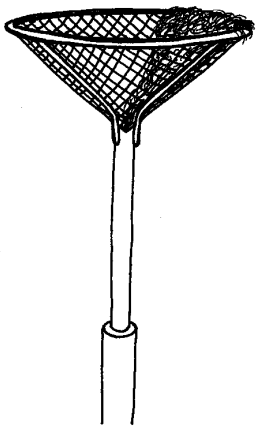
Hinge roof for cleaning, and use a wire to keep box shut. Place 3" of sawdust in bottom of box. For a squirrel box, place entrance on side of box instead of front.

Mourning Dove and Mallard Nest Basket



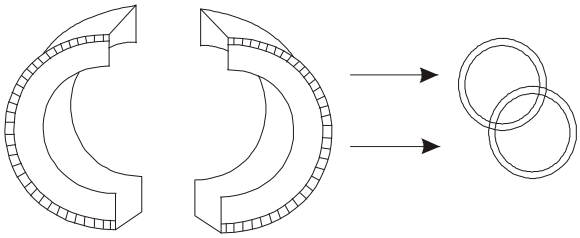




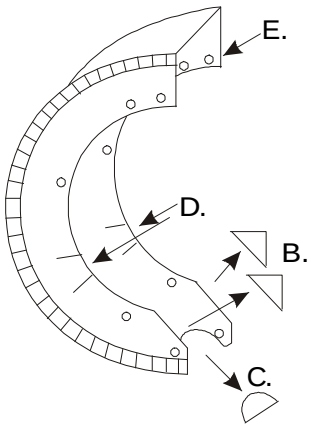


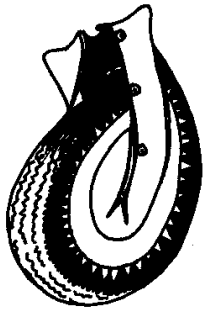
Cut with tin snips to form a circle. Cut out a pie shape, and wire edges together to form a cone. Place onto tree limb with wire.
A mallard basket can be made in the same way using 36" x 36" wire mesh, and placing on 2' 2" basket pipe above water. Vegetation for nesting is placed in the mallard basket and secured with soft wire.

Squirrel Tire Den



A.





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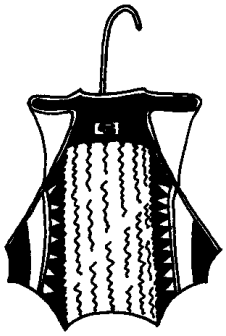
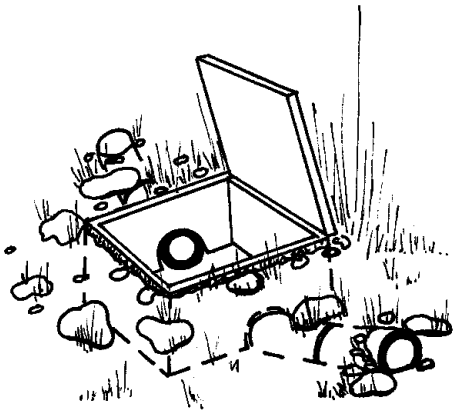


Old tires can be reused to construct a squirrel den. Use a regular, non-steel belted, tire. A) remove the bead from both sides of the tire, and cut the tire in half. B) cut a 3" triangle from each corner of the bottom of the tire. C) In the same end, cut a 3" diameter semicircle (this is the entrance hole). D) Cut 3" flaps in sidewalls about 1/3 distance up from the bottom of the tire. E) Punch holes into the sidewalls as shown. F) Fold the short end of the tire into the long end, and secure with roofing nails and washers. Hang with heavy wire or metal rod.

Rabbit Den



Dimensions of the burrow are not critical. A bottom is not necessary, as it will sit on the ground. Use durable lumber for the box, and bury it at ground level. Two semicircles should be cut on opposite ends at the bottom of the box. The tile should fit snugly into these holes. Bury the tiles at about 45 degree angle from the surface of the ground to the bottom of the box.

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INTRODUCTION TO SPECIES MANAGEMENT

Because of its varied landscapes, soil and habitat cover types, and vast water resources, Michigan supports a wide diversity of wildlife species. The chapters in this section will help you create, restore, or enhance habitat on your property to attract the kinds of wildlife that interest you. There are individual chapters on specific species throughout Michigan including wild turkeys, deer, grouse, woodcock, rabbits, pheasants, quail, squirrels, and waterfowl. Other species included are black bears, bats, and frogs, turtles, and snakes. Other chapters included are songbirds, bluebirds, woodland birds, wetland birds, and grassland birds.

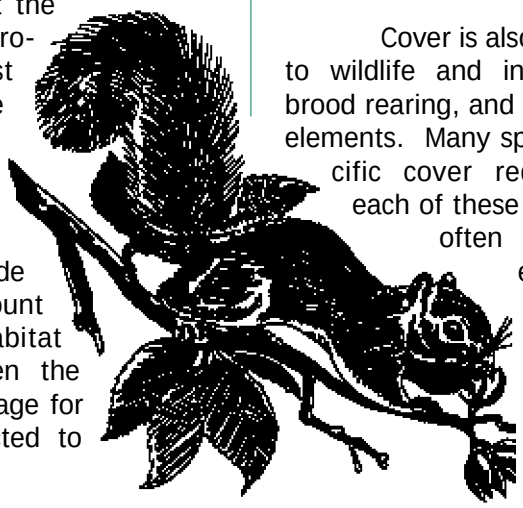
Proper wildlife management considers species habitat requirements, and includes knowing how plants and animals respond to changes that occur to their habitat, both natural (windstorms, floods, succession) and human induced (timber harvest, haying). Your management plan can make a critical difference for targeted species or communities of species. The kinds and numbers of wildlife that use your land can very well be the direct and indirect result of your efforts. For these reasons it is important to understand your property's potential, to know its history, its soils, and to be able to identify its plant and animal species.

Whenever possible consult with and work with your neighbors. After habitat destruction, habitat fragmentation is a serious threat that many wildlife encounter. If you are managing your land primarily for turkey, and your neighbor wants more pheasants, your plans could cancel each other out. Therefore, finding ways to work with your neighbors may result in more effective wildlife plans.

Habitat Considerations

Each species requires different variations of the four basic habitat components: food, water, cover, and space. In order to determine which species will benefit from your land, and subsequently which will not, you must determine what each species needs for survival. Instead of picking a species that you want to see on your property, you should first determine what habitats occur there, or could feasibly be created, and then decide which species are likely to benefit from enhancement of these habitats. For example, if your property and surrounding areas are comprised primarily of grassland and agricultural fields, it is not realistic to want to manage

your land for turkeys. You would be wiser to manage for pheasants or other grassland birds. Once you have determined what species are likely to frequent the habitat you can provide, you must determine the specific habitat need of the species you want to feature. If you provide the correct amount of required habitat components, then the species you manage for should be attracted to your property.



The presence of food will greatly enhance the attractiveness of your property. Food can best be provided through plantings of mast producing trees and shrubs, grasses, and flowers. These can be planted as borders on your property, in gardens, or as the main component of your land. There are also many ways to enhance the food that your land already produces with active management tools such as timber harvesting, mowing, and burning.

Water is another component essential to a species survival. The restoration of a wetland, creation of a pond, or maintenance of a stream are great ways of providing this component. An area with water will attract a wide variety of species. Since Michigan is home to many lakes, and streams, water is usually not a limiting factor.

Cover is also very important to wildlife and includes nesting, brood rearing, and shelter from the elements. Many species have specific cover requirements for each of these uses, which are often seasonal. For example, establishing a stand of switchgrass, will provide winter shelter for pheasants. It is important to establish year round cover for a species in order to provide adequate habitat.

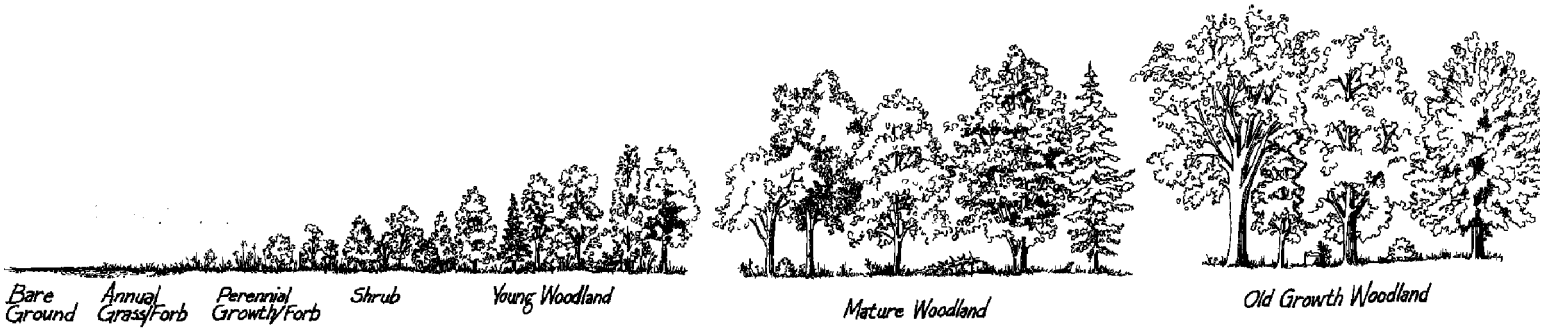
Space is another requirement that must be met. Some species require a small amount of living space. However, other wildlife may need large tracts of land to survive. You must be aware of the amount of space a species needs, and how your management activities will effect them. You must also be concerned with the edge sensitivity of certain species. For example, in managing for turkeys you decide to create openings in your forest to regenerate oaks. However, this decision would impact woodland birds that require a large amount of undisturbed forest.

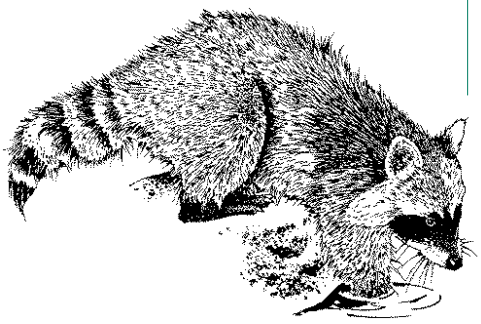
Succession and Wildlife

"Succession" is the word used to describe how land changes over time, with or without our help. Each successional stage provides different habitat components. Natural succession does not only move forward, but is also set back by natural disturbances such as wildfire, windthrow, flooding, disease, and storms.

As habitats change, forward or backward in succession, different types of wildlife are attracted to them. Begin by understanding the five basic stages of succession and the kinds of wildlife attracted to each. Keep in mind that the species appearing in different successional stages vary in different parts of the state, with different soils, and with different natural disturbances. The species described in the following example are geared towards southern Michigan, but the concept is the same throughout Michigan.

Bare soil is the starting block, and the first plants to establish themselves in bare soil are annuals such as ragweed, lambsquarter, and foxtail. This successional stage provides seasonal nesting cover for killdeer, horned larks, and other small songbirds, as well as brood-rearing cover for pheasants and quail.





The next successional stage is the perennial grasses and forbs. These include goldenrod, asters, black-eyed Susan, and many kinds of grasses. This provides food and cover for species such as mice, rabbits, skunks, foxes, hawks, owls, butterflies,meadowlarks, bobolinks, and other songbirds.

After a few years shrubby plants such as sumac, dogwood, and blackberry begin to invade the area. It now becomes more attractive to raccoons, opossums, deer, grouse and songbirds such as cardinals, brown thrashers, and song sparrows.

As succession continues the first tree species move in such as cottonwood, aspen, and chokecherry. During the early stage of this forest development, young seedlings provide browse for rabbits and deer. The increasing amount of vertical structure attracts thrushes, ruffed grouse, blue jays, and orioles.

As the forest grows over time, more shade-tolerant trees like beeches and maples invade. Squirrels, wild turkeys, deer, and wood ducks are examples of wildlife that eat the nuts produced by these trees, which also furnish den cavities for screech owls, squirrels, raccoons, and woodpeckers. There are several different tree species in these stages that are dependent on the forest type that grows there.

You may decide to let succession run its course. However, you can also manage your land for any stage of succession. This is dependent on the current conditions of your land in conjunction with your goals. There are several ways to change successional stages such as burning, mechanical alterations, chemical use, or planting. These tools are either used to set back succession by removing unwanted species, or to speed up succession by promoting the growth of desired species.

Prescribed burning is the well planned and controlled use of fire. A hot fire will set back succession, while a cool fire can advance succession in a young forest such as Jack pine. Mechanical alterations include mowing, cutting, disking, and plowing. This is primarily used to set back succession, but can also be used to increase the growth of species such as aspen, sumac, and autumn olive that spread more rapidly when cut. Chemicals can also be used to speed up or set back succession. Herbicides are used to remove vegetation, either to set back succession or to encourage the growth of desired species. Fertilizers are also used to enhance plant growth. Plantings are often used to advance succession. Refer to the chapters on **Prescribed Burning, Timber Harvesting, Grass Planting, Tree and Shrub Planting**, and **Grain Plot Planting** for more information.

Management Implications

Regardless of what you and your neighbors do to your land, certain species of wildlife will likely visit, and some will possibly occupy the habitat you have created. Therefore, species that use your property reflect both the habitat niche available as well as the collection of diverse habitats within the area.

As your property and the land that surrounds it change, so will the wildlife that use those landscapes. For every management decision you make, there are some species that will be negatively effected. For example, if we plant native prairie grasses to encourage

pheasants, quail, grassland and ground nesting songbirds to use the habitat, we will discourage forest-loving wildlife such as thrushes, woodpeckers, and squirrels. You cannot manage for both species in one area as they have different habitat needs. Therefore, you must be aware of the trade-offs involved when making management decisions. Determine what species will be effected, and then decide if the benefits will be greater with your management plan. If not, then you may need to consider other alternatives.

You should also be aware that creating or enhancing habitats may invite unwanted guests. For example, if you plant trees and shrubs, in the hopes of attracting wild turkeys and songbirds, you will most likely also lure deer, rabbits, and mice that can become a nuisance by eating the new plantings. Free-roaming dogs and cats may also be attracted to any habitat that suddenly has an abundance of wildlife.

In summary, before providing habitat for wildlife, you must know what they need to survive. Providing the correct habitat requirements for a certain species will encourage them to visit and possibly occupy your land. It is important to know what habitat your land can provide before deciding which species you want to manage for. Also, you must be aware of the trade-offs that are involved, or what species will be impacted, in your management plan.

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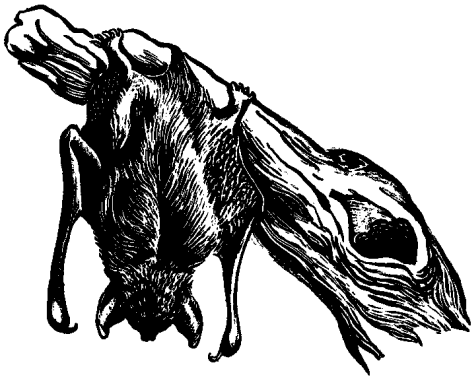
BATS

Bats comprise one-fourth of the world's 4,000 species of mammals and are most often found in forested areas near water, which are insect-rich areas. Fruit-eating bats are nature's most important seed-dispersing animals. Nectar bats pollinate many rain-forest trees, shrubs, and flowers and without their help the forest would be less diverse. The ability of insect-eating bats is phenomenal--one little brown bat can eat 600 to 1,000 mosquitoes in an hour. Over-sized ears and nostrils help bats to use a sonar system that experts believe is a thousand times more sophisticated than the best airport radar invented to date.

Bats are among the most fascinating of all wild creatures. Because they are also among the least understood, myth and ignorance have caused many people to fear and hate them. For example, bats are not blind; in fact, they have good eyesight. Bats are actually very clean animals and they do not get caught in people's hair, nor do they eat through house attics or interfere with pets or backyard feeding birds. In addition, no bat species preys on humans. The non-aggressive vampire bats of South America and Central America have evolved to specialize in drinking small amounts of blood from cows, goats and chickens. There are no vampire bats in the United States.

Because bats are so distinctive, they have their own scientific order. Chiroptera is a Greek word that means "hand-wing" because the wing is similar to a human hand with a thumb and four long fingers. Also, they are our only true flying mammal.

Some bats are so small they weigh as little as a dime. Others have a wing span that may stretch to five or six feet. Another interesting fact: Bats have been known to migrate at cruising altitudes up to 10,000 feet, much higher than most birds. Of the 43 species of bats that live in the U.S., more than half are considered rare or uncommon. Nine insect-eating species of bats, including one classified as rare, live in Michigan. All are nocturnal (active at night), and feed nearly exclusively on flying insects, including moths, beetles, and mosquitoes.



Bats in Michigan

The **hoary bat** is Michigan's largest with a wingspan of up to 15 inches. Heavily furred, the hoary's dark-colored hair is tipped with white giving it a frosted appearance. Its ears are short and rounded. It's rarely encountered by people and migrate south in winter. It is a solitary species that spends its summer months in forest trees near water throughout Michigan. Researchers know little about their feeding habits and predators.

The **red bat** also migrates south and is a solitary bat of forests near water. Its long, pointed wings may stretch 12 inches, and it has short, rounded ears, and a furred tail. Color varies from a bright orange to a yellow-brown, and the males are usually brighter in color than the

females. Like most other bat species, the red breeds in fall, but conception is delayed until spring when the female gives birth to one to four pups after a gestation period of 80 to 90 days. Blue jays prey heavily on the offspring. Other predators include opossums, sharp-shinned hawks, great-horned owls, and feral house cats.

The **silver-haired bat** lives in forested areas near streams and lakes. Similar in size to the red bat, the silver-haired species is black or dark brown with silver on the tips of its hairs. Considered scarce throughout their statewide range, the silver-haired bat is most easily identified by its slow flight, which is typically low to the ground. A solitary species, females are thought to establish nursing colonies in June and July when they give birth to two young. A southern migrant, the silver-haired is preyed upon by skunks and great-horned owls.

The **eastern pipistrelle bat** does not migrate as it hibernates in caves or abandoned mines through winter in the western Upper Peninsula where it lives year-round. This bat occupies rock crevices and building ledges during the day, and leaves just before sunset to feed on insects. A tiny bat with a wingspan of 10 inches or less, the pipistrelle is often confused with a large moth. Ranging from a golden brown to reddish brown, the species has few known predators.

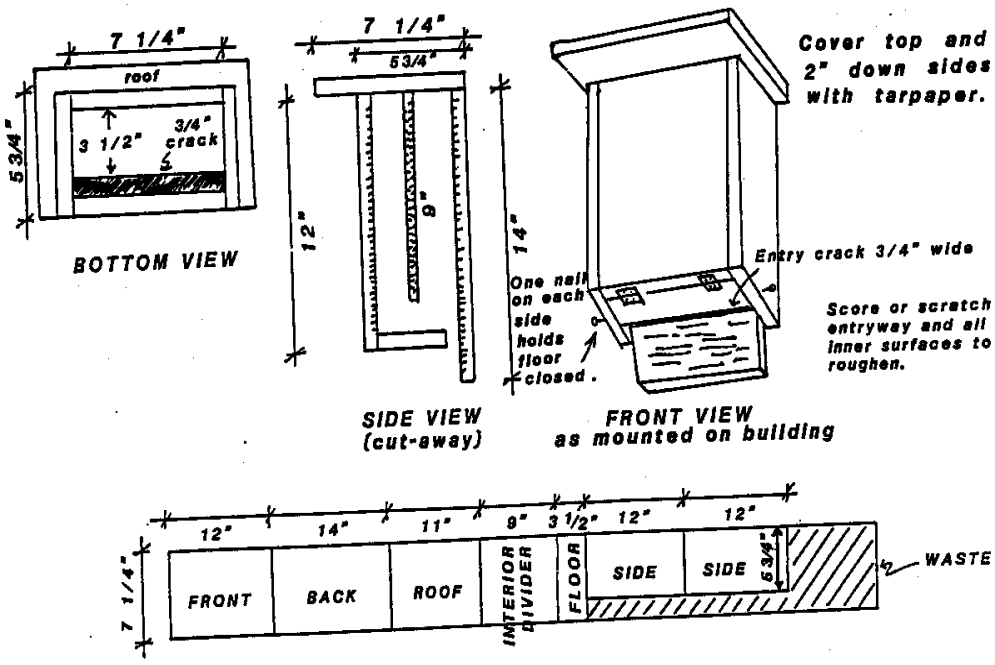
The **northern long-eared bat** until recently was also called the Keen's bat, which is now considered a separate species living in Canada. Very large ears make these bats easy to identify at close range. Similar in size to the silver-haired and red bat, the long-eared is brown in color. Although it typically roosts alone in buildings and under tree bark in the summer, small numbers hibernate together in caves, often with big brown bats. The species also forms small nursing colonies of about 30 bats in a tree hollow or under bark.

The **evening bat** lives in extreme southern Michigan and is easily confused with the little brown bat except the evening bat has a curved, rounded fleshy protrusion (tragus) on the ear instead of a pointed tragus. Their wings span 10 to 11 inches. The evening bat flies low to the ground and is sometimes seen swarming around caves, which it rarely enters. Young are born in summer in colonies that range from a few individuals to several hundred, and litter size is typically two pups.

The **little brown bat** is especially abundant throughout the state and is the most seen species. A light brown to dark brown in color, little browns are fairly small in size with a wingspan of 8 1/2 to 11 1/2 inches, small ears, and large feet. In summer, colonies of the species live in hot attics and under shingles and siding; in winter, they hibernate in caves, crevices, houses, hollow trees, or mines. Females form nursery colonies away from the males. Little brown bats like to feed on aquatic insects and are frequently seen dipping and diving over water but will also forage over lawns and pastures, among trees, and under street lights.

The **big brown bat** has a large nose, is reddish to dark brown in color, and sports a wingspan ranging from 12 1/2 to 13 1/2 inches. Its slow, steady flight, and large size make it fairly easy to identify. Beetles, wasps, mosquitoes and flies from pastures, lawns and vacant lots in the city make up its diet. They are late-dusk fliers that often swoop low to the ground. A colonizing species, big browns roost in buildings and under bridges in summer and hibernate in caves, mines, houses, hollow trees, and even storm sewers in winter. Efficient feeders, the species often roosts for

Bat House Instructions



a short nap after gorging itself. Porches, garages, and breezeways are good places to find them. The female gives birth to only one pup per year.

The Federally endangered **Indiana bat** is considered rare in southern Michigan, the only region in the state where it resides. A light brown in color, the Indiana bat closely resembles the little brown bat. A southern migrant, the species forms nursing colonies in tree cavities or under loose bark of trees along forested floodplains.

Habitat Management

The following are options to consider when managing habitat for bats:

•Retain trees with loose, scrappy bark. Cutting down shagbark hickory or other tree species with flaking bark reduces available habitat for some species to roost.

•Preserve and protect wooded corridors, riparian areas, and trees along streams, rivers, lakes, and ponds.

•Retain abandoned mines for hibernation. Twenty thousand bats have been found in a single mine. Destroying their winter "homes" would be detrimental to their survival. And, disturbing their sleep may even kill them because they expend valuable energy waking up and trying to go back to sleep. It may be beneficial to add mine closures that will allow bats to enter, but keeps humans out.

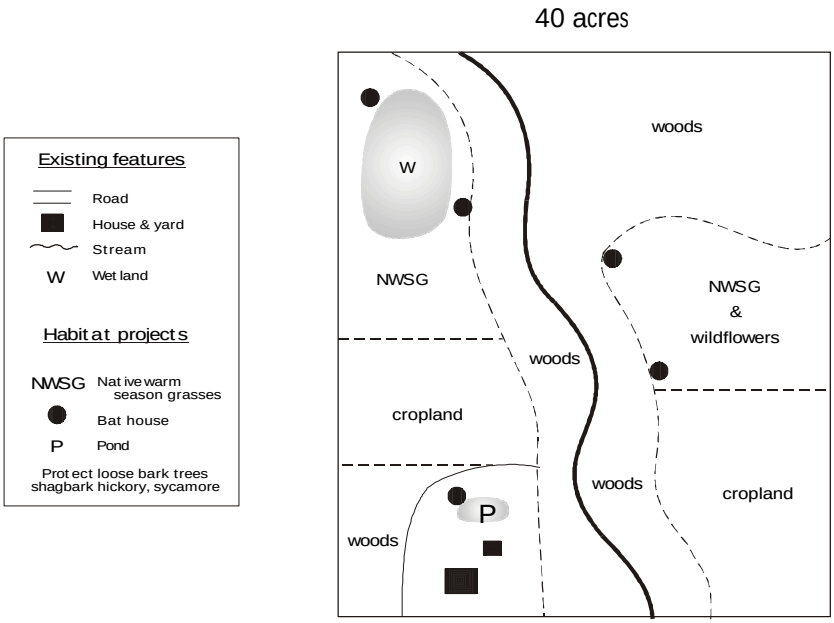
•Minimize the use of insecticides. Their broad use can seriously impact bats. Although there may be an increase in insects near your home, maintaining natural conditions will increase food not only for bats, but for birds and even dragon flies.

Concerns

Colonizing species that occupy human dwellings cause great alarm among fearful inhabitants. Rather than killing these beneficial mammals, prevent entry into your home by locating and plugging potential entrance holes. If bats are already present, plug the hole after sunset when they leave. Putting up a bat house nearby may discourage them from entering your home while keeping them in the area.

Building a Bat House

You can attract bats to your property by providing a bat house. You can make a simple structure by nailing the top of a



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

two-foot wide piece of tar paper around a tree trunk so the tar paper will resemble a tight-fitting skirt. The idea is to keep water from leaking into the structure. Bats will enter from below and cling to the tree bark. They can then move around the trunk as the sun rotates during the day.

To build a bat house from wood, refer to the diagram and directions above. Entry space should be about 3/4 inch wide, and all inner surfaces must be roughened to allow bats to climb on them with ease. Screen mesh also works well.

To bring the house to preferred daytime summer temperatures of 80 to 90 degrees, cover the house with tar paper or paint the structure black so it will absorb heat. Place the bat house on the east or southeast side of a pole, tree, or building at least 15 feet from the ground and out of the wind as much as possible. Be careful placing houses on trees, they may become feeders for cats or raccoons.

The best location is near water where insect populations are high. If bats must fly a half-mile or more to feed, they will most likely not use the structure. Once used, bat houses do not need to be cleaned.

Since bats are loyal nesters, putting up a bat house in an area they frequent is no guarantee they will use the structure. Solitary roosters (red, hoary and silver-haired bats) will likely ignore them, and one or two years might pass before the other species, all of which are colony roosters, may find them to their liking. In Michigan, little brown bats and big brown bats are the species most likely to use bat houses.

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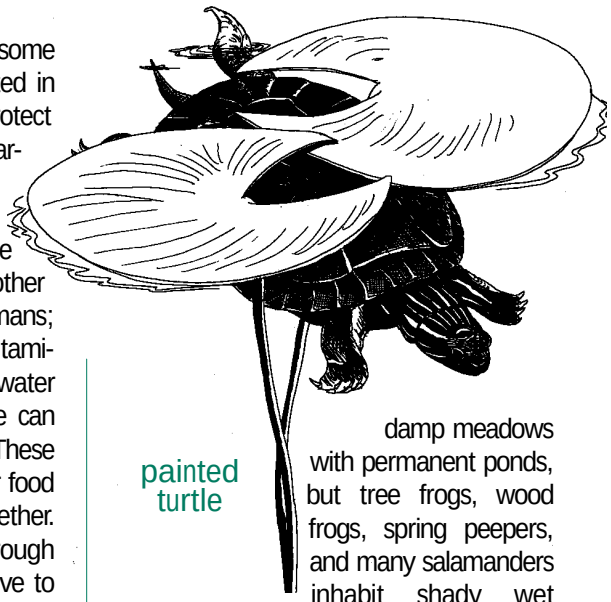
FROGS, TURTLES & SNAKES

Michigan reptiles include turtles, snakes, and one lizard species. Michigan amphibians include frogs, toads, and salamanders. Much of the time we are not aware of these creatures; when we are aware, their presence sometimes annoys or frightens us. Snakes, in particular, have been the subject of unwarranted fear and prejudice, but fortunately this attitude is beginning to change. Reptiles and amphibians are important to study because they are sensitive to subtle environmental changes such as water quality or ozone depletion in the atmosphere that permits more ultraviolet light to reach the earth from the sun. As "environmental indicators", reptiles and amphibians help us to monitor these and other changes that may eventually be harmful to us.

They also play an essential role in our ecosystem. Frogs, toads, lizards, and some snakes can destroy large quantities of harmful insects. The larger snakes eat mice, rats, and other rodents. Some turtles act as scavengers in lakes and ponds, and others prey on snails, which act as intermediate hosts for parasites, including the one that causes "swimmer's itch." Reptiles and amphibians provide an important food source for other animals including fish and birds. These creatures are interesting to observe and study, and most species carry out their ecological roles without conflict with people.

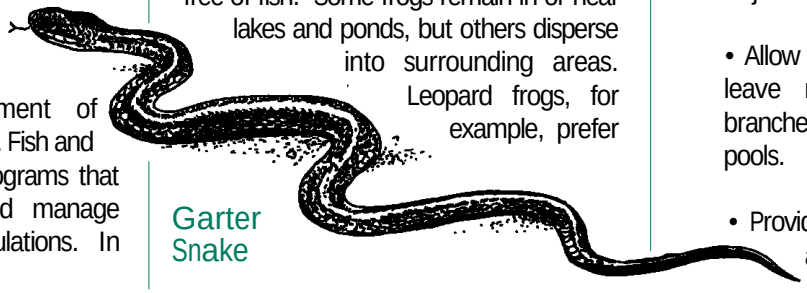
The Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service administer programs that help us to understand and manage amphibian and reptile populations. In recent years declining numbers of some amphibians and reptiles have resulted in state and federal laws designed to protect them. Reasons for the decline are varied and complex. They include the fragmentation and destruction of wetland areas; exploitation by people for food, pet trade, fishing bait, and other purposes; direct persecution by humans; and exposure to environmental contamination. Pesticides entering the water where many of these creatures live can impact their ability to survive. These chemicals can also contaminate their food source (insects) or eliminate it altogether. Because amphibians breathe through their skin, they are especially sensitive to toxins in the air or water.



painted turtle

Overall Habitat Considerations

Amphibians and most reptiles require moist lowland areas that have available water at least on a seasonal basis. Turtles usually inhabit permanent water resources such as lakes, ponds, or slow-moving parts of rivers. Aquatic snakes spend much of their lives in and near the shallow edges of lakes and streams. Frogs, toads, and most salamanders lay their eggs in water and spend the early part of their lives as gill-breathing larvae or tadpoles. Many breed in temporary ponds such as vernal pools and other shallow wetlands free of fish. Some frogs remain in or near lakes and ponds, but others disperse into surrounding areas. Leopard frogs, for example, prefer damp meadows with permanent ponds, but tree frogs, wood frogs, spring peepers, and many salamanders inhabit shady wet woodlands with temporary seasonal ponds.



Garter Snake

Because most frogs, turtles, and snakes require different habitats at various times of the year, they become vulnerable when travel is involved. Roadway traffic, for example, claims large numbers of migrating breeders in the spring. When their habitat needs are in close proximity to each other, the need to travel lessens reducing mortality. Neighboring property owners can often cooperate to restore, protect, or create new critical habitats. To do this you can:

- Provide sun-basking opportunities such as logs, boulders, and other objects that these animals seek.

- Allow leaf litter to accumulate, and leave rotting logs and downed branches in woodlots and woodland pools.

- Provide plants in ponds, marshes, and other bodies of water.

Amphibians in particular rely on submergent aquatic plants (water plantain, coontail, and bladderwort) to support their egg masses, to act as nursery areas for larvae, and to offer feeding areas for adults. They use emergent plants (cattails, waterlilies, sedges, and rushes) for protection against predators.

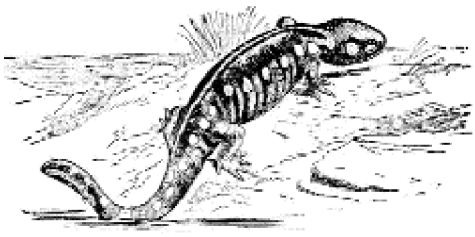
Managing Habitat for Frogs, Toads and Salamanders

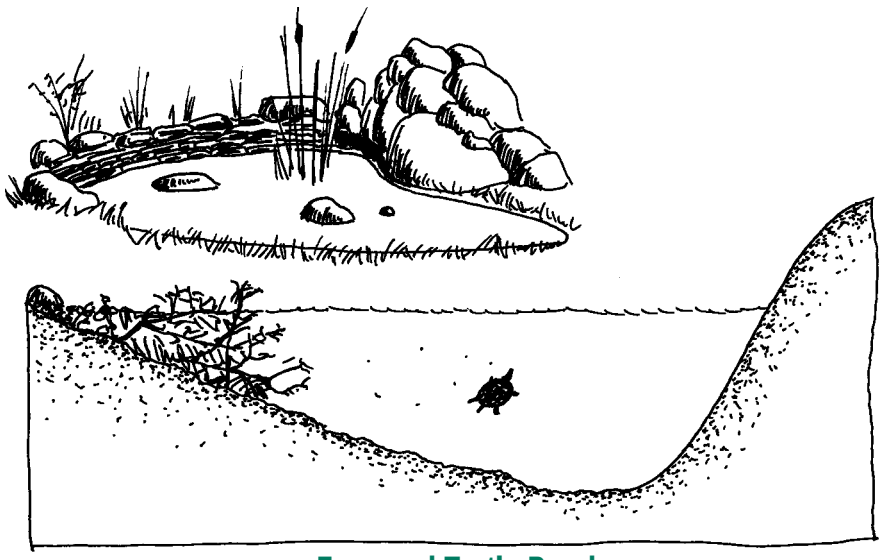
Although more than 3,400 species of toads and frogs occur worldwide, only 14 live in Michigan, and two of them -- the Blanchard's cricket frog and the boreal chorus frog of Isle Royale -- are uncommon. Michigan is also home to eight species of salamanders, including the Eastern newt. Rare species, protected by the Endangered Species Act, are the marbled salamander and the smallmouth salamander.

Water is critical for population survival because these creatures seek shallow wetlands and vernal pools in which to breed and lay their eggs. When the shallow wetlands remain wet, and are free from egg and larvae-eating fish, most young, gill-breathing amphibians will make the transition from egg to larvae to adult in one summer. Dry years can result in very few eggs or hatchlings, or minimal survivability to adulthood. Species that do not require a large wet area may lay their eggs in ditches with just enough water to encourage breeding.

Most frogs, toads, and salamanders lay their eggs on submerged sticks and plants. However, the green frog and bullfrog lay their eggs in a large mass that floats on the surface or attaches to vegetation. The mudpuppy uses rocks in warm, shallow water for its nest chamber. The four-toed salamander is especially adapted to boggy cedar swamps containing sphagnum moss where it lays its eggs.

Spotted Salamander





Frog and Turtle Pond

Other species with specialized habitat needs or unusual life cycles include:

- The **mink frog** lives in ponds, bogs, lakes and slow-moving streams of the Upper Peninsula.

- The **eastern newt** hatches into a larval form in shallow water, transforms into a land-loving juvenile, and then at two years of age or older becomes a fin-tailed adult that returns to water.

- The **pickerel frog** prefers cool, unpolluted water and will not inhabit bogs, lakes, or streams with excessive nutrients, suspended sediments, or contaminants.

- The Fowler's toad lives in open woods and sandy-soiled fields located along southern Lake Michigan sand dunes with ponds and wetlands.

Landowners interested in building ponds should consider creating them broad, weedy, and shallow, and plant natural vegetation along at least part of the pond margin. Surrounding the pond with beach sand or mowing to the water's edge will be of little or no use to amphibians. Because many larger frogs (bullfrogs, green frogs, and leopard frogs) hibernate in the bottom of ponds and lakes, you should provide an area deeper than five feet to prevent the water from freezing to the bottom in winter. Avoid stocking ponds or lakes with fish that will eat amphibian eggs and larvae. Consider building two ponds -- one for game fish and one for amphibians.

Salamanders consume worms, snails, slugs, and both waterborne and terrestrial insects. In the woodlands, salamanders seek leaf mold, decaying logs, and moist spots under rocks for food and shelter.

Frogs and toads eat insects, spiders, and mites. Leaving leaf litter and rotten logs in your woods will provide frogs and toads with important cover. Toads in particular are beneficial to gardeners because they consume insects harmful to flowers, vegetables and other plants. Attract toads by placing an old stump or hollow log in your garden. Propping up pieces of wood

Toad Home: Create by placing a shallow depression under flat rocks. To create an entrance, punch a hole in an 8-inch flower pot and slide into depression.

or turning a flowerpot on its side will also give toads a damp, shady daytime haunt.

Managing Habitat for Snakes

Reptiles do not have a water-dependent larval stage as do amphibians, but many species live in or near wetlands and waterways where they find food and shelter. Creating, restoring, or enhancing wetlands is generally beneficial to snakes and turtles too. Aquatic snakes spend much of their time in or near the shallower edges of lakes and streams. Uplands are also favored by most snakes, all lizards, and the eastern box turtle.

Michigan is home to 17 species of snakes. Seven species lay eggs; the other 10 bear their young live. Egg-laying snakes bury their eggs in sand or soil in late spring or early summer. Many people are familiar with the common garter snake, but few have seen Michigan's only venomous snake, the massasauga rattlesnake, which is shy and unassertive. Another uncommon snake is the black rat snake and three other species (the Kirtland's snake, the copperbelly water snake, and the Eastern fox snake) are considered rare and are protected. The Kirtland's and northern copperbelly inhabit wet meadows, tamarack swamps, river-bottoms, woodland ponds, and open swamp-forests in the southernmost counties of the Lower Peninsula.

The eastern massasauga rattlesnake frequents marshes and swamps but will move into meadows and woodlands in summer. Wet meadows, marshes, and the grassy edges of lakes and streams are preferred by the butler's garter snake, northern ribbon snake, blue racer, eastern fox snake, and the eastern smooth green snake. The northern ringneck snake and black rat snake like moist woodlands. The hognose snake and western fox snake inhabit open sandy woodlands and wooded dunes.

Michigan's most common snake, the eastern garter, occupies open woodlands, meadows and old fields. Also preferring these habitats are the brown snake, the northern red-bellied snake, and the eastern milk snake, which also frequents barns and sheds.

The following are options to consider when managing habitat for snakes:

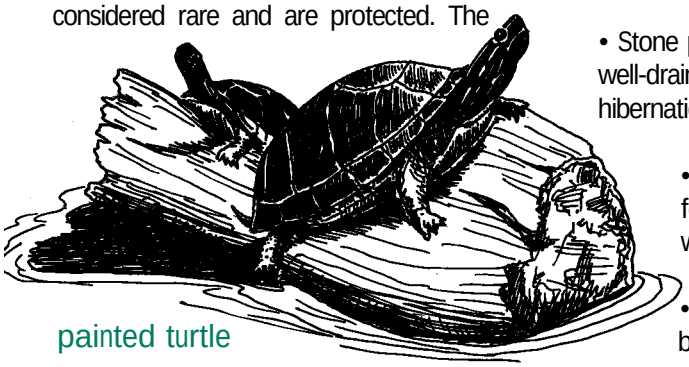
- When trimming trees and shrubbery or harvesting timber, leave the debris in piles of brush or logs to provide warmth and cover.

- Stone piles that face south along a well-drained slope are attractive as hibernation chambers.

- Maintain open, sunny places for basking within dense woodlands.

- In winter, maintain rodent burrows, natural cavities around tree roots, and cracks in old house and barn foundations as places for hibernation.

- Keep grasses uncut along the water's edge, which provides cover.



painted turtle

You may wish to create a snake hibernation mound for use along the forest edge. It is essentially an underground brushpile designed to provide burrow sites for hibernating snakes. Build these mounds along forest openings, road cuts, timber landings, or any land clearing with slash and stumps. It is important that sunlight reaches the mound so it should be located on the north side of a clearing.

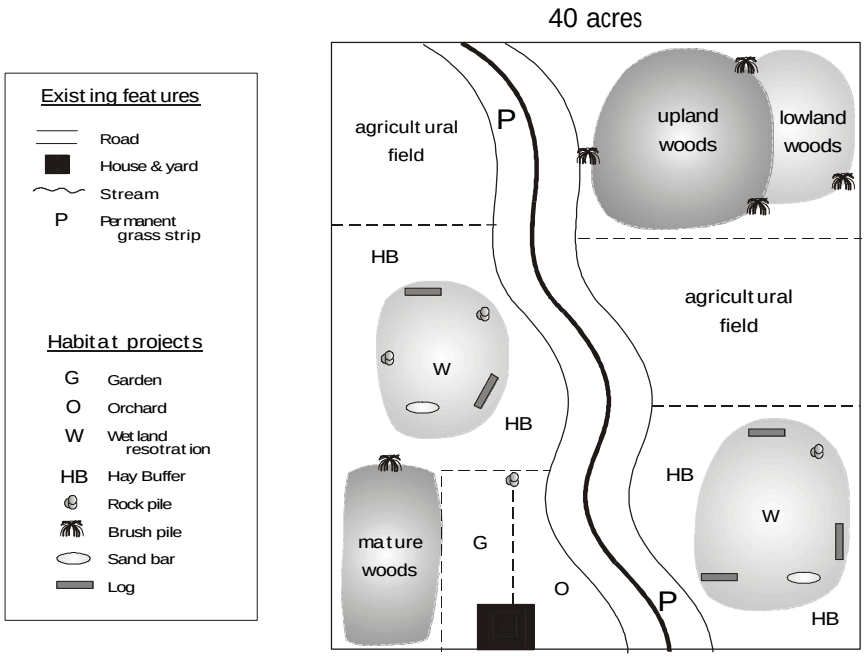
Trees on the site should be cut to approximately 12 to 18 inches above the ground level. Then cut the trunks into 10-foot lengths and remove all branches. Dig a trench eight feet deep and nine feet across. Fill the bottom of the trench with a layer of logs and continue filling the trench with some stumps and branches. Soil should then be pushed into the trench to ground level. The 10-foot logs should then be laid on top of trench side by side. Keep placing soil, logs, and branches until the mound is approximately 10 feet high. Please see figure above.

snake hibernation mound

Managing Habitat for Turtles

Four of the ten species of turtles living in Michigan are considered uncommon.

FROGS, TURTLES & SNAKES



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

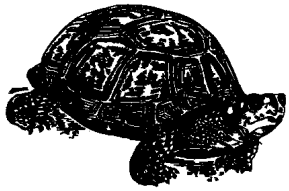
They include the spotted turtle, wood turtle, Blanding's turtle, and the eastern box turtle. The wood turtle prefers sandy-bottomed rivers and streams in the Upper Peninsula and northern Lower Peninsula. The eastern box turtle likes open woodlands near water in the western and southern Lower Peninsula. Both the spotted and Blanding's turtle seek clean, shallow water with a vegetated mud bottom. Slow-moving rivers, marshes, and mud-bottomed lakes provide habitat for painted, snapping, and spiny softshell turtles. The musk turtle prefers shallow lakes with marl, sand, or gravel bottoms. The map turtle inhabits larger lakes, river, and the oxbow sloughs of rivers.

All Michigan female turtles dig a nest hole in the ground with their hind legs to bury their eggs. The nest site is moist soil or sand in an open, sunny area near the water with little or no obstructing vegetation. Stream bank stabalization, though a good conservation tool, can eliminate nesting sites for wood turtles. When nesting habitat is not available, turtles may travel a considerable distance to find it, thus increasing their vulnerability.

Most females lay their eggs in June, and the young are hatched in late summer or fall. Because hatchlings may overwinter in the nest, the nest site must remain undisturbed all year. Turtle eggs are a popular food item among nest predators like the raccoon, skunk, and opossum.

Landowners can provide nesting habitat by spreading sand in a slightly elevated, open place near a pond or lakeshore to prevent flooding of the nest. Because aquatic turtles burrow into the bottom mud of lakes and ponds, the sites must not freeze completely in winter. Lakes and ponds with depths of five feet and greater provide over-wintering habitat for aquatic turtles that burrow into the mud. Land-based species dig into the leaf litter and hibernate in the forest, and emerge again in the spring. Note that pet turtles should not be released into the wild due to the spread of disease.

However you decide to manage your property, it is important to realize that education is the most important tool. There are many myths that exist about many of the species within this chapter that frighten people into thinking they should not exist on their land. Amphibians and reptiles play important roles in nature as do songbirds and insects. Inform yourself about the positive and negative effects that may occur due to the changes you implement.



box turtle

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Private Land Partnerships: This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this guide provides you with the knowledge and the motivation to make positive changes for our environment.

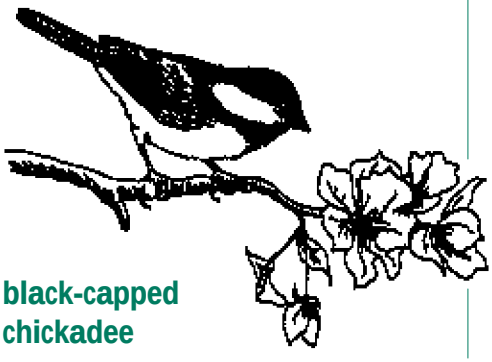
FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

SONGBIRDS

Bird watching is among the most popular of all American recreational pursuits. Songbirds in particular offer much pleasure to landowners who attempt to attract them to habitats as small as backyard feeding stations and as large as sweeping grasslands, large wetlands or dense forests. Of the world's more than 8,000 species of birds, a total of 233 are known to breed in Michigan and more than 360 spend at least some time in the state. The list includes many songbirds ranging from the common American robin to the endangered Kirtland's warbler.

Songbirds use many different types of habitat including forests, grasslands, wetlands, and shrublands. Therefore, birds that visit your property reflect the habitat available in your area. For example, if you attract a bobolink, a grassland bird, to your property, we can assume that there is a grassland nearby. Birds, such as the black-capped chickadee, are widespread and use a variety of habitat types. This is one reason why it is common and does not need special protection. On the other hand, some species are more particular about their habitat needs and tend to be rare. For example, the Kirtland's Warbler, which breeds exclusively in Michigan, nests only where there are large stands of 8 to 20 ft tall jack pines. With proper management, and a clear understanding of what your land and the surrounding landscape can do, you can create important habitat for songbirds.



black-capped chickadee

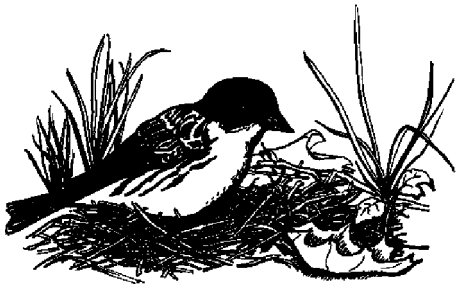
Habitat Components

Even though all species need the basic habitat components of water, food, cover, and space, the amount and kinds of each differs by individual species. Therefore, your landscape determines the opportunities you have for bird conservation. The following describes some of the basic habitat needs of songbirds.

Space

Space and territorial needs vary with each wildlife species. By understanding how much space is necessary for each species, you can learn what wildlife is attracted to your property. Bluebirds, for instance, are territorial and need about five acres per pair. In contrast, purple martins are not territorial, and need only small areas. You can create a larger area for those species that are territorial by working with neighbors.

Michigan's landscape has greatly changed since the early 1800's when the first European settlers arrived. No longer are there vast forests in southern Michigan, and we have lost over 35% of wetlands statewide. New home development continues to fragment the state. Fragmentation occurs when roads, homes, pipeline corridors, and other forms of development break up a landscape.



Kirtland's warbler

Many songbirds are sensitive to size and shape of their habitat. "Area sensitive" species, such as acadian flycatchers, wood thrushes, and ovenbirds have low tolerance to fragmented habitat. For this reason area sensitive species tend to seek out grasslands, forests, or wetlands hundreds of acres in size. Many of these species are declining in number as they no longer have these large areas. However, other species such as cardinals, chipping sparrows, and chickadees can tolerate fragmentation and smaller areas. These species are most often seen in urban areas, and are fairly common.

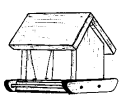
Water

Most songbirds need open water of some kind. Luckily, Michigan is home to wetlands, lakes, rivers, streams, and ponds. However, providing a water source on your property can attract songbirds to your area. A small pool with stones in the shallow edges draws them to bathe, drink and help control their body temperatures. They will use the dry tops of the rocks as preening sites after bathing.

Providing a simple birdbath should meet their needs. You can buy them commercially, or create one by simply flipping over the lid to a garbage can . Remember to keep it shallow--an inch or so of water is plenty. In hot weather, especially, it is important to clean daily. Make sure the water is shaded and cool during the hottest part of the day, and place it near escape cover such as an evergreen shrub.

Birds are attracted to the noise of flowing water. Providing moving water through a fountain may increase songbird usage but is not mandatory. Misters and drippers are other means to move water and draw more birds. Songbirds will use water sources year round. In winter consider providing water in a heated dog bowl or buy a birdbath heater.

Food



Natural foods, such as fruits, nuts and seeds provided by trees, shrubs, grasses, and flowers will attract a variety of songbirds. Planting highbush cranberry, dogwoods, or other fruiting shrubs on your property may draw migrants as well as resident birds. These plants can also provide areas to sing, court, nest, rest and hide, as well as pleasing landscapes.

Providing bird feeders can also attract songbirds. There is no best time to start feeding birds. Once food is established, they will visit year round. When food supplies are scarce, such as in the very early spring or during bouts of severe weather, birds will rely on your feeders the most. However, if you have to stop feeding for a month or so, the birds will find alternate sources, even during the winter.

Locating feeding stations in several places reduces crowding and lessens the chance for avian diseases that can kill certain small songbirds such as house finches. Clean the feeders periodically, cleaning more often during humid summer months. If possible, protect the feeders from the wind and try to locate them in or near winter cover such as evergreen shrubs. For more information, refer to chapter on **Bird and Other Wildlife Feeders** in the Backyard Management section.

Cover

Songbirds use cover for shelter, nesting, and brood rearing. Dependent on the type of species, required cover types could vary from woodlands to grasslands to wetlands. After assessing what cover types are available on your property, you can determine what species you will be able to attract. By planting trees, shrubs, grasses, and flowers, you can enhance the cover and attract more species.

Management Considerations

Landowners interested in attracting songbirds should realize that any habitat manipulation will benefit certain species, while discouraging others. Even making a decision not to change a habitat will positively effect one group, while it negatively impacts another.

After assessing what types of birds might frequent your land, it is then possible to make your land more attractive to these species. The following suggestions will help you to increase songbirds on your property. For more information see the individual chapters on **Woodland Birds, Grassland Birds**, and **Wetland Birds** in this section.

Forests

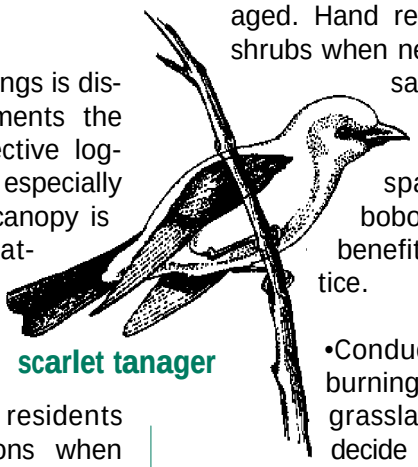
Due to the increase in urbanization and rural estates in southern Lower Michigan, the variety of bird species that live there has drastically changed. This area has become highly fragmented. Thus it houses more edge-dependent species than edge-sensitive species such as the wood thrush, red-eyed vireo, cerulean warbler, American redstart, ovenbird, and scarlet tanager. Nest predators such as crows, bluejays, opossums and skunks, along with the brown-headed cowbird, a major nest parasite, are most active along the forest edge.

Therefore, the following are options to consider when managing forests in southern Michigan (south of Clare, Newaygo, and West Branch):

- Maintain and enhance large blocks of contiguous forests for

those species that are edge-sensitive. Woodlots can be enhanced by planting trees and shrubs along their perimeter to increase their size and reduce the harsh edge.

•Creating forest openings is discouraged as it fragments the forest. However, selective logging can be used, especially where a continuous canopy is maintained, and scattered mature trees of a variety of species are kept.


scarlet tanager

Northern Michigan residents have far fewer limitations when developing management plans. The landscape is less developed, therefore less fragmented, and supports more species of birds than southern Michigan. Therefore, the following are options to consider when managing forests in northern Michigan:

•Small clearings may be developed to benefit certain species. However, be careful to not create fragmented conditions by cutting too much.

•Maintain and enhance evergreens, especially white and black spruce, balsam fir, hemlock, white cedar, and white pine, as they are preferred by many species of birds. Such birds include the brown creeper, black-throated green warbler, blackburnian warbler, and Canada warbler.

•As in southern Michigan, maintain a diversity of tree species and larger tracts of forest.

Grasslands

The following are options to consider when managing grasslands:

•Large patches of grassland are recommended, and often trees within a grassland are discouraged. Hand remove trees and shrubs when necessary. Upland sandpiper, Henslow's sparrows, grasshopper sparrows, and bobolinks, especially benefit from this practice.

•Conduct prescribed burning to maintain the grasslands. If you decide to burn grasslands, do so only after seeking professional advice. Refer to the **Prescribed Burning** chapter in the Grassland Management section for more information.

•Plant areas of both warm season grasses with forbs, and areas of cool season grasses with legumes to provide a diverse habitat.

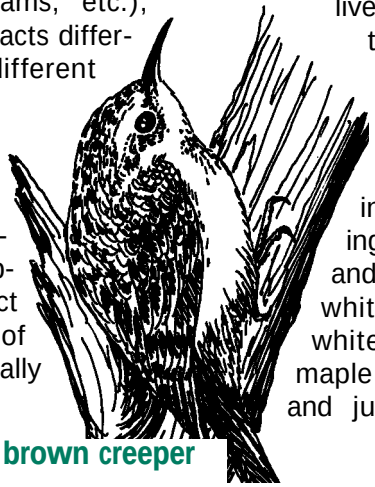
Wetlands

The following are options to consider when managing wetlands:

•If possible, keep a variety of wetlands (marshes, swamps, bogs, fens, streams, etc.), because each attracts different birds at different times of year.

•Avoid building over or draining any wetlands present on your property, as they attract a wide variety of songbirds. Especially avoid constructing roads in wet areas, even those areas that are wet only temporarily.

•If possible, restore degraded or drained wetlands.

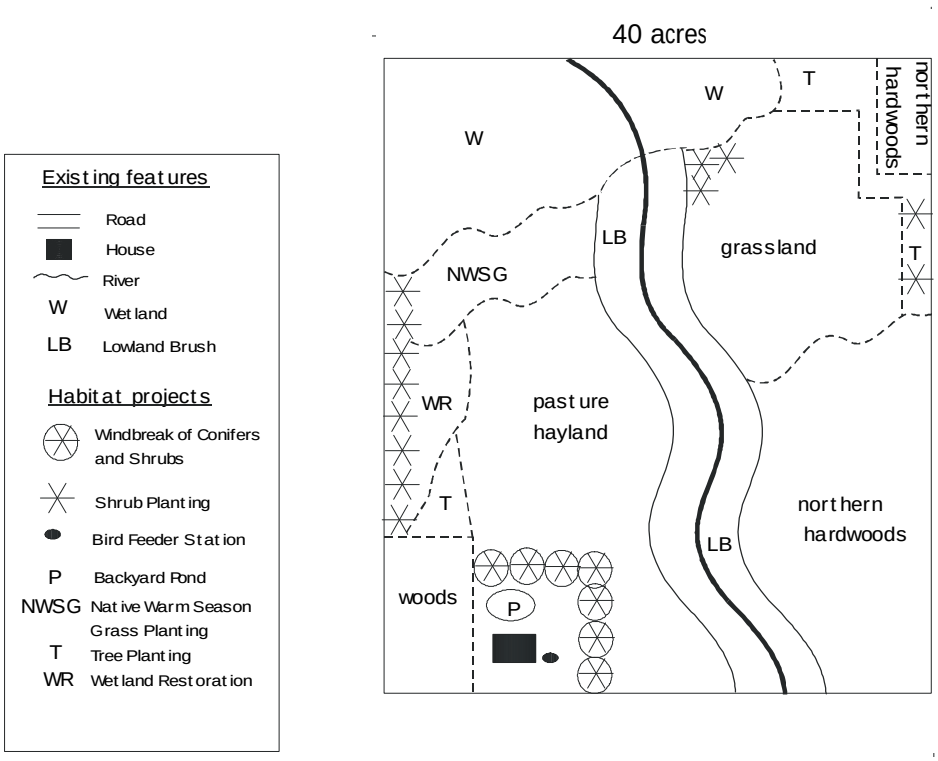

brown creeper

Backyard Areas

Many kinds of songbirds are attracted to balconies, decks, lawns, and ornamental shrubs and trees in both rural and urban settings. You do not even need to own property to enjoy songbirds as they may visit your condominium or apartment complex. For example, robins, house wrens, song sparrows, mourning doves and eastern kingbirds are among at least 14 species that nest in urban habitats. In urban and suburban areas, you may wish to focus on attracting spring and fall migrating birds along with the more familiar birds. However, rural dwellers have more options, especially if the surrounding area is largely grassland, wetland or forest, as there are more breeding species that require this type of landscape to survive.


bobolinks

Regardless of where you live, it is helpful to maintain a diverse yard with an abundance of trees and shrubs, as well as areas with leaf cover for ground-feeding birds. Consider planting a variety of native tree and shrub species such as white spruce, hemlock, white pine, oaks, sugar maple, flowering dogwood, and juneberry. Cardinals will



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nest in dense shrubbery, chipping sparrows in pines and spruces, and house wrens in cavities of trees or nest boxes. Even wood ducks and screech owls will nest in town if tree cavities are present. Rufous-sided towhees and white-throated sparrows will use leaf-covered areas under trees and shrubs (and you won't have to mow these areas either). In winter, you may find pine siskins feeding on cones of your evergreens, especially in northern Michigan.

Other Considerations

•Use native plant species for plantings whenerver possible. Alien species, such as purple loosestrife, garlic mustard, autumn olive, and glossy buckthorn, should be avoided and actively removed as they displace native species used by birds as food sources and sheltered sites.

•House cats can be a major predator of songbirds, especially in southern Michigan. Keeping cats indoors is the best way to stop this problem. If this is not possible, securing bells to their collars when outdoors can help warn birds and small mammals of their presence, thus reducing their impact as a predator.

Feeding songbirds can be educational and fun. To enjoy the full benefit of songbirds, get a good field identification guide that contains color pictures or paintings and buy a quality pair of binoculars. You may even wish to keep a checklist of birds that visit your land in order to determine the variety of birds that you have attracted to your area.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

BLUEBIRDS

Although Eastern bluebirds have never been extinct in Michigan, bird lovers have been concerned about this popular member of the thrush family for more than 100 years. The winter of 1894-95 with its record cold and deep snow caused heavy mortality among certain semi-hardy species including the eastern bluebird and American robin. Although bluebirds were able to bounce back from this major loss, they then had to compete with introduced species from Europe such as the English or house sparrow and the European starling. With these introductions there was increased competition for cavity nesting sites, which further decreased bluebird populations.

By 1950, bluebirds were no longer common around people's homes. In addition to bad winters and foreign bird competition, habitat changes also contributed to their decline. As farming practices changed from small family farms to large operations, many fencerows were removed. Subsequently, this removed nesting cavities found there in trees and wooden posts, reducing bluebird nesting sites. Also, the increase in pesticide use and the gradual shift to more row crops had a negative impact on the bluebird's food availability. However, thanks to public education and a concerted effort by many people to provide nest boxes, bluebirds have made a comeback in recent years.

Bluebirds can be found throughout the state, and are most common in rural areas. They prefer grassland habitat with scattered trees; especially where trees are large enough to provide nesting cavities and provide shelter from early spring storms. Bluebirds are found in old fields, abandoned orchards, open woodlands, oak savannas, oak barrens, jack-pine barrens, and the edges of bogs and sedge meadows. They usually avoid heavily forested areas, even during migration. Common associates of bluebirds include eastern kingbirds, tree swallows, field sparrows and American goldfinches. Most or all of these species will benefit from management for bluebirds.

Although this popular songbird nests in every Michigan county, it is most common in the northern Lower Peninsula. It is seen less frequently in the metropolitan area of southeast Lower Michigan and in the intensively farmed Thumb region. Most Michigan bluebirds migrate south in winter, but a few southern Michigan residents stay here during mild winters.

Life Cycle

From mid-February to mid-March, bluebirds return to Michigan in small flocks from southern wintering grounds. Early nesters, they begin to look for woodpecker holes and cavities, which they will clean out if necessary.

Bluebirds are extremely territorial, and will often fight over nest cavities. Males typically show several potential sites to females, who will make the final decision. Males may mate with more than one female, and females may mate with more than one male.

Once the female selects a cavity, she spends a week or so bringing soft, dry grass with which to form a deep, cup-shaped nest inside the cavity. She will then lay a clutch of three to six eggs, with five eggs being the standard. For the next 12 to 14 days she will incubate the eggs. Once hatched, the nestlings will remain in the box for about two weeks. Therefore, bluebirds need four to five weeks

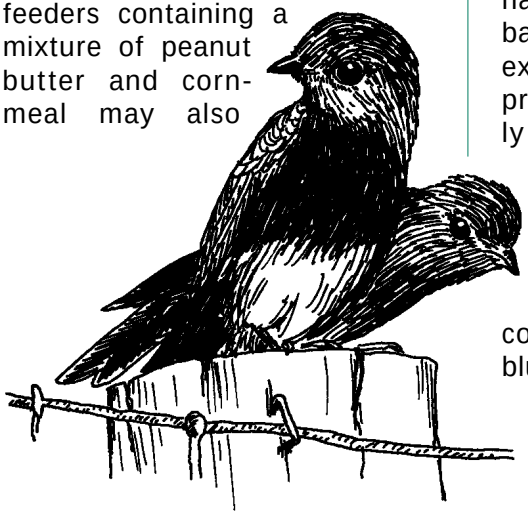
of uninterrupted time to rear their young.

Both sexes aid in feeding the young, and they stay with the juveniles for several days after the fledglings leave the nest. The adults may raise one or two more families during the summer-long nesting season before they head south again for the winter.

Food and Water

Bluebirds like to perch on telephone and electrical wires from which they prey on grasshoppers, crickets, beetle and other insects, which make up about two-thirds of their diet. Bluebirds are also attracted to mowed lawns where they catch ground-hugging insects. During fall migration and on its winter range, fruiting vines, shrubs, and trees are favored.

Although bluebirds do not winter in Michigan in large numbers, they may be found in wetlands where they feed on sumac, wild grapes, pokeweed, honeysuckle, poison ivy, and holly. Bluebirds do not migrate long distances, and when food abounds in mild winters, they go no farther south than is necessary. Bird feeders containing a mixture of peanut butter and cornmeal may also attract them in winter.



Like most birds, bluebirds are attracted to water. Bluebirds like to bathe nearly every day and sometimes several times daily. Therefore, the presence of an abundance of water is important in their survival.

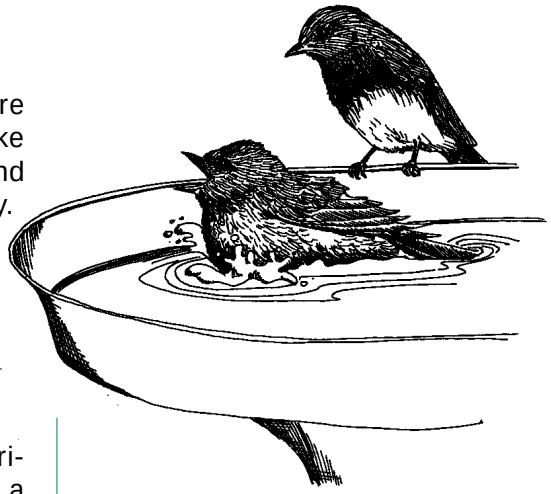
Management Considerations

Since bluebirds are territorial, your land will only support a limited number of bluebird pairs. They will usually not nest within 100 yards of each other. Keep this in mind when measuring the success of your management.

Oak savannas, oak barrens, and jack-pine barrens are good examples of native habitat important to bluebirds. Generally, bluebirds do best where soils are either very dry or very wet. Trees have a difficult time becoming established in these areas, and the scattered trees that result often make good nesting sites for bluebirds.

Habitat manipulation should be minimal in these types of areas, although fire management can be beneficial in oak savannas, oak barrens, and jack-pine barrens where it can be safely executed by fire management professionals (permits are usually required). In other areas, such as abandoned orchards and old fields, more active management may be needed.

The following are options to consider when managing for bluebirds:



•In orchards and old fields encourage scattered clumps of native fruiting vines, shrubs, and trees. Wild grape, dogwoods, serviceberry, and raspberry are all good in these areas.

•Mow your yard early and late in the typical mowing season to help increase insect foraging opportunities.

•Provide perches in and around your property. Dead tree limbs and garden stakes, with and without cross pieces, in your yard will improve foraging opportunities. Other birds that will use the perches include swallows, goldfinches, phoebes, and great-crested flycatchers.

•Set up nest boxes and provide water baths along fencelines in orchards and old fields, or open area with scattered trees and low sparse grassy groundcover. Barrens and savannas are also great places for this since both sites for nests and water may be in short supply.

•Provide fresh water in a bird

bath no more than two inches deep. Add flat rocks to create varying depths and secure footholds. Locate the bath near tree branches as it gives bluebirds a chance to look it over from their perch.

•If you see bluebirds near your feeder, you may be able to keep them coming by providing what is called the Miracle Meal. To 1 cup of melted lard or suet add 4 cups yellow corn meal, 1 cup all-purpose flour, 1 teaspoon corn oil, plus sunflower hearts, peanut hearts and chopped, soaked raisins. Let set, cut into chunks, and feed as suet. If starlings or other birds drive off the bluebirds from their feeder, retro-fit an old bluebird nesting box by adding a feeding platform inside, just under the hole.

Building and Placing a Nest Box

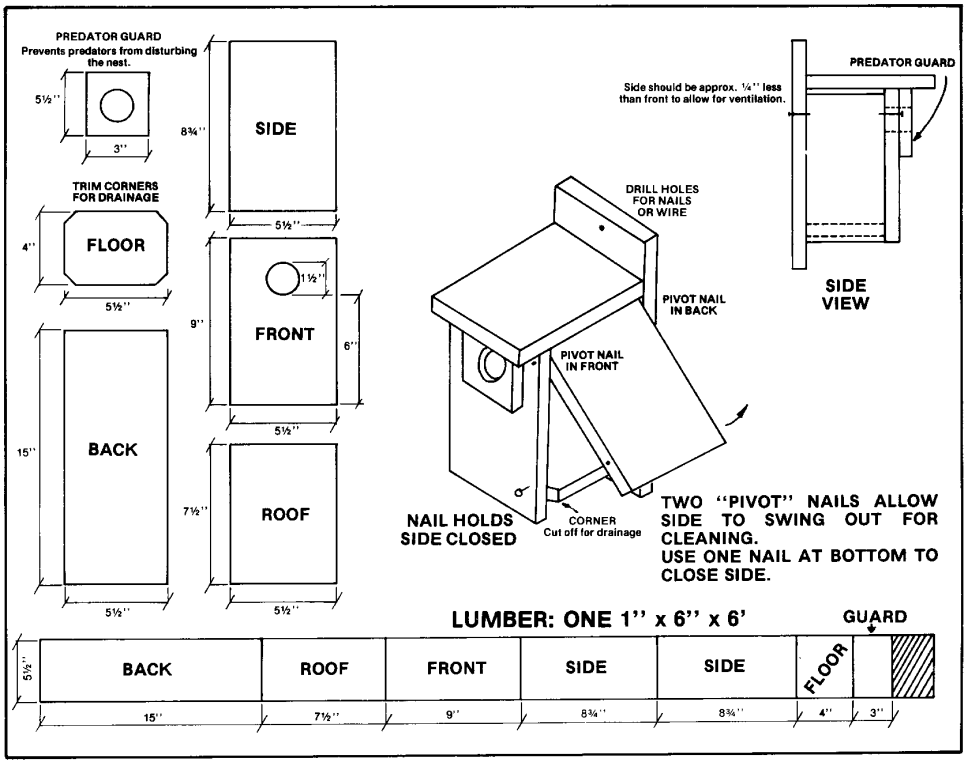
Materials: Use 1/2 inch or 3/4 inch wood such as cedar or exterior-grade plywood. Treat pine or other wood on the outside only to protect it from the weather. If you paint the box, use a drab color such as gray, green or tan, which will help the box to blend into surroundings and help protect it from overheating. Do not use pressure-treated wood, which contains copper arsenate. Use 1-inch coated box nails or wood screws. The box may be nailed, screwed or wired to metal poles, fence posts, private utility poles or tree trunks.

Design: The outside dimensions of the box should be 5-1/2 inches wide and 15 inches tall in back. The body of the box is placed two inches from both the top and the bottom of the backboard. The bottom should be recessed a quarter-inch, and the inside corners cut away to provide drainage. Make the entrance hole 1-1/2 inches in diameter, and do not provide a perch on the box, which will attract sparrows and other undesirable birds. Install a predator guard (as shown below) around the entrance that will prevent predators from disturbing the nest.

Access: You need to be able to get into the box to clean it out after each clutch, or to remove nests of wasps and other birds. The design in our diagram allows for the side to pivot outward. Some box builders prefer access from the front or top of the box.

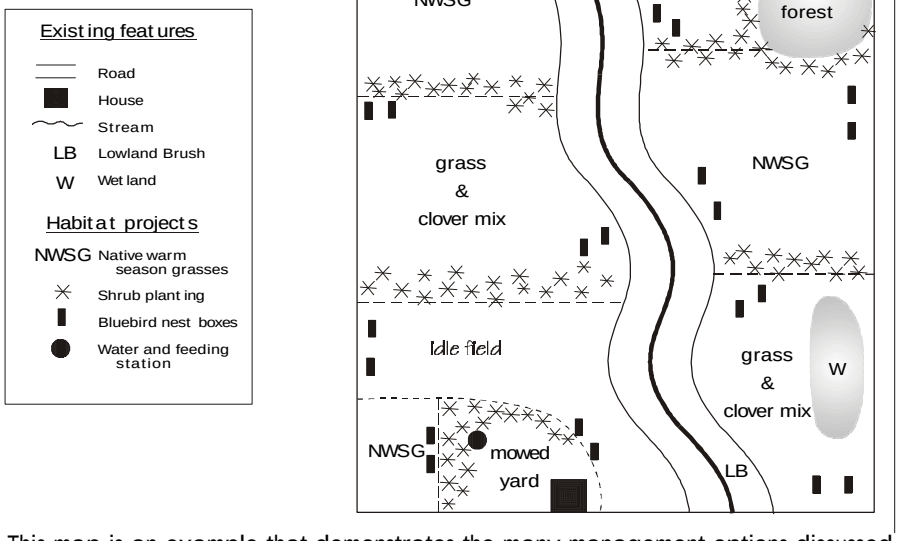
Mounting: Using holes placed in the extensions of the back, secure the box four to six feet above the ground. Metal poles provide better protection against predators, or you can place a collar of sheet metal 18 inches wide just below the box if necessary. If ants invade the box, greasing the mounting pole will prevent them from climbing. You can also place the box on a fence post.

Location: Locate the box in an open field area with plenty of insects but in an area where pesticides are not being used. The boxes should be placed away from buildings and near perches. If possible, mount it along a field edge near wires or other perches. If you place the box too close to trees and shrubs, though, house wrens will



Bluebird nest box diagram

40 acres



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

likely invade. Boxes placed near gardens may result in bluebirds helping to control garden insects.

Place two boxes 15 to 25 feet apart and at least 100 yards from the next pair of boxes. Pairing boxes allow tree swallows (or other territorial birds) to use one box and leave the empty one for bluebirds. Artificial nest boxes should be erected and ready by mid-February. Expect chickadees, titmice, sparrows, woodpeckers, wrens, and flying squirrels to also use the boxes.

Concerns

Wrens and sparrows are a special problem because they will evict bluebirds and destroy their nests. If the box is filled with unorganized twigs, a wren has likely moved in. Assuming the wren is not nesting, remove the twigs and plug the hole until the wren relocates. Then, consider mounting a wren box with 1-inch diameter hole near shrubbery, or move the bluebird box farther from shrubbery.

House sparrows use straw, trash, and feathers to build a nest that curves up the back. Look for other clues such as missing or pierced eggs, and pecked or dead nestlings lying under the box. An option is to move bluebird boxes away from buildings and bird feeders. Because sparrows are not protected by law, they can be destroyed.

Crows, jays, and grackles are other birds that prey on bluebird eggs and young. Solutions are to increase the roof overhang or deepen the box. To control wasps and bees, first remove their nests, then rub bar or liquid soap on the box ceiling. A predator guard will discourage raccoons, squirrels, and house cats.

Providing nesting, foraging, and watering sites is essential to attracting bluebirds to your property. Bluebird trails and cooperative projects with neighbors are an excellent way to build a population of bluebirds and associated species in your area.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

Private Land Partnerships: This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this guide provides you with the knowledge and the motivation to make positive changes for our environment.

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

GRASSLAND BIRDS

Grassland habitats support a large variety of birds. Before European settlement, southern Michigan grasslands were largely dry prairies, oak savannahs, and wet meadows. During the settlement of Michigan, expansive, open prairies disappeared quickly as they were converted to farmland due to their rich soils. Wet meadows were drained and also made into productive agriculture lands. Michigan once had 70,000 acres of upland prairies and 350,000 acres of wet prairies. Today, they have been reduced to fewer than 2,000 acres.

Over the past 25 years, grassland bird populations have declined in North America more than any other group of birds. This decline is due to fragementation and loss of habitat. Habitat fragmentation occurs when large blocks of habitat are broken up by human development such as roads, trails, powerlines, homes, farms, and other disturbances. In Michigan, two species that have been extirpated due to these impacts are the greater prairie chicken and lark sparrow.

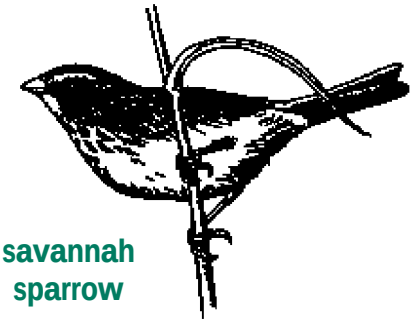
eastern meadowlark

Succession

Large grasslands support more bird species than small grasslands. Because of the massive decline of native grasslands in Michigan, it is critical to grassland bird survival that large blocks of this habitat be maintained and managed. Before management begins, it is necessary to understand the natural progressions that occur on the landscape over time.

"Succession" is the word used to describe these natural progressions. Over time, an area changes from annual plants to perennial plants to shrubs to forests. Succession can be set back or moved forward naturally (wildfire, windthrow, flooding, disease) or through human disturbance (prescibed burning, mechanical and chemical treatments).

As habitats change, different types of wildlife are attracted to them. For example, a large meadow will provide nesting cover for bobolinks, but when woody plants begin to emerge the bobolinks will no longer use it. However, now American goldfinches will appear. Therefore, to manage for grassland birds you will need to prevent succession from proceeding too far into the shrub stage by maintaining a mix of annual and/or perennial grasses and forbs. Annual plants include weeds such as lamb's quarters, ragweed, mare's tail, and foxtail, and grasses such as quack grass and witchgrass. Perennial plants include goldenrod, asters, daisy fleabane, brome, timothy, switchgrass, Indiangrass, and big bluestem.



savannah sparrow

Warm season grasses are the most productive of cover types for grassland birds. Big and little bluestem, Indiangrass, and switchgrass are examples of warm season prairie grasses, which grow most rapidly during summer's peak when warm nights follow hot days. Because these prairie grasses stand up well to snow, they provide thermal cover for roosting birds and other wildlife. Consider mixing the grasses with forbs (native, flowering herbaceous plants such as wildflowers) to provide wildlife food and perches for songbirds. Black-eyed Susan, blazing star, coreoposis, wild bergamot, and coneflower are some examples of these forbs. Big bluestem, Indiangrass, and switchgrass are examples of tall prairie grasses. Short prairie grasses include little bluestem and prairie dropseed.

Cool season grasses, such as timothy grass, orchardgrass, and Canada wild-rye, and legumes such as medium-red clover and alfalfa grow most rapidly during spring and early summer and again at the end of summer when cool nights follow warm days. These grasses provide a variety of cover and food for grassland birds, and are considered short to intermediate grasses. Cool season grasses are best planted in conjunction with adjacent warm season prairie grasses.

switchgrass

Species Preferences

Depending on the grassland bird, each species may prefer a certain type of grass or grass/forb mix. Many species prefer around 75% grasses and 25% forbs, such as the dickcissel, song sparrow, horned lark, and upland sandpiper. Northern bobwhite quail prefer half and half. Whereas the Henslow's sparrow, and common yellowthroat prefer a minimum amount of forbs.

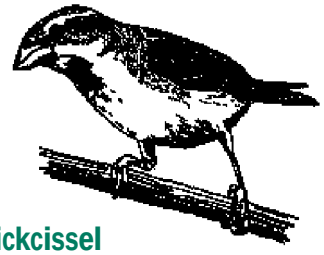
In addition, certain grassland birds are attracted to specific grass heights. This refers not only to the natural height of the grasses themselves, but also the height of the grasses due to human or natural disturbance. For instance, killdeer prefer very short grasses and sparse open areas. These usually include plowed agricultural and early stage old fields. The upland sandpiper, and horned lark are found in short grasses such as newly planted row crops and grasses, recently mowed hayfields, and old fields. Grasses intermediate to tall in height such as late stage old fields, uncut hayfields, and established prairies attract the eastern meadowlark, dickcissel, bobolink, and field and savannah sparrows.

bobwhite quail

This chapter characterizes grassland birds as species that utilize grasses at some point throughout the year. These species can also be distinguished into two groups: grassland dependent and independent. Dependent species use grasslands for all of their habitat needs. Independent species use grasses for one or two habitat components while also utilizing other areas, such as forests or wetlands, for their habitat needs. For example, the American goldfinch prefers shrubs and small trees along with intermediate grasses to fulfill its habitat needs. The grasses are used for food and nesting materials. An example of a grassland dependent species is the eastern meadowlark. It only utilizes grasslands for all of its habitat needs.

Edge-sensitivity

Grassland birds also have a preference for the amount of unfragmented habitat available. Edge-sensitivite grassland birds are those with the lowest tolerance for fragmented habitat. These are also usually the species that prefer only grasslands (grassland dependent species). Conversely, species that live in more than one habitat usually have low sensitivity to edge.



dickcissel

Increasing edge for a certain wildlife species will also detrimentally impact other wildlife species. When grasslands are fragmented, many grassland birds are subjected to nest predation from crows, jays, skunks, raccoons, opposums, foxes, and cats. This problem reiterates the importance of expansive grasslands for the survival of declining grassland bird species.

Grassland birds that are edge-sensitive include the upland sandpiper, bobolink, and savannah and Henslow's sparrows. The eastern meadowlark and grasshopper sparrow are moderately sensitive to habitat fragmentation. Due to their sensitity and the increase in fragmentation, many of these species are declining or no longer exist in southern Michigan.

Grassland birds that are tolerant to an abundance of edge include the northern bobwhite quail, red-winged

big bluestem

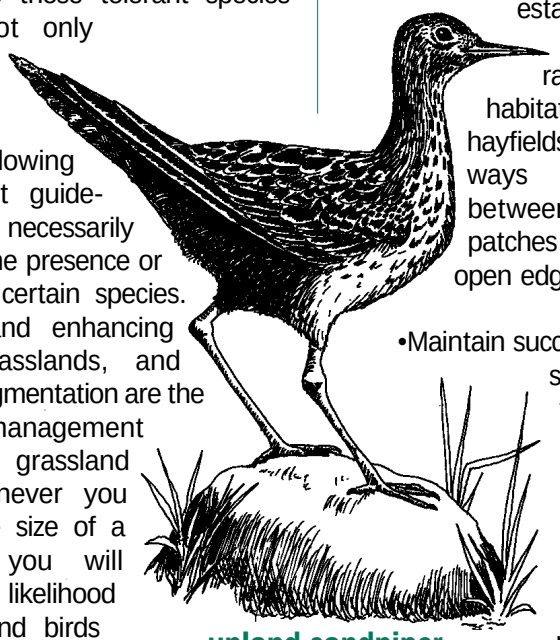
blackbird, American goldfinch, vesper, field, and song sparrows, dickcissel, and common yellowthroat.

Management Considerations

It is important to take a community or landscape approach to your management. If you own only a small grassland, it may help to determine what the surrounding landscape looks like. If other grasslands or agricultural lands are present, then it may be feasible for you to manage for grassland birds. However, if your grassland is surrounded by forest, you may want to consider other goals.

Although most of Michigan's original grasslands no longer exist, there are opportunities available to help grassland birds. Federal and State conservation programs are helping to increase grasslands by setting aside land that had been actively farmed. Some good ways to maintain grasslands in agricultural landscapes is through pastures, old fields left idle, and protecting vast, open meadows. Also, for those within smaller, parcels, prairie plantings in your yard may be beneficial to those tolerant species that do not only need grasslands.

The following management guidelines will not necessarily guarantee the presence or absence of certain species. Restoring and enhancing existing grasslands, and reducing fragmentation are the best management options for grassland birds. Whenever you increase the size of a grassland, you will increase the likelihood that grassland birds will benefit. Therefore, the larger the grassland, the more species it will support.



upland sandpiper

The following are options to consider when managing for grassland birds:

•To manage for edge-sensitive species, you will need a minimum of 20 acres. Moderately sensitive species need between 10 and 20 acres, and tolerant species need less than 10 acres. These estimates are the minimum amounts these species need to survive. Again, the larger the grassland, the better.

•Avoid fragmenting existing grassland areas. If hiking trails are to be developed, restrict activities to the edges of the area. Avoid maintaining hedgerows that may serve as predator perches.

•Minimize the amount of linear edge by avoiding irregular borders. Circular tracts are ideal.

•If large tracts of grassland restorations are not possible, establish several patches. Try to incorporate adjacent grassy habitats such as pastures, hayfields, and grassy waterways as connections between the grassland patches or as non-wooded, open edges.

•Maintain succession in its earliest stages by managing for grasses and sparse shrubs. Manipulations such as burning and mowing are required to maintain grass productivity typically within three to five year intervals.

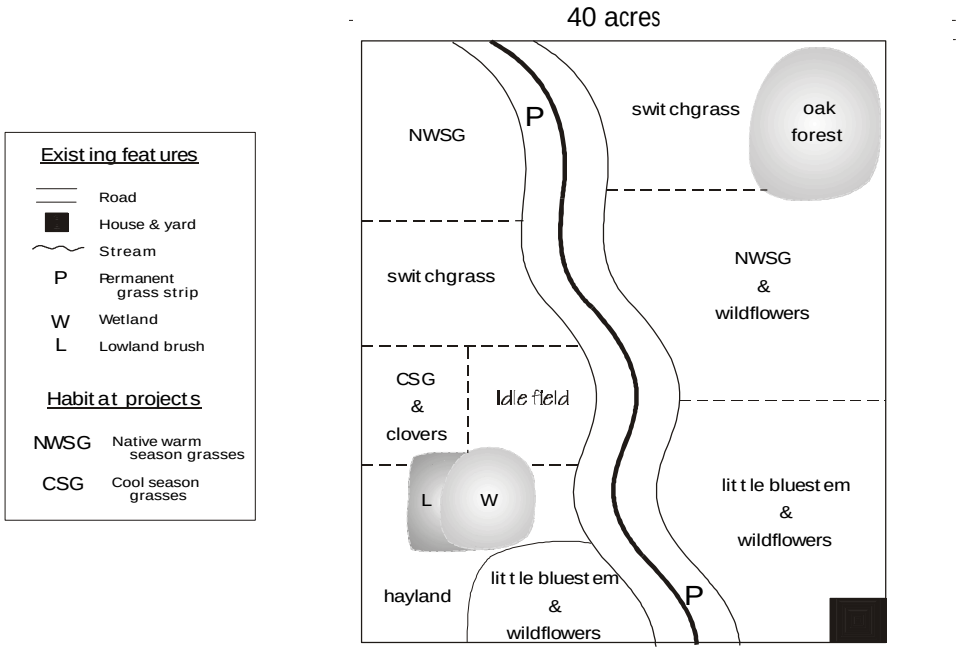
bobolink

•Manipulate your grasslands in 1/3 to 1/4 annual rotations. If several fields are maintained, it is better to manipulate one entire field, rather than a portion of each field per rotation. This will reduce fragmentation of your grasslands. However, if you have only one field, do not manipulate the entire field at once as it will displace the grassland birds. If possible, allow some subunits to lie idle each year.

•Use prescribed burns to increase the productivity of warm season grasses in particular. Conduct burns in early spring (March or April) or late fall (October or November). Refer to the **Prescribed Burning** chapter for more information.

•Mow grasslands, including cool season grasses and hayfields, between July 15 and August 31. This will reduce the chance of destroying bird nests, and discourages the invasion of problem grass species that move in after late season mowing. Cutting height should be about 6 inches.

GRASSLAND BIRDS



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

•If you use the grassland for grazing, permit only light activity by livestock, and leave some areas ungrazed each year by rotating. Do not graze below 6 inches. Moderate grazing may actually benefit some wildlife species.

•Plant or maintain several types of grasslands in your area. A mosaic of tall and short grass fields will provide habitat diversity. If you can plant only one area to grass, a mixture of warm season grasses with forbs is best. Cool season grasses mixed with legumes is a second choice.

•Create 100 ft shrub buffers next to forest edges and human habitations to reduce the harsh edge. An alternative to planting shrubs along the edge of a forest is to allow the fire to burn slowly into the woods so as to create a "feathered" edge. Local fire authorities should always be contacted prior to the burn to discuss permits and/or restrictions.

•Chemical treatments of grasslands can also be used to control woody plants. Herbicides can be used to control any type of undesirable plants in your grassland, from wood plants to grasses and weeds. Correct application is most important. Damage of non-target vegetation or to wildlife is possible if you do not follow the herbicides label instructions. Michigan State University Extension Office can provide more information of the types, use, and applications of herbicides.

•Reducing or eliminating the use of insecticides will provide more valuable insect food for birds.

In summary, to attract grassland birds you need to provide the most grassland possible in your area. Reducing fragmentation, and restoring and enhancing existing grasslands will greatly benefit grassland birds. Working with your neighbors to maintain larger tracts of grasslands in your area will likely increase your success.

FOR ADDITIONAL CHAPTERS CONTACT:
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FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
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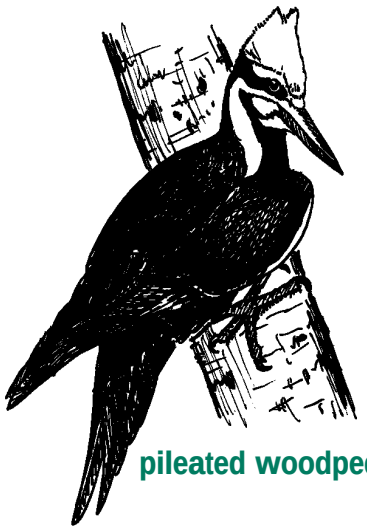
WOODLAND BIRDS

When much of Michigan's vast forests fell to the ax and saw in the late 1800s, many woodland bird species declined. These included the common raven, wood thrush, ovenbird, American redstart, whip-poor-will, scarlet tanager, and cerulean and hooded warblers. Wild turkeys were extirpated and passenger pigeons became extinct in Michigan, although this was also due to commercial overhunting. Hairy and pileated woodpeckers were also impacted along with great-horned, northern saw-wet, and barred owls. Today, wild turkeys have been reestablished and many species of songbirds are doing well in Michigan's forests. However, migratory species are declining at an alarming rate.

From an overall landscape perspective, many woodland birds survive best in large tracts of forests connected to each other by forested corridors. Therefore, there are many management opportunities for woodland birds in northern Michigan, which is currently more than 70 percent forested. Options within southern Michigan exist in forest areas, and riparian zones. Neighbors who cooperatively manage their woodlands also increase opportunities for woodland bird management.

Small forested tracts are also very important for some species like the northern cardinal and the great-crested flycatcher. Migrating birds may also use these small forests as stop over sites.



pileated woodpecker

Forest Types

Michigan is home to many types of woodlands, each of which attracts certain kinds of birds. Therefore, the first step to managing for woodland birds is to determine what type of forest system is dominant on your property and surrounding lands.

Certain woodland birds are found in only one forest type. Requiring a certain element within the forest, these birds are considered habitat specialists. For example, red-winged crossbills almost exclusively feed on seeds from conifer cones within dry mesic conifer forests. Another example of a specialist species is the Kirtland's warbler. Their survival depends on jack pine stands that are eight to 20 years old.

On the other hand, some species require a mix of forest types and different ages. For example, the indigo bunting does not require one specific forest type, but rather a mix of forest types to survive. They are located in brushy and weedy habitat along the edges of non-specific decidious forests, swamps, abandoned farm land, roads, and railways. They prefer the fruits of shrubs, small trees, and vines.

Edge-sensitivity

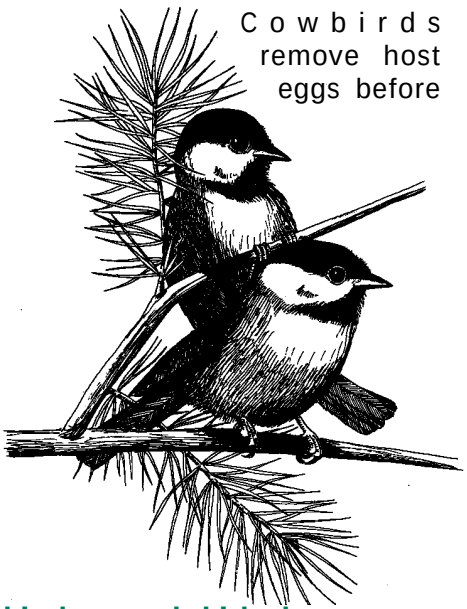
Fragmentation occurs when roads, homes, trails, power lines, and other forms of development break up the natural wooded habitat. Some birds are greatly affected by human disturbance to their habitat, while others are less bothered or not impacted at all.

Edge-sensitive species are those birds with the lowest tolerance for fragmented habitat. Many of these birds seek forest interiors and shun forest edges. Species with moderate to high sensitivity to fragmentation do best at least 100 yards from the edge. Many habitat types create an edge next to woodlands such as grasslands, brushlands, wet-

brown creeper

lands, and river corridors. Edge-sensitive species prefer forest areas hundreds to thousands of acres in size. These large tracts of forest lessen problems such as nest predation and brood parasitism which is quickly increasing due to the rise in habitat fragmentation.

One of the most common brood parasites is the brown headed cowbird, which is attracted to the forest edge. Cowbirds do not make their own nests, instead they invade the nests of others. Cowbirds remove host eggs before laying one of their own in the host's nest. Their eggs tend to hatch one to three days earlier than the host's. Because cowbird nestlings are larger and grow faster than the young of their host, the young cowbird receives more food and parental care than the host's young. As a result, most of the host's young do not survive. A female cowbird can lay up to 77 eggs each season if she can find enough host nests in which to deposit them.



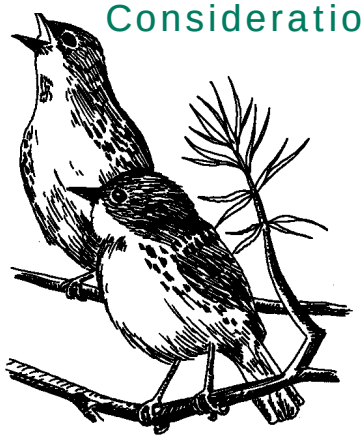
black-capped chickadees

Woodland birds that are edge-sensitive include the broad-winged hawk, pileated woodpecker, wood thrush, yellow-throated vireo, ovenbird, American redstart, veery, and black-and-white, cerulean, and hooded warblers. Many edge-sensitive species are declining in populations as their habitat becomes more fragmented.

Woodland birds with a moderate sensitivity to habitat fragmentation, which can tolerate stands between 40 and 100 acres in size, include the yellow-billed and black-billed cuckoo, hairy woodpecker, acadian flycatcher, scarlet tanager, red-eyed vireo, northern parula, white-breasted nuthatch, tufted titmouse, and blue-gray gnatcatcher.

Woodland birds that are the most tolerant to an abundance of edge include the indigo bunting, gray catbird, Carolina and house wren, American robin, black-capped chickadee, northern cardinal, rose-breasted grosbeak, rufous-sided towhee, common grackle, northern oriole, brown-headed cowbird (a nest parasite), eastern wood-pewee, great-crested flycatcher, and downy, red-headed, and red-bellied woodpeckers. It is not surprising that many of these species are found in urban areas.

Management Considerations



cerulean warbler

The following are options to consider when managing for woodland birds.

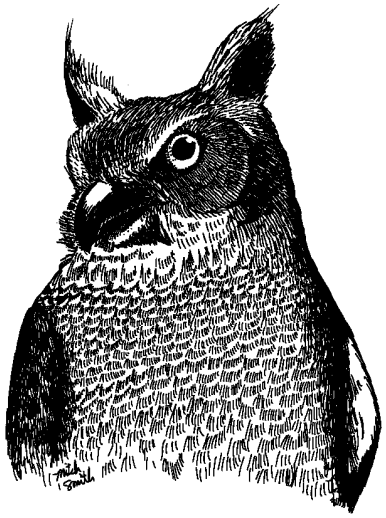
Edge-sensitive considerations:

- Maintain sites larger than 40 acres, and leave woodlands as undisturbed as possible.

- Manage your woodland in a circular shape rather than a rectangular or other long, narrow design. This will reduce the amount of edge.

- Maintain a well-developed understory of woody and herbaceous plants because many species of forest birds need the food, nest sites and cover provided by such low growing plants. Slightly opening the canopy can help maintain the understory. However, be aware that some species require a more sparse understory, such as

great-horned owl



the red-headed woodpecker.

•If you cut, remove only single mature trees. Single-tree selection results in the maintenance of the largest area of contiguous forest without the undesirable fragmentation caused by other types of timber harvest.

•When single-tree selection is not possible, owners of large forested tracts should adopt a uniform plan of rotation cutting to make sure the oldest sections are next to each other. This same plan of rotation cutting can help a manager to design wooded connections between disturbed areas and to keep gaps to a minimum. This practice is better for woodland birds because it causes the least amount of disturbance.

Edge-tolerant considerations:

•Plant shrubs along woodland edges and in grass openings.

•Maintain or create dense thickets or densely growing understories of young trees in mature forests. To provide such habitat, cut groups of mature trees in stands no larger than one acre, or thin the large, mature trees to produce a dense understory. Watch for overbrowsing of new understory growth by white-tailed deer, and take necessary precautions.

General considerations:

•Attempt to protect or restore wooded areas along streams, as these areas are of special value to many bird species, and they provide movement between corridors.

•In areas where mature forests are limited, try to protect one or more mature tracts to serve as repopulation centers. Ideally, the mature tract should be at the center of the area being managed.

•Speed up natural succession by planting trees and shrubs in open areas, thereby reducing fragmentation. To provide a diverse habitat remove aggressive, non-native shrubs, and forbs.

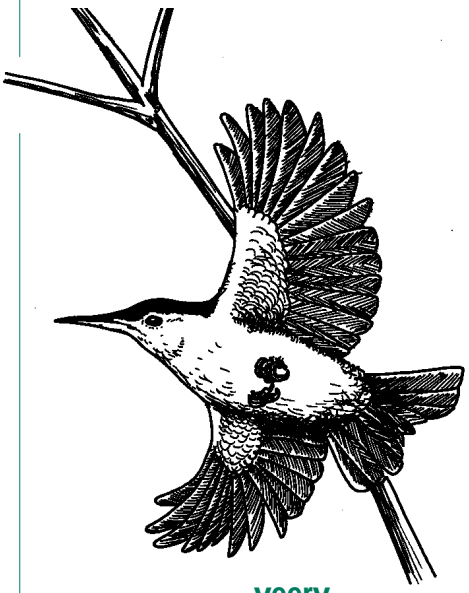
•Allow large trees that are dead or dying to remain standing as they provide food and homes for many species. You can create these snags by girdling healthy trees (removing the bark in a band around the trunk).

•If mature live and dead trees left standing number less than one per acre, erect nest boxes for cavity nest builders such as the wood duck, and members of the woodpecker family. Information is available in the chapter on **Homes for Wildlife** in the Backyard Management Section.

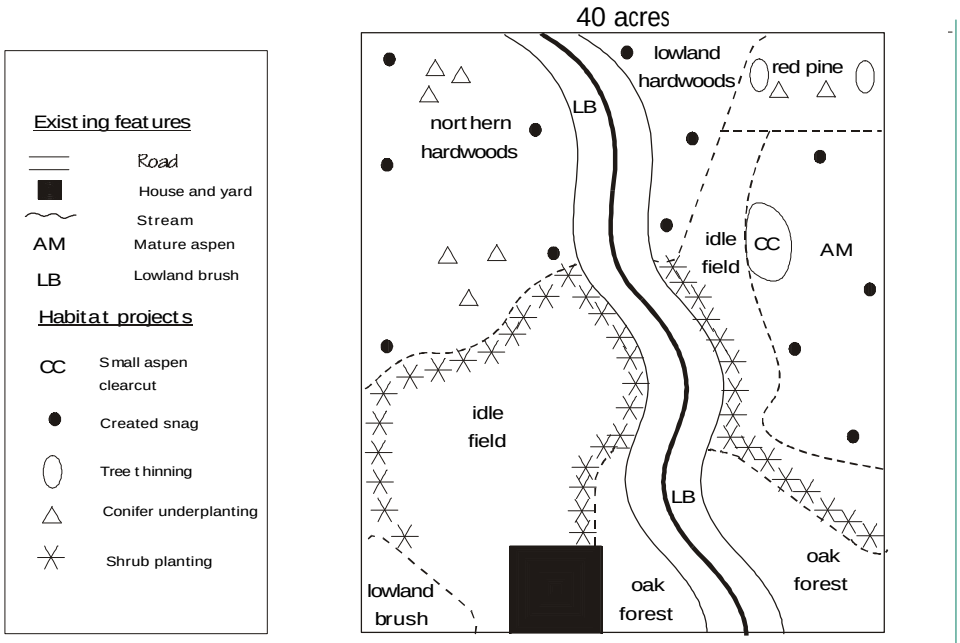
•During the nesting season of late April through early August, keep disturbances such as camping, picnicking, or cutting to a minimum. This "hands-off" practice is especially important in the forest interior. Avoid construction projects such as building roads, trails, ponds, powerlines rights-of-way or other land-clearing practices that fragment forested areas.

•Reduce brown-headed cowbird feeding opportunities near woodlands. You can accomplish this goal by eliminating mowing and grazing on land next to the forest. If you must mow roadside vegetation, cut it no shorter than six to nine inches to discourage cowbirds from feeding there. Plant bare ground to grass and revegetate logging trails and roads.

As you can see, even doing



veery



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

nothing to your wooded property will encourage some kinds of birds and discourage others. Specific management prescriptions will have a similar effect. For these reasons, it is important to classify the type of woodland habitat you own as well as properties adjacent to yours. You can then develop goals for the kinds of birds you want to encourage on your land.

Forming a landowners association with your neighbors is a good way to enhance a larger forested area than your own property. Applying legal restrictions such as a conservation easement to your land is also a good way to eliminate the threat of future development. For information, contact the Michigan United Conservation Clubs.

FOR ADDITIONAL CHAPTERS CONTACT:
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PRIVATE LAND PARTNERSHIPS
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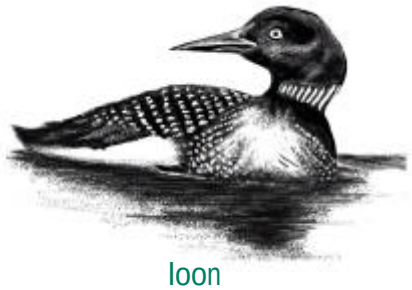
WETLAND BIRDS

Found throughout Michigan, wetlands, such as wet meadows, marshes, swamps, and peatlands, originally covered 11 million acres or about one-third of the state's landmass. During the last 200 years, over 35 percent of these wetlands have been drained or filled for agricultural fields, building projects, or other human purposes. Chemical contamination, isolation, and fragmentation have also contributed to the loss of wetlands. Fragmentation occurs when roads, trails, homes, and other forms of development break up the wetland area.

Since wetland birds rely on moist areas for food and cover, wetland losses have caused the decline of many of these species including least bitterns, yellow rails, black-crowned night herons, Forster's tern, and marsh and sedge wrens. More than half of all remaining Michigan wetlands are less than one acre in size. Bird species that inhabit small swamps and other wetlands include red-winged blackbirds, yellow warblers, green herons, woodcock and tree swallows. Therefore, protecting or restoring wetlands on your property may help increase wetland bird populations. The wetlands and associated uplands that are present on your property will determine what species of wetland birds will be attracted.

It is important to remember that some wetlands are not always wet. Seasonal wetlands, for example, may contain water only during wet periods in the spring and fall. All wetlands, however, are important to wildlife.



loon

Waterfowl, shorebirds, wading birds, raptors, loons, grebes, cranes, woodcock, kingfishers, and many songbirds depend on wetlands during all or part of their life cycles. Wetlands associated with springs and seeps may be as small as a few square feet while some Great Lakes marshes or peatlands cover thousands of acres. The identification and management of this habitat is explained in the **Wetland Management** Section.

Many different wetland birds are attracted to a variety of wetlands based on the type of food and cover provided. For example, plovers and sandpipers are attracted to shorelines with little vegetation where they nest, and find insects and other food. Bitterns, yellow rails, and herons are wading species that depend upon shallow water with cattails, bulrush, and smartweed to provide food such as small fish, frogs, and invertebrates such as snails, crayfish, and insects. The type of food and cover present in a wetland is based on water levels and vegetation composition. Throughout the year, different types of wetlands contain varying depths of water, or no water at all, which determines the type of vegetation that will grow there.

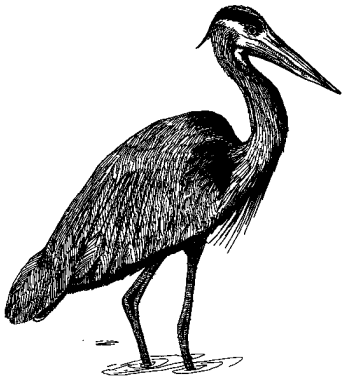
Wetlands with both dense and sparse stands of vegetation provide food and cover for specific types of birds. Some wetland cover types include dense cattail stands, grassy meadows, and wooded swamps. Sedge fields, wet meadows, mud flats, and beaches all provide good food sources, including insects and seeds, for a variety of wetland birds. The food and cover needs of many bird species also varies by seasonal activity. Migration stop-over, pair bonding, nesting, and brood rearing often require different components of a wetland.

In general, if you want to attract and manage for a diversity of wetland birds, restore and protect several wetlands or a diversity of wetland types, which will provide a variety of food and cover.

Cover Types for Wetland Birds

Because each wetland is different from the other, a different manage-

marsh wren



great blue heron

ment prescription may be involved for each. For more information refer to the **Wetland Management** section.

Wet meadows are seasonally wet and often have less than six inches of water depth at any given time. The following are options to consider when managing for wet meadows.

Marshes normally have water depths of at least several inches and typically contain perennial vegetation such as cattails, bulrushes and water plantain. Some species that frequent marshes are marsh wrens, common yellowthroat, American goldfinch, Virginia rails, great blue herons, and sandhill cranes. The common snipe, American and least bittern, and northern harrier are species that require marshes of 10 acres or more.

Shorelines can consist of beaches, mud flats, and rocky areas. At times, shorelines can border ponds, lakes, streams, or marshes. Shorebird species that use mud flats include dowitchers, common snipe, semi-palmated sandpipers and dunlin. Plover, sandpipers, yellowlegs, and gulls can be found on beaches.

Swamps, that are located near rivers, lakes, and streams are usually wet in spring, dry in summer, and sometimes wet again in fall. Lowland hardwoods, or swamps, typically have water less than a foot deep, and they harbor ash, maple, swamp white oak, basswood, cottonwood, and other broadleaf trees. The rose-breasted grosbeak, eastern wood-pewee, red-eyed vireo, white-breasted nuthatch, downy woodpecker, veery, and willow, alder and great-crested flycatchers are forest songbirds that inhabit forested wetlands. Swamps are also important to red-shouldered hawks, and can provide the structures for great blue heron rookeries.

Another type of swamp is the wet conifer forests which contain tamarack, balsam fir, black spruce, and white cedar. These wetlands attract forest-dwelling species such as the yellow-bellied flycatcher, golden-crowned kinglet, white-throated sparrow, red-breasted nuthatch, nashville warbler, black-and-white warbler, American goldfinch and cedar waxwing.

Peatlands are classified into bogs and fens. They contain a wide variety of vegetation from sedges or brush to broadleaf trees or evergreens. Alder flycatchers, swamp sparrows, rufous-sided towhees, palm warblers, hermit thrushes, and sandhill cranes are attracted to peatlands. Open peatlands may also contain shrub wetlands, which are favored by common yellowthroats, chestnut-sided warblers, song sparrows, and red-winged blackbirds.

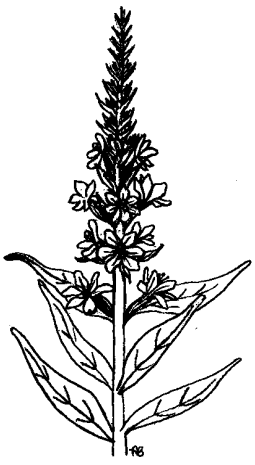
Management Considerations

To meet the diverse needs of wetland birds, landowners should protect existing wetlands and restore former wetlands when feasible. What follows are general management considerations that apply to most wetlands.

•Do not fragment any wetland on your property with roads, trails, or buildings regardless of the wetland size.

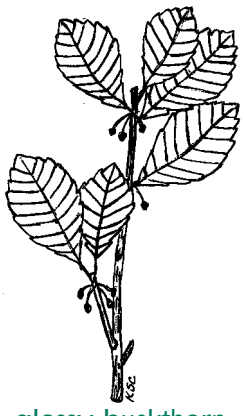
•Provide a buffer of upland vegetation of 100 feet or more around the wetland to protect it from sediment and chemical runoff, and other degradation.

•Plant buffers to dense grass. If necessary shrubs or trees can also be maintained within the grasses. Maintain this buffer along streams and rivers, and on lake front properties as well. In the process you will help maintain a healthy fringe of the wetland vegetation at the

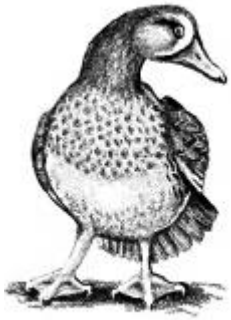


purple loosestrife

garlic mustard



glossy buckthorn



blue-winged teal

edge of lakes and streams.

•Leave naturally dying and decaying trees standing in swamps because they provide insects for woodpeckers and homes for cavity dwellers.

•Use proper timber management techniques if timber harvest is an economic necessity. For more information refer to the **Lowland Hardwoods** or **Lowland Conifers** chapters in the Forest Management section.

•Prevent pesticide, lawn and farm chemicals, including fertilizer, and petroleum products, from reaching the wetland so they do not kill invertebrate food by contaminating the water body.

•Restore or create corridors of grass and/or shrubs that connect two or more wetlands. These areas are important for travel, especially for females with flightless young.

•Expect and allow natural fluctuations in water levels. Do not artificially manipulate water levels without assistance as you may alter the present vegetation composition. Incorrect manipulation of water levels may be harmful to wildlife or result in the invasion of undesirable plants. Landowners should seek professional advice before artificially manipulating water levels.

•Remove invasive plants such as purple loosestrife, phragmites, and glossy buckthorn, through the careful use of prescribed herbicides such as Rodeo. Be sure to follow all label directions. Invasive species tend to eliminate native species reducing plant diversity.

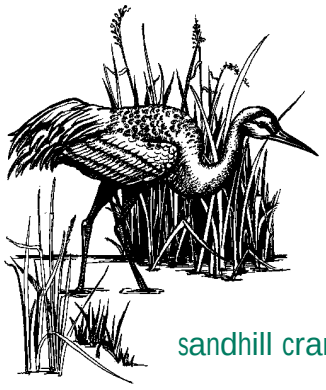
•Allow development of smartweed, wild millet, cattails, bullrush, sedges, reeds, and other valuable plants, which produce food and cover for wetland birds and a variety of other wildlife.

•Minimize disturbance to your wetlands. Enjoy birds and other wildlife from afar. Too many disturbances by people or free-roaming pets may deter breeding, cause nest abandonment, and reduce hatching success and fledgling survival.

•Do not drain or plow meadow as they are important producers of grasses and forbs that provide food and cover for many species of wildlife.

•Restrict forestland and grassland manipulation such as logging, min-

downy woodpecker



sandhill crane

ing, mowing, burning, and grazing until after July 15 and before August 30 to minimize impact to nesting birds and allow sufficient new growth for winter and spring cover.

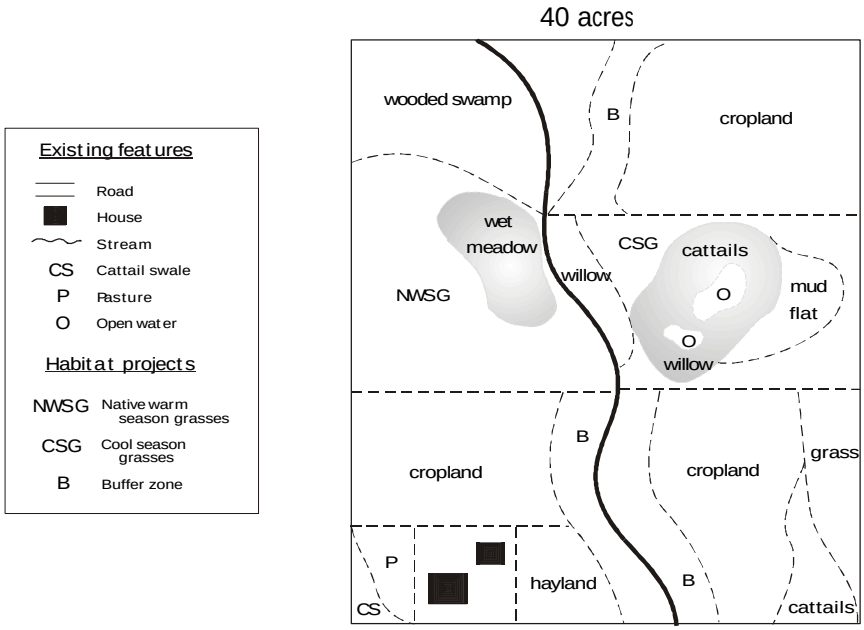
•Mow only one-third of grassy areas each year. The other two-thirds should be left alone to provide wildlife habitat.

•Burn in late winter or early spring (before April 1) to aid in the regeneration of warm season grasses and forbs, cattails, sedges, and other wetland vegetation, and to minimize impacts to frogs and turtles.

•Do not excavate for ponds and do not dam streams to create impoundments because such manipulation will change the wet land integrity by creating unnatural water fluctuations and possibly destroy rare plant species.

•Manage uplands in association with wetlands for nesting cover.

In summary, many bird groups rely on wetlands for food, shelter, water and living space. The more diverse a wetland is, the greater variety of birds it will attract. Multiple wetlands in close proximity, connected by grass/woody corridors, result in greatest wetland bird abundance and diversity. Healthy wetlands are dynamic and diverse, and when coupled with abundant upland



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

cover, provide habitat to a greater variety of birds for nesting, brood rearing, and migrational stages. Protect all wetlands on your property and restore former wetlands when feasible.

FOR ADDITIONAL CHAPTERS CONTACT:
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Lansing, MI

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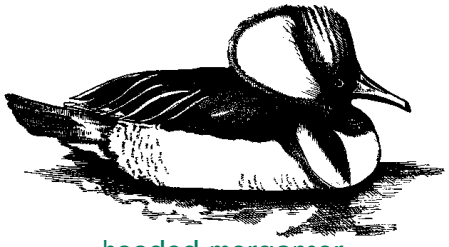
WATERFOWL

With its vast water resources, Michigan is a key state for protecting and managing North American waterfowl populations. Many species of ducks, geese, and swans pause to rest and feed here as they migrate further north in spring and south in fall. Mallards, wood ducks, blue-winged teal, and Canada geese are the most common summer residents and nest in all 83 counties. Hooded mergansers and black ducks are also widespread but less common. Ring-necked ducks, common goldeneye, and common and red-breasted mergansers generally nest only in the northern two-thirds of the state. Michigan nesting waterfowl that are the least common include green-winged teal, northern pintails, northern shovelers, gadwalls, American wigeon, canvasbacks, redheads, and ruddy ducks. Through reintroduction efforts, the native trumpeter swan, our largest waterfowl, is once again nesting in Michigan.

The long-term loss and degradation of wetlands and associated uplands has resulted in a national decline in several duck species, and other wildlife also dependent on these habitats. In Michigan an estimated 35 percent of the original 11 million acres of wetlands have been drained or filled, mostly for farming or building purposes. Wetland losses continue with an ever-spreading urban population. With much of the state's land base in private ownership, especially in southern Michigan, opportunities to protect and restore waterfowl habitat rest with private landowners. Landowners who protect or restore both wetlands and associated upland cover are likely to attract waterfowl, as well as small mammals, songbirds, reptiles, and amphibians.



hooded merganser

Wetlands and associated uplands that are present on your property will determine what species of waterfowl will be attracted. Each species has certain needs that are linked to different kinds of wetlands and uplands. For example, mallards and blue-winged teals, nest in upland, grass-dominated habitats surrounding wetlands. They prefer uplands consisting of a diverse mixture of grasses and wetlands that have a variety of water depths at all times of the year. On the other hand, wood ducks, black ducks, and hooded mergansers select wetlands associated with wooded uplands.

Annual Cycles and Seasonal Needs

Waterfowl experience an annual cycle that includes several stages, generally dependent on the season. In the winter they bond with a mate, and in the spring they migrate, breed, nest, and rear their brood. In the summer molting occurs, and in the fall they migrate again.

black duck

As a result of this cycle, waterfowl depend on a mix of wetlands and associated uplands throughout the year as their cover and food needs differ. Cover needs vary as waterfowl breed, nest, and rear broods. Food needs also vary with season. At times, waterfowl may feed extensively on aquatic insects, but at other times their diet may shift to seeds and other plant materials. Egg production, molting, and migration all require high-energy foods, while brood rearing requires an area with an abundance of insects. Because waterfowl have such varying needs, a diversity of wetlands with a mix of adjacent upland nesting cover is most beneficial.

Available food attracts migrating waterfowl to stop and feed in Michigan each spring. Marshes, shallow lakes, ponds, river bays, beaver floodings, and seasonal wetlands such as flooded pastures and seasonal pools are all important because they usually contain food. The seeds of smartweed, wild millet, curly dock, and beggars tick can be found at these locations. These plants and their decaying material from the previous year attract snails, beetles, midges, caddisflies, fairy shrimp, water fleas, and scuds which are high-energy

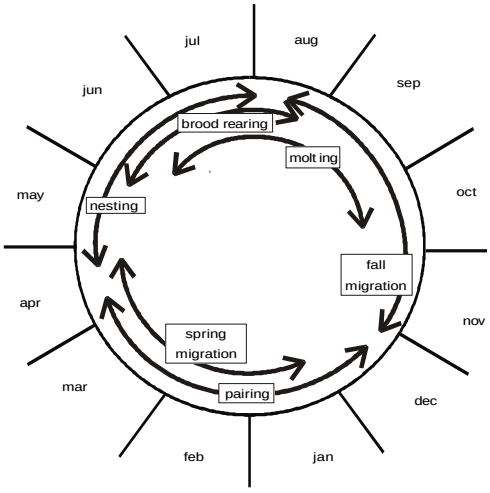
foods for migration.

Spring migrating waterfowl eat these invertebrates in large quantities because they are rich in protein and calcium. Waterfowl need a lot of protein and lipids to replenish fat reserves, especially in spring when they are flying long distances, and to help produce eggs. Seasonally flooded wetlands are important because they warm faster than deeper, permanent wetlands and thus produce preferred food earlier.

After waterfowl feed in the spring, some stay for the summer as residents. These birds use the wetland area to rest, loaf, preen themselves, pair bond, and breed. Pairs that stay in the wetland complex often nest in surrounding uplands, then lead their offspring to water where the young also feed primarily on protein-rich invertebrates.

Throughout the summer and fall waterfowl acquire as much protein as possible. Molting, the three to five week long summer period when the adult birds shed their wing feathers and grow new ones, requires a large amount of protein intake. Likewise, in the fall resident birds put on as much fat as possible to prepare for migration, and those waterfowl that nested farther north also rely once more on local wetlands as a crucial stopover.

Waterfowl foods do not only vary seasonally, but they also vary substantially among species. For example, wood duck females eat mostly acorns and other plant food in fall and winter, then rely more and more on invertebrates during the nesting season, with plant life furnishing about 20% percent of their needs during the egg-laying period. By contrast, gadwalls use half plant food and half animal food in both spring and summer. Canada geese are grazers and will feed mainly on vegetation.



Note: Males tend to be earlier than females in all stages as they do not have to recover from breeding or brood rearing.

annual cycle

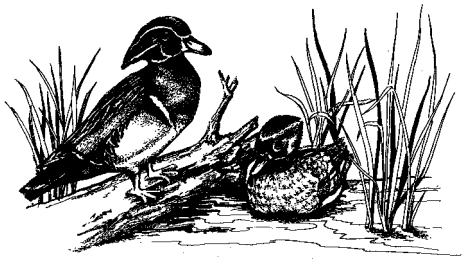
As you can see, a variety of wetlands and uplands are needed to meet the seasonal needs of waterfowl. A wetland complex with different types of habitat is most desirable because it will provide different food and cover at different times of the year. Wetlands that feature secure cover and food production for brood rearing are critical for the welfare of waterfowl. However, each species has different specific needs.

Life Cycles of Three Common Waterfowl

The following brief explanations illustrate the special needs that different species of waterfowl require:

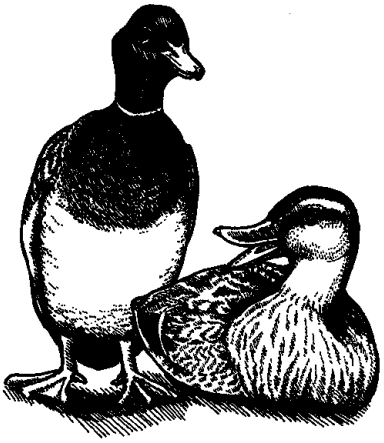
Wood ducks arrive in Michigan from southern wintering areas typically in March. Because females lack the fat and protein reserves needed for egg production, they disperse into forested and stream bottom areas where they feed heavily on acorns and aquatic seeds. Water depths averaging 8 inches are ideal for foraging wood ducks, and loafing and roosting sites can be maintained where water is deeper. During this time, nesting pairs also begin searching for suitable nesting cavities mostly along forested waterways, although they may select trees a mile or more from water. Trees with diameters at least 14 inches at chest height produce most of the suitable nesting cavities. Average clutch size is 12 eggs, and incubation takes about 28 days. Hens and their broods are highly mobile from nesting sites to wetlands, occasionally moving up to 2-1/2 miles. Shallow, flooded habitat with good overstory cover are important brood rearing areas. Button bush, willow, and emergent vegetation such as cattails can provide this cover.

Breeding pairs of **blue-winged teal** prefer seasonally or temporarily flooded, shallow wetlands. They usually feed in those portions with less than 8 inches of water. In dry years, gently sloping basins that provide shallow water all summer are important. The hen typically nests in upland grasses or wet meadow sedges near such water, although nests may be located as far away as one mile. Areas with short grasses have the highest nesting success. Clutch size averages 10 eggs, which the hen incubates for 23 days. Semi-permanent wetlands located near nesting areas are important for brood rearing. Livestock ponds with well-developed emergent vegetation provide locally important brood habitat. Seasonal wetlands also provide excellent brood habitat, but because blue-winged teal are relatively late nesters, seasonal wetlands are often unavailable when ducklings leave nests.



wood duck

The breeding range of **mallards** is the most extensive of any duck species in North America. Like other ducks, female mallards are influenced by their homing instinct when returning to the breeding grounds. Because hens and drakes form bond pairs during fall and on the wintering grounds, the drakes follow their mates back to the hen's breeding site. In the spring, females



mallard

seek midges, crustaceans, mollusks, and other aquatic invertebrates rich in nutrients needed for egg production. Hens normally like grassy areas, including hayfields, in which to lay their eggs. Nest sites may be up to a mile away from wetlands, but are typically within 500 ft. The hen lays one egg each day for 9 or 10 days until the clutch is complete. After the last egg is laid, the hen will incubate her clutch for about 25 days. After hatching, the hen leads her ducklings to water. Mosquitoes, dragonflies and other insect larvae are among the types of protein-rich foods that the ducklings eat. The young are able to fly in 50 to 60 days. Fall and winter foods of mallards consist mostly of high-energy seeds from aquatic or emergent wetland plants and farm crops. Native foods include seeds, leaves and roots from sedges, millet, smartweed, coontail, duck potato, duckweed, and mast from nut-producing trees. Cultivated grains include corn, sorghum, wheat, barley, and oats.

Management Considerations

Landowners can adopt many practices to increase the number and kinds of waterfowl on their lands. Perhaps the most important consideration is to protect all wetlands on the property by maintaining them in their natural state. Temporary shallow pools and seasonally flooded woodlands or fields are just as important as permanent wetlands such as swamps, marshes, ponds, and streams.

The following are options to consider when managing for waterfowl:

•Restore any drained or degraded wetland basins you have identified. Potential sites may be located in former farmland or marginal farmland still in production. See the **Wetland Restoration** chapter for details.

•Protect, maintain, or restore upland habitats around the wetland. If a buffer at least 100 feet wide does not exist, create one by planting grass, which many duck species will use for nesting. A grassland that is three to six times larger than the wetland itself dramatically improves reproduction success by reducing the impact of predators.

•Plant upland nesting areas and buffer zones with a diverse mixture of native warm season grasses and forbs, such as big blue stem, little bluestem, Indiangrass, bush clover, leadplant, and wildflowers. Cool season mixes of orchard grass, timothy, and various clovers (ladino, white, and red), and alfalfa can also be used. Fields of native warm season grasses and forbs next to fields of cool season grasses make a good nesting complex. For more information refer to the **Grassland Management** section.

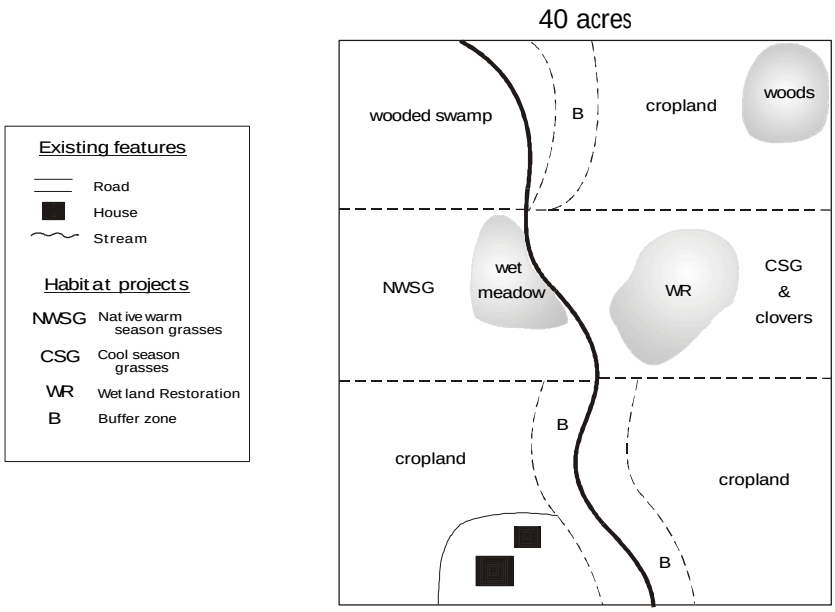
•Mow grasses between July 15 and August 30 to minimize nest disturbance, and to allow time for grasses to grow before the next nesting season.

•Manage for large, overly mature trees along waterways and within one mile of good brood wetlands. Trees such as silver maple, sugar maple, basswood, and aspen as provide potential cavity sites for nesting wood ducks, hooded mergansers, and common goldeneyes. Also, leave mast-producing trees such as oak, maple, and elm to provide food for wood ducks, mallards, and black ducks.

•If you wish to encourage geese, who are grazers, provide mowed grass areas next to wetlands. In a similar manner, to discourage geese, do not mow next to wetlands, and promote tall grasses and possibly shrubs.

•Provide supplemental nesting structures if nesting cover (tree cavities, for example) is limited within one-half mile of brood wetlands. Information on wood duck boxes and mallard nest baskets is provided in the chapter on **Homes for Wildlife** in the Backyard management section.

•If you are managing a marsh, establish a 50:50 mix of open water and wetland vegetation, as this is preferred by many species. If cattails are invading, cut them just above the ice line during the winter. Allow them to lie on the ice until spring thaw as it can help boost the growth of invertebrates, providing more food for waterfowl. Burn a portion of the marsh every three years, or a portion of the marsh



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each year, in late winter/early spring to help native vegetation regenerate. See the chapter on **Prescribed Burning** for details. Remember, that these types of habitat changes can reduce winter escape cover for other wildlife such as pheasants and other grassland birds.

•Monitor your wetlands for invasive, aggressive plants such as purple loosestrife, glossy buckthorn, autumn olive, and phragmites, and try to control these exotics before they become an overwhelming problem. Purple loosestrife can be cut in winter and the resulting new growth sprayed with Rodeo herbicide in June before flowering time. Be sure to follow label directions.

•If your wetland has a water-control device, you can reduce undesirable plants through flooding, or allow development of smartweed and other valuable plants through drawdowns. Each wetland, however, is unique. A wildlife biologist or wetlands specialist can explain the advantages and disadvantages to manipulating water levels as well as certain other practices on your land.

•Because invertebrates are critical food items, avoid using insecticides in and around the wetland, including the upland buffer area. But when necessary, use insecticides that have little or no impact on both aquatic invertebrates and vertebrates. Landowners should also prevent lawn and farm chemicals from reaching the wetland.

•Minimize disturbance to your wetlands. Disturbance by humans, free-roaming pets, and natural predators can cause waterfowl to expend critical energy reserves, prompting them to forego breeding or to abandon nests. In addition to mortality, other impacts may include reduced hatching success or reduced duckling survival. Enjoy waterfowl from a distance by using binoculars or spotting scopes, or build viewing blinds before nesting begins.

In summary, much can be done to manage your wetland for waterfowl. Providing a diversity of wetland types, with adequate adjacent cover is the best way to attract waterfowl. Wetlands differ according to location, topography, water level, water quality ,and the kinds and numbers of plants and animals that use them seasonally. Those wetland complexes that are most diverse, in terms of water levels, cover types, and surrounding uplands, are the most beneficial to waterfowl. They should be protected at all times and restored whenever possible.

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PRIVATE LAND PARTNERSHIPS
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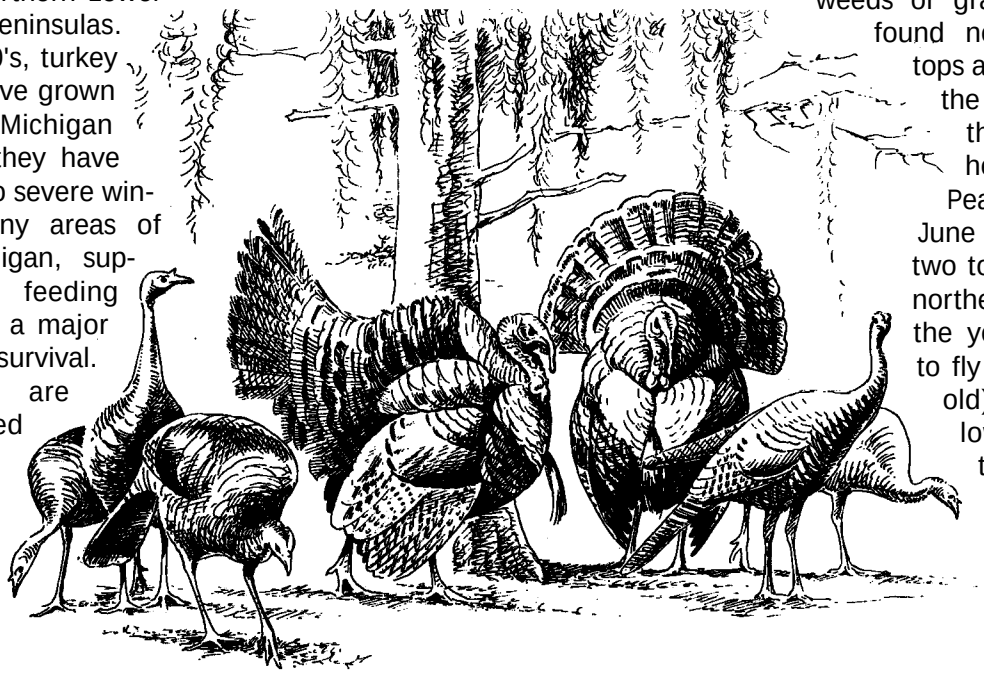
EASTERN WILD TURKEYS

The eastern wild turkey can be found from northern Florida and Mississippi to Maine and northern North Dakota. Before the first settlers arrived in Michigan, wild turkeys were established mainly in the southern part of the state. They were absent in the northern Lower Peninsula and Upper Peninsula due to the colder weather and deep snows.

Turkeys prosper in a mix of forest and agricultural lands. Because of habitat loss and unregulated market hunting, Michigan wild turkey populations plummeted in the late 1800's and by the turn of the 20th century few observations were reported. By the 1950's Michigan's wildlife biologists began a reintroduction program releasing birds in southwestern Michigan and later in the northern Lower and Upper Peninsulas. Since the 1960's, turkey populations have grown in northern Michigan even though they have been subject to severe winters. In many areas of northern Michigan, supplemental feeding seems to play a major role in winter survival. Wild turkeys are also located throughout southern Michigan and flocks are growing and expanding.

The home range of wild turkeys is one to four square miles or about 640 to 2,000 acres. Michigan landowners who are able to provide the necessary habitat components are likely to have turkeys on their property, especially if they live in a region of the state that does not receive more than 60 inches of snow each year.

Turkeys have exceptional hearing and eyesight. The bird's ability to run at 15 to 18 miles per hour and to fly on five-foot-wide wings at speeds approaching 55 miles per hour also make it a challenging quarry for predators. Many landowners simply enjoy seeing turkeys. Because the birds may travel several miles each day, opportunities for seeing them are good if habitat needs are met.

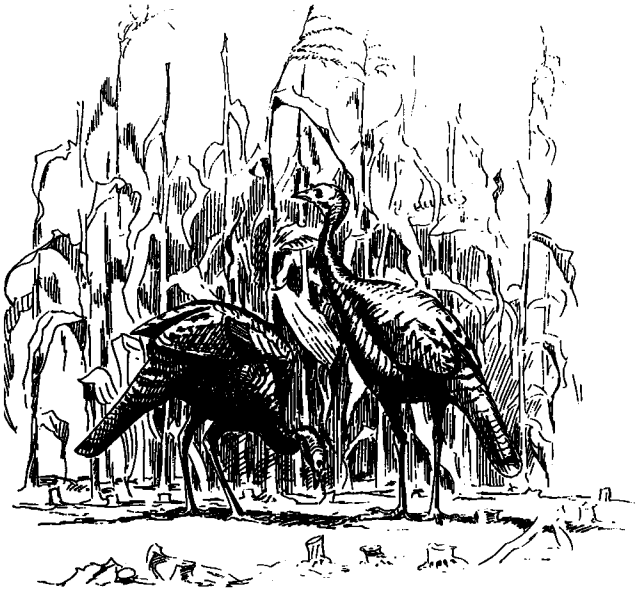


Life Cycle

Turkeys are social birds and in winter often separate into three distinct groups: adult males (toms), young males (jakes), and females (hens) of all ages. These flocks begin to disperse in late winter or early spring when courtship and mating rituals begin. Toms set up territories and begin gobbling, strutting, and displaying in hopes of attracting a harem of hens. Most hens, regardless of age, will breed with a gobbler each spring.

Egg laying begins in April, and each hen will lay a clutch of 11 to 12 eggs over a two-week period. She usually chooses the base of a large, mature tree or stump, such as an oak or beech, in fairly open, isolated woods. However, some hens may nest in idle fields of weeds or grass. Nests are also found next to downed tree tops and brush piles. When the clutch is complete, the hen will incubate her eggs for 28 days. Peak hatching occurs in June in southern Michigan; two to three weeks later in northern Michigan. Until the young poults are able to fly (at about two weeks old) and roost in the lower branches of trees, they are very susceptible to predation.

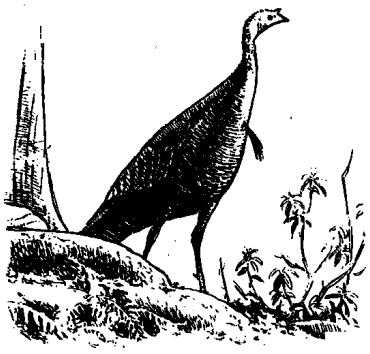
Nest predators such as crows, raccoons, skunks, opossums, domestic pets, and human disturbances are the biggest threat to successful hatching. Adult wild turkeys have few, if any, natural enemies. Although coyotes will sometimes kill an adult bird, turkey densities are seldom significantly affected, even in areas where coyotes are plentiful.



Food and Water

The diet of an adult wild turkey includes about 90 percent plant matter and 10 percent animal matter. Hens consume about 1/3 pound of food daily; adult gobblers may eat 1/2 to 1 pound of food each day. Turkey foods fall into four main categories: mast (nuts and fruits), seeds, greens, and insects. In winter they prefer hard and soft mast including acorns, beechnuts, crabapples, and hawthorns. They will also eat waste grains in harvested fields of corn, buckwheat, soybeans, oats, and grain sorghum.

Turkeys foraging in agricultural areas in the fall and spring eat mostly waste grains, wild plants, insects, and young grasses. Corn, buckwheat, and wheat are outstanding sources of fall, winter, and spring foods. More information on planting these crops are available in the **Cropland Management** section.



As spring changes into summer, hens typically lead their young to open areas with succulent ground vegetation including grasses, sedges, and a variety of forbs and legumes, especially clover. These fields of grass and legumes contain protein-rich insects, which make up 75 percent or more of the poults' diet until four or five months old. Insects include grasshoppers, ground beetles, flies, caterpillars, ants, and crickets. As the poults grow, the seeds of ragweeds, sunflowers, and grasses are favored along with the fruits of dogwood, wild grape, cherry, sumac, and blackberries. Wildlife managers generally agree that artificial feeding of wild turkeys can overly concentrate the birds in a small area, making them more susceptible to poaching and the spread of disease.

Water is another important necessity. Turkeys need water almost daily, and hens rarely nest farther than a quarter-mile from a reliable water source such as a creek, spring, seep, or farm pond.

Cover

Prime cover includes a mixture of open areas within a mature (or nearly mature) forest containing a variety of tree species including white and red oaks, hickories, ash, beech, and white and jack pine. Turkeys use these mature trees as roosting sites but seldom roost in the same place on successive nights. Therefore, several suitable roosting locations scattered throughout their range are needed. Understory trees, and trees/shrubs at woodland edges or in openings also provide cover. Such trees and shrubs include ironwood, musclewood, hazelnut, beech, wild plum, serviceberry, mountain ash, wild black cherry, dogwood, crabapple, black locust, hawthorn, and pin and chokecherries.

Although turkeys can survive in areas that are only 10 percent forested, their survival improves when mature woods comprise 30 to 50 percent of the available habitat. Turkeys like open, mature woods but will also use timber stands that have grown beyond the small-pole (2-inch to 9-inch diameter) stage, if the understory is not too dense. Turkeys prefer varied habitats and also make use of brushlands and openings as well as pastures and row-cropped and idle farm fields. Travel corridors for turkeys include forested streams and river floodplains, which connect adjacent woody cover.

On cold, winter nights turkeys often seek two to five acre stands of dense mature conifers, which

will provide thermal protection as well as roosting sites. Mature woods that contain nut-producing trees (oaks, beeches, hickories) are especially important in winter because they yield carbohydrate-rich food.

Grass and clover meadows produce high quantities of insects and can provide outstanding brood rearing habitat. Mixes of grasses, clover or alfalfa can be used. Refer to the **Grassland Management** section for more information on grass varieties, seeding rates, and methods.

Habitat Considerations

In Michigan, the ideal habitat mix is 20 to 30 percent bottomland hardwoods, 10 to 30 percent mature oaks, 5 to 10 percent conifers, 10 to 15 percent shrubs, 20 to 30 percent croplands and 15 to 25 percent grasslands, clover pastures or idled fields. In good-quality habitat, the area will safely support one bird per 30 acres or one flock for every 640 to 800 acres. But unless you own a lot of land--1,000 acres or more--it is unlikely that turkeys will remain on your property year-round because they need a large amount of living space. Even so, there are many things you can do to attract wild turkeys to your property at various times of the year. General management options include:

(1) managing woodlots of any size to maximize favored wild foods and cover

(2) creating or maintaining openings

(3) providing year round food needs.

The following are specific management considerations for eastern wild turkeys:

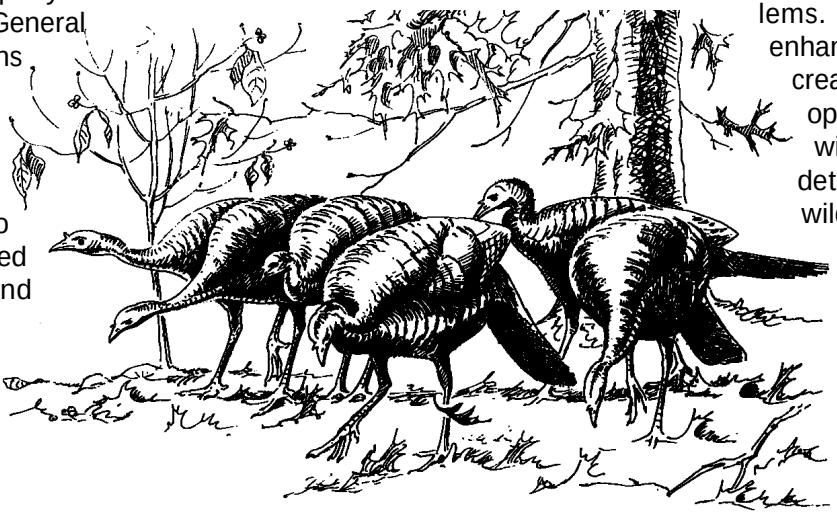
•In areas where good thermal cover is limited, and where pines can naturally occur, plant a four to eight acre stand of pines. With proper management in 20 to 40 years this will provide necessary cover.

•Rivers or creek bottoms, swamps and lowland hardwoods should be protected and maintained because of their importance as a corridor to turkey and many other wildlife species. Corridors should be at least 100 feet wide.

•Mature hardwood stands should contain some younger trees that will eventually replace those that are harvested for timber or die of natural causes.

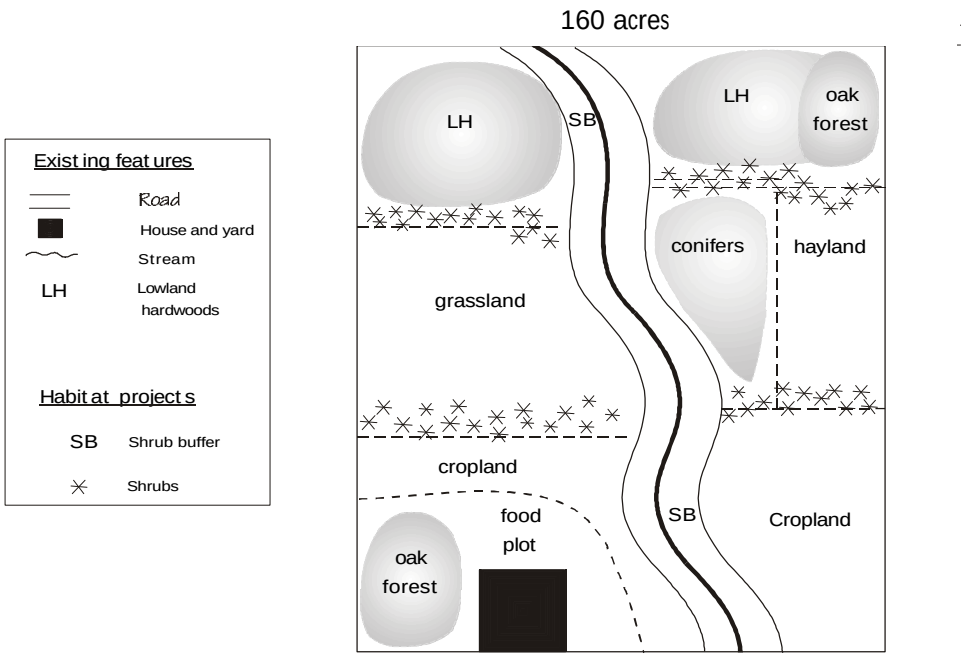
•Manage mixed stands of deciduous (leaf-bearing) trees to maintain and encourage those trees that produce nuts, fruits, or seeds. Encourage these kinds of trees by cutting species that provide little benefit to turkeys. Proper thinning of trees, therefore, may be necessary. Consult with a professional forester for details and also refer to the **Forest Management** section.

Nuts and berries are essential components of the turkey's diet.



Managing Openings

Openings can vary in size from a half-acre or less to more than 10 acres. Actual size is less important than where the opening is located and what is planted there. Openings should be large enough to admit sunlight to create forage growth. For example, linear openings such as power line rights-of-way, should be at least 60 feet wide. The optimum shape of an opening is long and rectangular with an irregular boundary that follows the land contours, provided you do not create erosion problems. If possible, maintain or enhance existing openings before creating new ones. Too many openings within a small area will fragment your forest and detrimentally impact a variety of wildlife species. Within a 100 acre forest, maintain three to five acres of openings. Several small openings are usually better than a single large one. However, if your area is severely fragmented, do not create more openings.



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

What to plant in an opening depends on your goals and turkey needs. Do you want to provide an additional source of food or establish permanent brood habitat or both? Are you planning to offer supplementary food during the summer (clover) or winter (corn)? Do you want low-maintenance plants that will be available over several years, or do you want to replant the opening each year with a grain crop?

Concerns

No matter how we manage our property for wildlife, our decisions will always have impacts. For example, if we manage mature woodlands for turkeys we will discourage brushland species such as grouse and catbirds. Creating openings may produce habitat for turkeys and deer, but may increase cowbird or raccoon predation.

Habitat that is managed for wild turkeys also tends to benefit deer, squirrels, black-capped chickadees, and woodpeckers. You should also be aware that creating or enhancing habitats may invite unwanted guests. For example, if you plant trees and shrubs, in the hopes of attracting wild turkeys and songbirds, you most likely will also entice deer, rabbits, and mice that can become a nuisance by eating the new plantings and even killing them. Free-roaming dogs and cats may also be attracted to any habitat that suddenly has an abundance of wildlife.

In summary, eastern wild turkey populations have returned to Michigan and prospered since their reintroduction. If your property contains a mix of forest and agricultural lands, you may be able to manage for turkeys. However, be aware of the negative impacts that this management may have on other wildlife.

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RUFFED GROUSE

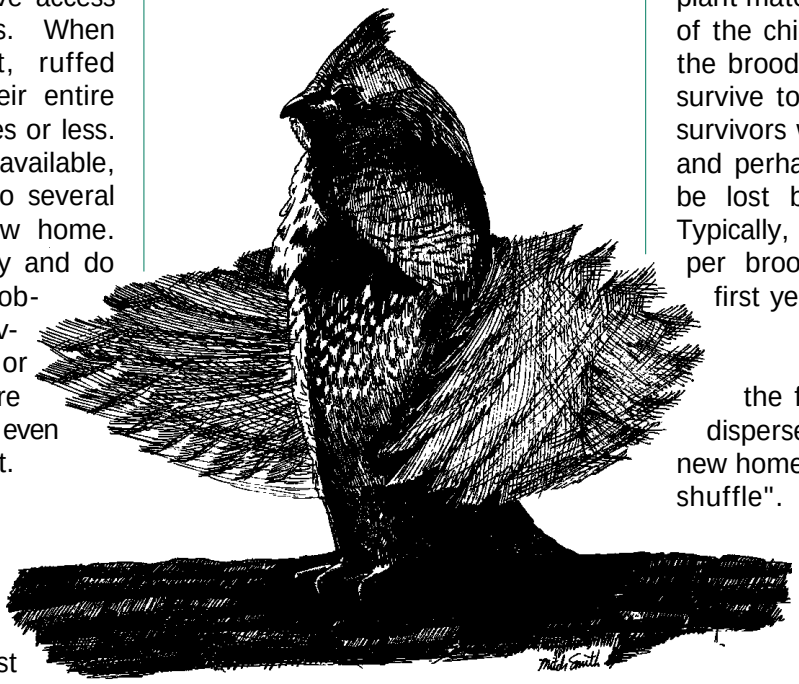
Ruffed grouse live in 34 of the 49 continental states and in all Canadian provinces. Michigan is an important portion of the grouse range. Often thought of as a bird of the deep forest, grouse actually thrive best in young, aspen forests and brushlands. When aspen is not available, oak, lowland brush, and dense stands of trees are optional habitats. Grouse are a welcome sight at bird feeders in neighborhoods where natural habitat is available. Despite human encroachment, grouse are able to survive.

You can manage for grouse in Michigan if you own 20-40 acres of woodlands, and birds have access to other nearby woodlots. When habitat needs are met, ruffed grouse usually spend their entire lives in an area of 40 acres or less. If critical habitat is not available, grouse will disperse up to several miles in search of a new home. Birds are basically solitary and do not collect in coveys like bobwhite quail, although several grouse may feed or roost together. Be aware that populations fluctuate even when habitat needs are met.

Life Cycle

Adult males establish territories as small as six to 10 acres and aggressively defend them against other males during the breeding season. After territories are determined, males select a log, stone, or earth mound from which to display in spring. Grouse beat their wings which results in a putt-putt-putt sound similar to a small gasoline engine starting up. This display is called "drumming" and is used to warn other males and attract hens. Drumming goes on all year but increases in spring. The male grouse chooses a drumming site that has the following characteristics: a large log for good visibility located in thick cover of young saplings or brush for protection.

Hens usually nest within a half-mile of their mates. After hollowing out a depression in the leaf litter at the base of a tree or stump, the hen lays one egg each day until her clutch, which numbers from eight to 14 light-colored eggs, is complete. After the last egg is laid, she incubates the clutch. Hatching occurs in 24 to 26 days.



A drumming log is a necessity for attracting hens in the spring.

Soon after hatching, the chicks follow the hen to a summer brood range, which can be several miles away. Ideal brood habitat is dense stands of brush, young aspen, and hardwoods, or lowland alders, with the ground clear of thick, low-growing vegetation.

Chicks feed heavily on insects during the first few weeks of life. Gradually their diet shifts to green plant materials and fruits. Mortality of the chicks is high. Only half of the brood hatched in late May will survive to mid-August. Half those survivors will not make it to winter, and perhaps one or two more will be lost by the following spring. Typically, only one to three birds per brood survive through their first year.

At 16 to 18 weeks old, the fully-grown young grouse disperse from family units to find new homes, which is called the "fall shuffle". During this period of movement grouse fill available existing habitat, and are vulnerable to predators and human hunting. The first to leave are the young males, which may travel as far as 4 1/2 miles. Young hens

leave the family about two weeks after the young males, and they may disperse 15 or more miles.

Grouse populations fluctuate according to weather trends, food availability, predation, and other reasons not fully understood. Evidence suggests the high-to-low population cycle repeats itself every 10 years.

Habitat Management

The best way to attract grouse onto your property is to offer habitat that meets the grouse's needs for food and safety. Optimum ruffed grouse habitat should include brushy areas, young aspen stands, mature aspen stands with an understory of hazel or ironwood, and dense sapling aspen stands. Oak, conifers, and lowland brush and trees are an option when aspen is absent.

The best grouse habitat is created when a forest with aspen is clear-cut every 40 to 50 years in small dispersed patches. Refer to the **Aspen/Birch** chapter in the Forest Management section. Aspen trees 15 years and older provide the most important year-round food sources in the form of green leaves, flower buds, and catkins. During winter the flower buds of aspen become the staple grouse food, but winter catkins of hazel and those of willow and birch are also eaten.

Aspen younger than 12 or 15 years provide the thick, dense cover that helps protect nesting grouse and hens with broods from aerial predators (hawks and owls) and land predators (foxes and coyotes). Therefore, the key to more grouse is to create varying ages of aspen, when possible, and a variety of hardwoods and brushy covers when aspen is not available. A grouse can be sustained in 10 to 20 acres if the habitat is ideal.

Management opportunities for ruffed grouse and other forest wildlife in oak forests depend, in part, on the composition and arrangement of the principal tree, shrub, and herbaceous food and cover plants. A mixture of oaks, aspen, and conifers are beneficial to grouse. Providing a dense understory and overhead cover, these habitats are most productive when they are 10-15 feet in height. However, it is important to avoid a domination of one species within a woodlot mixture - especially hardwoods and conifers as this may reduce the potential movement of

grouse onto your property.

Species composition and density also determine the long-term capabilities of your woods in sustaining grouse. Tall shrubs, greater than 5 feet, provide year round food and cover. Recommended species include hazel-nut, dogwood, witch hazel, serviceberry, and nannyberry. Maintenance of dense young forest should be the highest priority of grouse habitat management. In addition, ground cover such as blown down trees and debris, also provide substantial cover and necessary drumming sites.

Oaks can be maintained by cutting 30 to 80 percent of all trees, except saplings. However, it is also important to leave small clumps of trees for seed such as aspen, birch, and ironwood. Oak cuts should be 5 to 20 acres in size. They can be as large as 40 acres as long as they are shaped irregularly. Spacing between cuts of the same age should exceed 600 to 900 feet.

RUFFED GROUSE

Grouse enjoy eating nuts and berries and gain cover protection from the shrubs that produce these foods.

In southern Michigan, grouse will inhabit lowland hardwoods such as red maple, cottonwood, white ash, swamp white oak, pin oak, sycamore, and black gum if there is sufficient understory growth. Opening the canopy by selective cutting will allow sunlight to the ground and stimulate ground vegetation necessary for cover and food for grouse, rabbits, deer, and other wildlife species.

Establishing a lowland hardwood stand beneficial to grouse can be accomplished by selectively harvesting in a three stage rotation within a 30 year cycle. Vertical cover, of seedlings and saplings, and 20-30 year old poles, along with the horizontal cover provided by shrub and herbaceous growth are all needed. The 30 year rotation will at all times retain 1/3 of the stand in cover less than 10 years old. These strips of herbaceous growth, paralleled by pole and saplings stands, are intended to provide the mixed food and cover needs for a greater variety of wildlife.

If there are no aspen, oak, or lowland hardwoods on your wooded property, grouse may still be attracted to woody plants such as apples, crabapples, hawthorn, wild plums, dogwoods, nannyberry, raspberry, blackberry, sumac, grape, willow, cherry, hazelnut, and ironwood. Make small clearcuts no larger than 2 1/2 acres in size in the interior of the woods, sparing the above species. The result will be an explosion of dense thickets of young trees and shrubs, which will attract grouse.

You may consider transplanting aspen sprouts from another location or planting aspen seedlings, which will grow in the newly created open sunlight. Make sure the soil is conducive to aspen. Also, protect young trees with guards to discourage browsing by deer, rabbits, and mice.

Whenever you make a clearcut for grouse, be sure to leave one log per acre as a potential drumming site. The log must be at least 10 inches in diameter and cut at least 3 feet from the ground so as to leave a sufficiently sized stump. Eventually young trees will grow over the log, and a drumming site will develop.

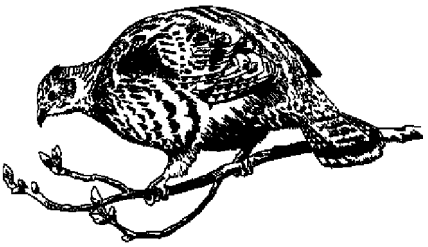
Plant fruit-producing shrubs (crabapples, hawthorns, dogwoods, sumac, etc.) along woodland edges and within openings. Encourage these and other shrubs by cutting away competing growth, thinning, and pruning if necessary. Protect the smaller shrubs with mouse guards (1/4-inch mesh wire or sheet metal 12 inches high) and deer and rabbit guards (1-inch mesh wire or sheet metal three to four feet high). Mow open areas and trails and plant with mixtures of clover, legumes, and grass.

Concerns

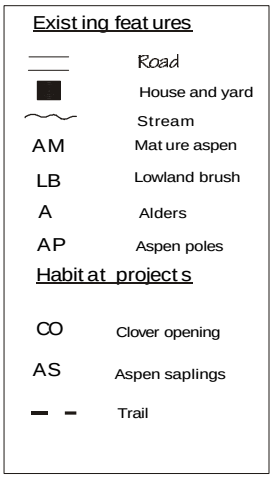
No matter how you manage your property for wildlife, your decisions will always have impacts. For example, clearcutting aspen or oak stands for grouse will discourage mature forest loving wildlife such as woodpeckers, some warblers, and squirrels. For this reason, it is important to have an overall management plan with specific goals in mind.

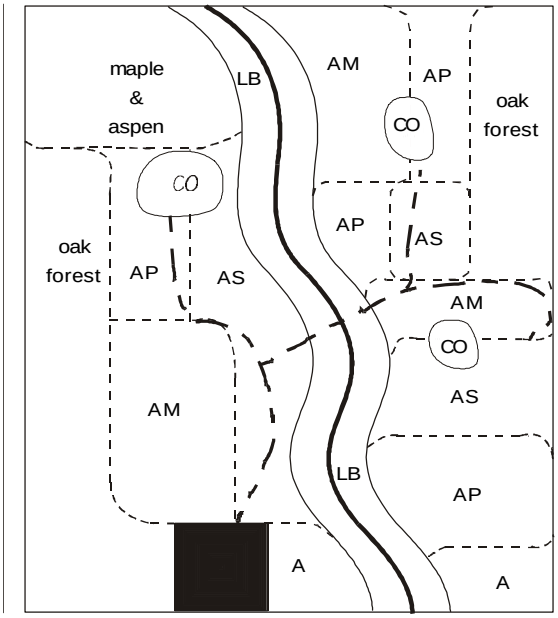
You should also be aware that creating or enhancing habitats may invite unwanted guests. For example, if you plant trees and shrubs, in the hopes of providing food for grouse and songbirds, you most likely will also lure deer, rabbits, and mice that can become a nuisance by eating the new plantings and even killing them. Free-roaming dogs and cats may also

RUFFED GROUSE



40 acres





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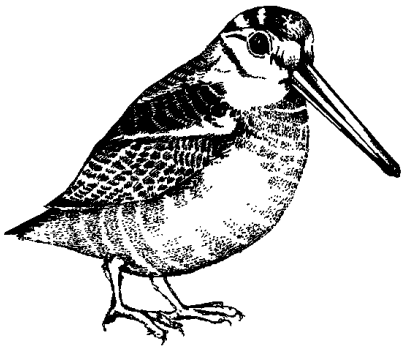
WOODCOCK



Michigan serves as an important breeding ground for woodcock, along with Minnesota, Wisconsin, southern Ontario and Quebec, the Maritime Provinces, and some New England states. Because woodcock are migratory, their populations are monitored by the U.S. Fish & Wildlife Service. Numbers in Michigan and other Midwestwern states increased dramatically after many old growth forests were cut during the 100-year period from about 1830 to 1930. The last woodcock population peak occurred in the 1950's. During the past 30 years, woodcock numbers have seen a steady decline. Since 1968, the number of singing males in spring has declined an average of 1.3 percent per year. Since 1985, the loss is even greater, an average of 2.8 percent per year. Hunting the birds seems to have little impact on overall numbers in the breeding population. Most experts agree that habitat loss and degradation are key reasons for the decline.

Although some people confuse woodcock with their close cousin, the snipe, the birds are separate species that belong to the sandpiper family. Unlike others in its family, woodcock prefer uplands. Woodcock are forest birds known for their erratic flight patterns and unusual spring displays by the males.

A Senecan Indian myth says God made the woodcock from the leftover parts of other birds. Large eyes are located along the sides of the bird's head, allowing it to see in all directions, including directly behind. A long, thin bill that averages nearly three inches in length permits woodcock to probe in soft earth for worms, slugs and other invertebrates. Nostrils lie high against the skull so the woodcock can feed and breathe at the same time. Its ears are located beneath the eyes. Woodcock stand about eight inches tall, appear to bob when they walk, and weigh about a half-pound each.

Woodcock need young-growth forests with openings for reproduction; especially in the upper Midwest where the forests are growing older. This process of natural succession is a key reason for habitat degradation, but prime cover is also lost to roads, houses, croplands, and other human developments. This chapter explains what woodcock need to survive and how interested landowners can help by creating or improving habitat on their property.

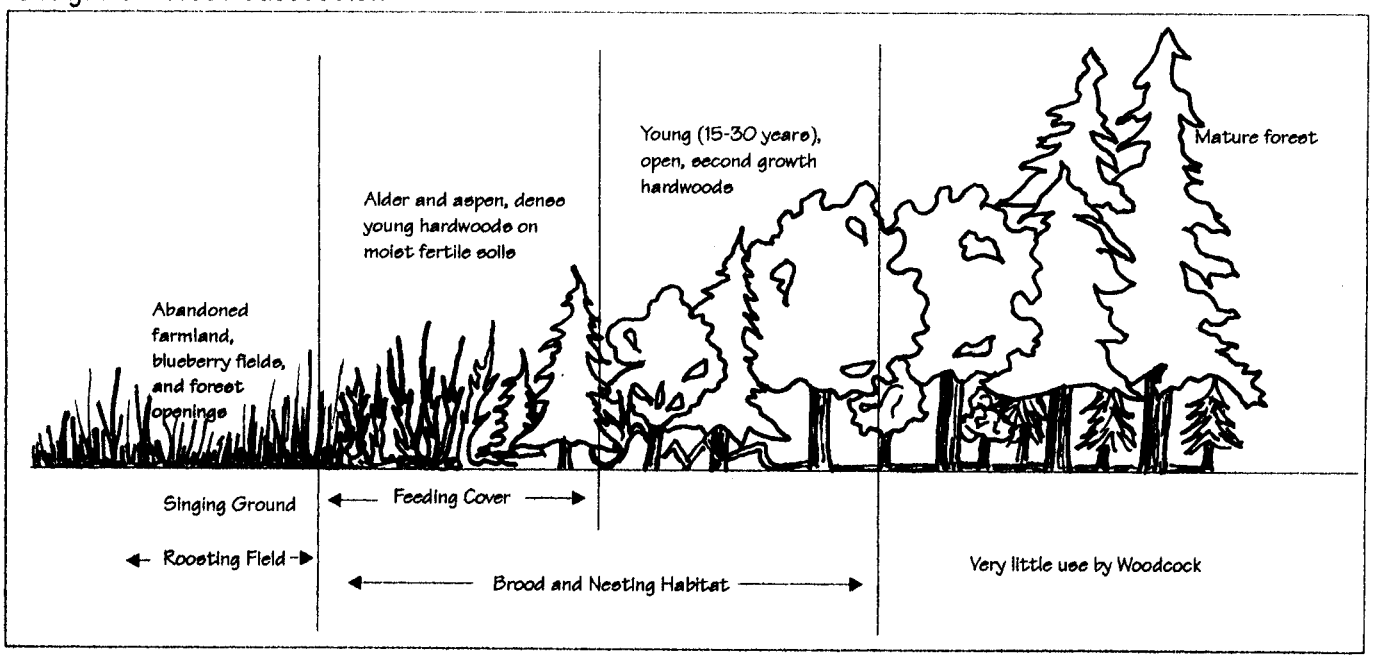
Life Cycle

Woodcock return to Michigan from their southern wintering grounds typically sometime in March. Breeding males establish a "singing ground" which they defend against other males, often in the same area year after year. Singing grounds are small clearings or very young stands of seedlings, and can be as small as a half-acre or as large as 100 acres. Every night, from March through May, the optimistic male puts on an aerial ballet, which is unmatched by any other bird in North America. The best time to hear and see the display is between sundown and full darkness.

Listen first for a buzzing, insect sound, an unusual noise, which biologists call a "peent." When the peents grow more rapid in succession, the male is ready to fly. The instant the peents stop, he will take to the air in a spiral ascent that grows wider and wider until he reaches heights of about 300 feet. If you miss him rising, listen for a chirping sound from high above, then a twittering--the sound of wind rushing through their wing feathers as the woodcock falls to earth.

A nearby female chooses a male to mate with. Hens build a shallow nest area in this same area of young-growth forest. Similar to snipe and certain other shorebirds, woodcock lay four eggs, which will hatch in about 20 days. As far as researchers know, woodcock raise only one brood per year. Each year brood sizes are fairly constant at about four chicks per successful nesting hen. However, chicks are lost each year between the early brooding season in spring and the hunting season in fall. In the event a predator destroys their eggs, hens will usually renest. The young are capable of foraging for them

Stages of forest succession



selves when only a few hours old. Within a few weeks, they begin to fly.

Habitat Needs

Woodcock require four key types of habitat in order to thrive:

1)Small clearings that provide singing grounds for the males' sky dance.

2)Young, second-growth shrubs such as alders, and hardwoods of mostly birch and aspen (poplar) in northern Michigan, or young stands of maple and ash in southern Michigan that provide nesting and brood-rearing cover.

3)Moist, rich soils that provide the invertebrates, especially earthworms, that woodcock eat. When soils become too acidic to support earthworms, woodcock have to find food elsewhere.

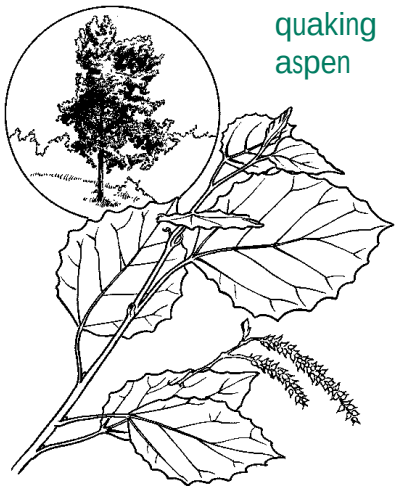
4)Roosting area which could be an old field, hayfield, grassland planting, or cut young forest area. The birds prefer open ground cover where they can see to run from predators and to probe for food. They will not use fields with thick, lush vegetation.

In general, woodcock need a mixture of small, scattered openings one to three acres in size among dense stands of shrubs and young leaf-bearing trees in a moist area. As young forests maturee, they loose their value for woodcock. A general principle to keep in mind is that when most trees grow larger in diameter than a silver dollar, breeding habitat quality begins to diminish.

Woodcock prefer aspen stands because they form the dense stands needed for nesting and brood rearing cover. Woodcock heavily prefer young, recently harvested aspen stands where soils are moist and earthworms are plentiful. Aspen regenerates by sending up root sprouts through the soil after being cut. For every acre of aspen forest that is cut, it is estimated that up to 70,000 root sprouts are sent up. Openings and new growth from aspen cuttings provide singing, nesting, feeding, and sometimes roosting areas.

Alder stands along streams and other lowlands are another type of preferred woodcock habitat. Like aspen, alder grows best when out of the shade of competing trees, and regenerates through cutting. It usually persists in streamside situations, but may be replaced with red maple, ash, and swamp white oak in lowland areas.

If you do not have an abundance of aspen or alder on your property, you may still be able to attract woodcock. Brushlands containing apple or crabapple trees, fruiting shrubs like highbush cranberry and dogwood, thickets of elderberry and sumac, and young-growth hazel, willow, cherry, and ironwood also make excellent woodcock habitat. Many of these brushlands are actually farm fields that were abandoned, sometimes because loam and clay soils made the field too wet for productive farming. In southern Michigan especially, lowland hardwoods such as red maple, cottonwood, white ash, swamp white oak, pin oak, sycamore, and black gum with an understory of



quaking aspen

shrubs and ground cover can provide good habitat for woodcock. Forests dominated by evergreens such as hemlock, fir, larch, make only marginal woodcock habitat.

If your property contains stands of aspen and birch mixed with old farm fields, forest openings, and brushy lowland areas, you most likely will be able to manage for woodcock. The more acreage the better, but if your property is small, you can still provide one or more habitat components and work with your neighbors to furnish other parts. Managing for woodcock will also benefit ruffed grouse, golden-winged warblers, chestnut-sided warblers, snowshoe hares, and deer.

Management Considerations

The following are options to consider when managing for woodcock:

•In aspen stands, develop a clearcutting rotation to keep the stand young and dense. See the **Aspen** and **Birch** chapter in the Forest Management section for more information.

•Regenerate alder by cutting when the stand and individual stems show signs of decay. To determine decay, look at the stand as a whole and decide if vertical stems are beginning to lie horizontally.

•If there is an abundance of alder on your property, in the winter cut strips 60 to 80 feet wide through existing stands. Cut adjacent strips three to five years apart in order to provide different ages of alder, and plan to re-cut the stand every 20 years. Maintain a buffer of 100 feet wide next to streams.

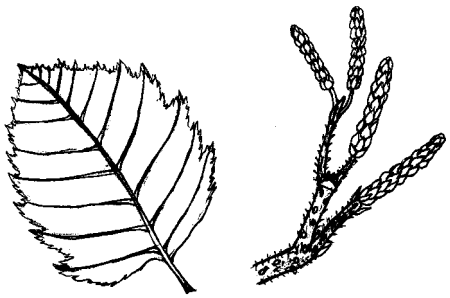
•Although some removal of slash (dead trees) is desirable to encourage singing males to use small openings, it is not necessary to clear all the ground. After seven to 10 years when the new alders have grown into suitable feeding cover, the slash will have decayed.

•Provide good nesting and brood rearing cover in areas without aspen by preventing old fields from proceeding into the forest stage of succession. To do this periodically remove trees as they grow older, or mow or burn half of the field every 10 years. Ideally, for woodcock nesting cover, old fields should contain 60 to 70 percent shrubs and young trees.

•Plant shrubs and trees along forest edges to help establish dense woodcock cover while waiting for new growth to occur in regeneration areas.

•Protect or restore lowland areas, as their moist soils provide excellent foraging opportunities for woodcock.

•If the lowland hardwood canopy grows too dense to maintain a productive understory, you may wish to thin the trees through single-tree selection cutting. However, be careful to not remove too many trees as this will disturb the lowland ecosystem. Refer to the **Lowland Hardwoods** chapter for more information.



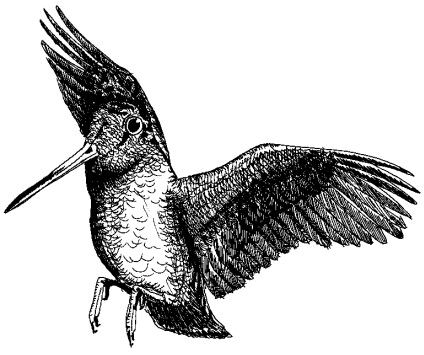
Alder

•Provide small clearings for singing at least a half-acre in size for every 20 to 25 acres of young forest. Clearings should be 5 to 10% of the total management area. You can create them by cutting or mowing. Where possible, create the clearings on a north-south orientation, and make them irregular in shape.

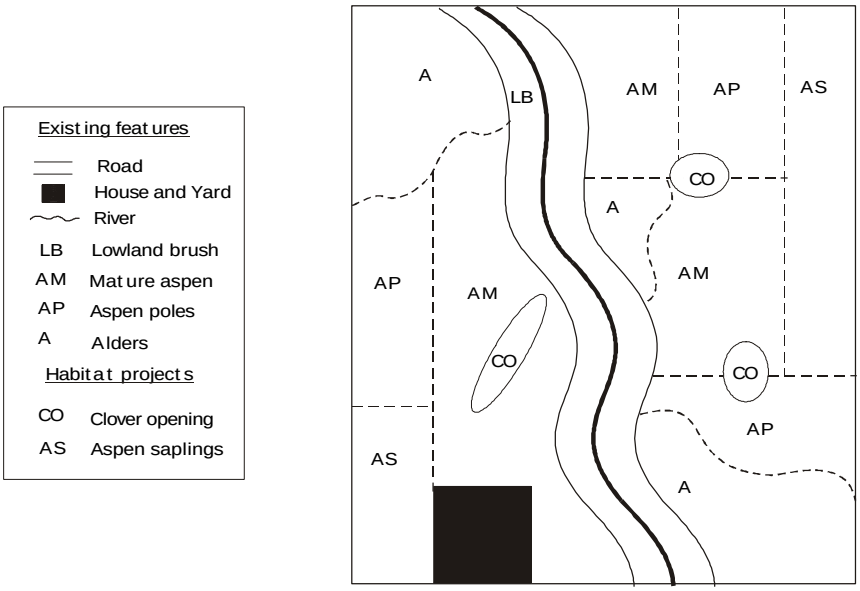
•Plant clearings with a low growing ground cover such as clover. This will provide good singing and roosting areas.

•Logging trails and landings, where felled trees were piled before transport to the mill, make excellent openings because they tend to stay open as the rest of the harvested stand grows thick with new seedlings.

•Locate roosting sites within a half-mile of feeding areas. Preferred



40 acres



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

sites tend to be about an acre in size, and one per 100 acres of overall habitat is sufficient.

•Maintain roosting sites by burning fields every three to five years to suppress invading woody species. To prevent nest destruction, conduct all burning before mid March, especially in southern Michigan. Be sure to contact your local fire authorities for permits, advice and regulation details.

In summary, Michigan is an important state for the production of woodcock. Landowners can help by restoring former woodcock habitats and creating new ones. It is important to remember that no matter how you manage your property, your decision will impact other wildlife. In this case, clearcutting aspen for woodcock will discourage mature forest loving wildlife such as woodpeckers, some warblers, and squirrels. For this reason, it is critical to know what animals currently live in your area, and how management for woodcock would affect them.

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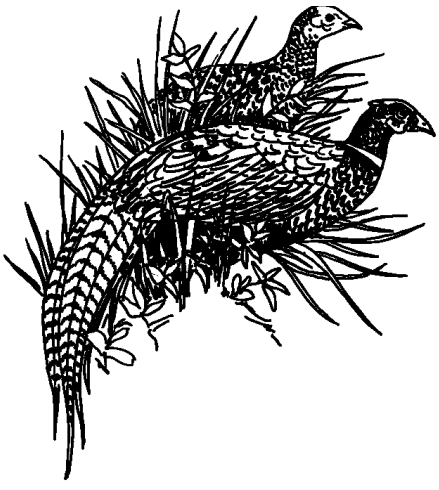
PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

PHEASANTS

After their introduction from China in 1895, it didn't take long for ring-necked pheasants to become one of Michigan's most popular wildlife species. Because pheasants thrive in a mix of cropland, hayland, grassland, wetland, and brush, populations exploded in southern Michigan. Much of the farmland in the 1940's and 1950's provided outstanding pheasant habitat. At that time, farms had small fields from 10 to 20 acres in size surrounded by brushy fencerows and diverse crop rotations.

However, by the 1960's farmland began to change and people weren't seeing as many pheasants. The number of farms fell from 190,000 in 1940 to less than 60,000 by 1990. The amount of land farmed also decreased from more than 18 million acres in 1940 to less than 11 million acres in 1990. Although predation, genetics, and overuse of pesticides are among many explanations for the decline of pheasants, Michigan's changing agricultural scene and loss of habitat are the main reasons.



Furthermore, farming practices have changed over time. Many practices are no longer wildlife friendly, and are aimed at making more money. This has been detrimental to pheasants. Such practices include early and numerous cuttings of hayfields, overgrazing by livestock, spraying of pesticides and herbicides, double-cropping, and fall plowing and discing of crop residues.

However, there are still many opportunities for farmers and other landowners who want to increase pheasants on their property while continuing to make a profit. Many landowners are presently purchasing property to manage specificially for wildlife and, through proper grassland management, are experiencing the revitalization of pheasants in their area. Other landowners with larger acreage have signed agreements with the U.S. Department of Agriculture to take hundreds of thousands of acres out of crop production and put them into federal conservation programs These programs are used to manage grassland species.

Habitat Needs

Pheasant habitat would include a combination of grasslands, idle fields, wetlands, croplands, haylands, and shrublands. Optimal habitat for pheasants include the following:

(1) undisturbed low- to medium-high grasses and legumes for nesting and brood rearing

(2) wetlands

(3) windbreaks and dense covers of cattails or switchgrass to protect the birds from heavy snow and cold winds

(4) fields of grain and weeds for a consistent winter food supply

The larger the parcel targeted for pheasant management, the bigger the positive impact will be. Ideally, you would want to manage at least a 40 to 80 acre tract. However, small landowners who work with their neighbors can increase their chances of helping pheasants.

Stocking of pheasants may increase sightings for a while, but game-farm birds are not equipped to thrive in the wild. Most become victims of predation. The best way to

produce more pheasants is to improve habitat—the places where pheasants live.

Breeding Habitat

Beginning as early as March and lasting into May, cock pheasants establish and defend breeding territories against other males. The territories, which may be as small as one or two acres, occur in weed fields, grasslands, crop-stubble fields, and along fence rows.

Cock pheasants display themselves by choosing open areas near secure habitat rather than displaying in the protective cover itself. They draw attention to themselves by flapping their wings and crowing once every minute or two to attract hens. This displaying makes them vulnerable to predators. When hens appear, they too become targets for predators. This is why it is important to have good cover nearby.

Nesting Habitat

Hens choose nesting sites in fields with cover that is low enough for them to see over, and not too thick to walk through. Eight to 10 inches of height is ideal. Alfalfa or other legumes, such as clover, fulfill these requirements. They will use a perennial mixture of legumes and grasses. However, brome grass and fescue are usually too thick, and neither goldenrod nor wild asters are preferred. Although hens will nest in narrow, linear cover such as brushy fence rows and roadside ditches, wider linear nesting habitat (at least 40 yards wide) is more secure.

Nesting habitat must be undisturbed for about 40 days. Hens visit the nest site for a half-hour each day for 12 to 15 days to lay a single egg. When the clutch is ready for incubation, the hen reverses her activities. She now stays on the eggs for approximately 23 days, leaving once daily for one-half hour to one hour to feed. Eggs typically hatch from late May through June, and the average brood size is 11 chicks. Hens may renest up to three times if their clutch or brood is lost, but the number of eggs decreases each time. When the eggs hatch, the hen will stay with her chicks for at least three months. This time period allows for the rearing of only one brood per year.

The cutting of hayfields during the nesting season has the biggest negative impact on pheasants because a sitting hen usually stays with her eggs. Mowing machines and evening and night-cutting practices further increase the chances of the hen being killed.

Farmers growing alfalfa and other forage for livestock, but who also want to increase pheasant numbers, might want to plant clover and other mixed grasses and legumes that don't mature until late June. If possible, refrain from mowing until July 15. Also, don't mow after August 30 or the field may not grow to the minimum eight-inch height that hens require the following spring.

The U.S. Natural Resource Conservation Service and Michigan Department of Natural Resources recommend several different combinations of legumes and grasses to improve nesting habitat for wildlife and to check erosion. The Natural Resource Conservation Service or Conservation District in your county can be contacted for details.

Rearing Habitat

switchgrass

For the first five weeks of life, pheasant chicks thrive on protein-rich grasshoppers, ants, beetles and other insects. The best place to find insects and their larvae is in fields of weeds or grass that have not been treated with pesticides. The habitat should not be too thick for young birds to walk through, but it should contain enough overhead cover in the form of grass or leaves to protect them from hawks and owls. Wide brushy fence rows provide food as well as security for chicks to travel between food sources.

To provide optimum nesting and brood-rearing habitat, your property should be comprised of 20 to 50 percent grasslands in fields from 3 to 10 acres in size, surrounded by brushy cover or crop fields. To provide diverse stands, grasslands should be planted to orchard grass, timothy, and clovers like ladino, medium red, and alsike. Native prairie grass stands of big bluestem, little bluestem, Indiangrass, or side-oats grama provide oustanding nesting and brood-rearing cover.

By late summer or early fall,

when chicks are old enough to survive on their own, brood size will normally be half that at time of hatching. Ground and aerial predators, heat stress, and poor diet all take their toll on young pheasants. By providing quality cover, the impact of these mortality factors can be lessened.

Secure Winter Habitat

The pheasant's world changes drastically in winter. Canopy covers of leaves are gone, and high grasses are usually blown down or matted by drifting snow. Pheasants are better equipped than some birds, such as quail, for scratching through a few inches of snow for grit, grain residues, and weed seeds. But as snows deepen and winter intensifies, pheasants are forced into heavier security cover such as cattails, swales, and ditch banks.

Pheasants seeking grit along roads are victims of car collisions. The concentration of birds in winter makes hunting easier for predators, whose normal songbird prey has migrated south or is buried under snow, such as mice, voles, and other small mammals.

A snow or sleet storm blowing across unprotected fields can be dangerous for pheasants. Because birds must face into the wind in order for their streamlined feathers to keep them warm, their nostrils may ice up and they can suffocate. An especially vicious storm may fill even deep drainage ditches, smothering pheasants under several feet of snow.

Thick stands of cattails or switchgrass provide pheasants with secure winter shelter from such weather. A thick field of forage sorghum helps, although switchgrass, which grows

from four to six feet high and won't break down under snow, is better. Good winter cover, isolated from woodlands and tall trees, within a quarter-mile of winter food is the key to pheasant survival. Besides grain and seeds, fruit-bearing trees, and shrubs such as silky dogwood, hawthorn, elderberry, and highbush cranberry are good sources of food and cover for pheasants.

Three to five acre blocks of switchgrass, with two to three surrounding rows of shrubs, will provide great winter cover. If this winter home borders a food plot or non-tilled cropland, you will have the necessary components to maintain pheasants throughout the winter.

Management Considerations

Landowners interested in managing lands for pheasants should create blocks 10 to 20 acres in size. Each block should be comprised of the following:

- 3 to 7 acres of nesting cover (grasses/legumes)
- 3 to 7 acres of heavy winter cover (native grasses such as switchgrass)
- 2 to 4 acres of grain crops (corn, buckwheat or sunflowers)
- 2 to 4 acres of fruit-bearing shrubs (hawthorn, highbush cranberry, elderberry, or dogwood)

Modifying some modern farming practices can help pheasants without creating loss of income. In some instances, money can actually be saved. Examples are:

- Practicing conservation tillage reduces cultivation and compaction and makes grain residue available for wildlife.
- Planting slopes and waterways with native grasses such as switchgrass checks erosion, and provides winter cover and sometimes nesting cover.
- Undergrazing pastures slows erosion and also provides pheasant habitat.
- Planting warm-season grasses such as big bluestem, little bluestem, and switchgrass provides high-quality summer forage when cool-season grasses stop growing. Switchgrasse gives pheasants nesting, brood rearing, and secure winter habitat.
- Incorporating red clover, alfalfa, or other legumes into pasture management improves food value for both livestock and pheasants.

Other practices that will also help pheasants:

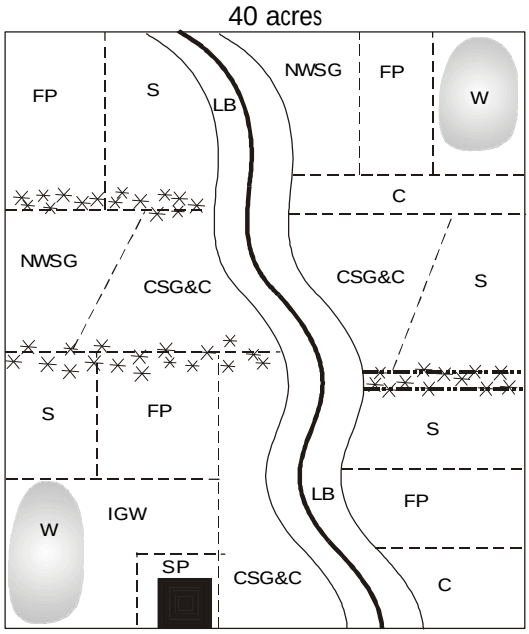
- Delay hayfield mowing until July 15 and do not mow after August 30.

Existing features

- Road
- House
- Stream
- Brushy fencerow
- W — Cattail marsh wet land
- IGW — Idle grass and weeds
- NWSG — Native warm season grasses
- LB — Lowland brush

Habitat projects

- Shrubs
- FP — Food plot corn
- S — Switchgrass
- CSG&C — Cool season grasses and clover
- C — Clover
- SP — Shrub planting



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•Alternate strips of corn, soybeans, and other row crops with wheat, legumes, or grass.

•Maintain field borders of brush, grass and shrubs.

•Plant idle land with grassland or crops, for winter food.

•Leave intact a portion of row crops until March 15 or later.

•Remove trees taller than 15 feet along fencerows. Cutting such trees eliminates sentinel perches for hawks and owls.

•Wetlands should be maintained or restored wherever possible.

In summary, pheasant populations have declined due to a change in farming practices and loss in agricultural lands. However, it is possible to incorporate wildlife friendly practices when farming to help increase pheasant populations.

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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

BOBWHITE QUAIL

Michigan is on the northern fringe of the bobwhite quail's range. Creatures of the edge, bobwhites prefer grasslands and early successional habitats containing brush and young trees. They also require a good amount of cropland as a food source. Good habitat provides a mix of quality nesting and brood areas, winter shelter, and a year-round food source. Populations often fluctuate, sometimes dramatically, with the severity of winter.

Southern Michigan landowners with 20 or more acres and who provide the right mix of habitat can expect to enjoy bobwhite quail on their property. They are relatively inconspicuous birds, spending most of their life in concealing cover. However, they can often be heard as their song is a distinct whistle which seems to say "bob-WHITE". Habitat developed for quail will also be of value to rabbits, cardinals, towhees, brown thrashers, eastern bluebirds, field and song sparrows, and many other grassland and shrub-inhabiting songbirds.

Life Cycle

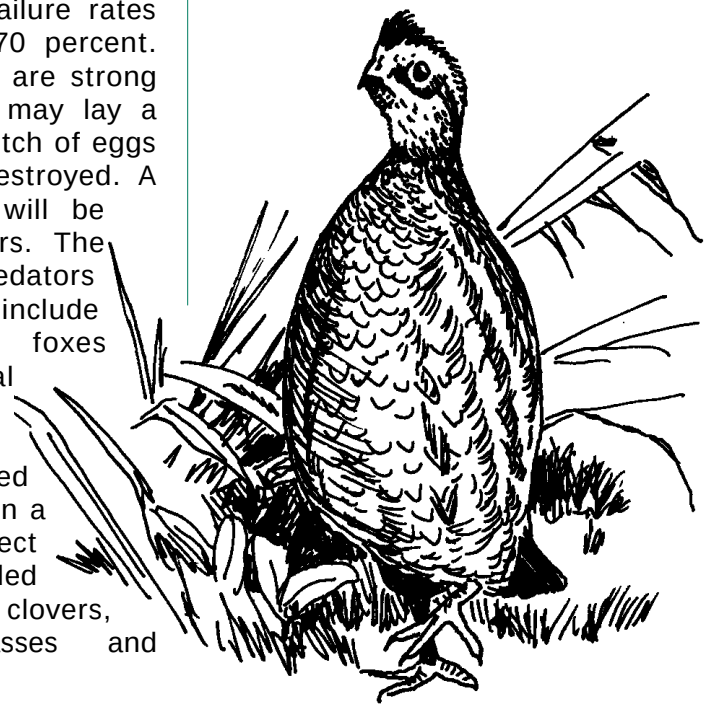
The hen locates her nest along field edges, brushy fencerows, and old fields with weeds and grasses. The average clutch size is 12-14 eggs, with 10-12 of them usually hatching. This large clutch size is the main reason that bobwhites often rebound dramatically after population lows. The males also contribute to incubation chores, often sitting on the eggs while the hen is away feeding. Mated pairs stay together for the entire brood rearing and nesting season, which can begin in April and last until September.

Nest disturbance and predation, along with bad weather and other variables, can contribute to nesting failure rates as high as 60 to 70 percent. However, bobwhites are strong renesters, as hens may lay a second and third clutch of eggs if the others are destroyed. A good nesting site will be secure from predators. The bobwhite's main predators at this time of year include skunks, raccoons, foxes snakes, and feral dogs and cats.

The newly hatched chicks rely heavily on a diet of insects. Insect abundance is provided by legumes, such as clovers, mixed with grasses and broadleaf weeds. This insect diet will last for about two weeks and then, over the next six weeks, slowly change to a diet of grain crops and seeds.

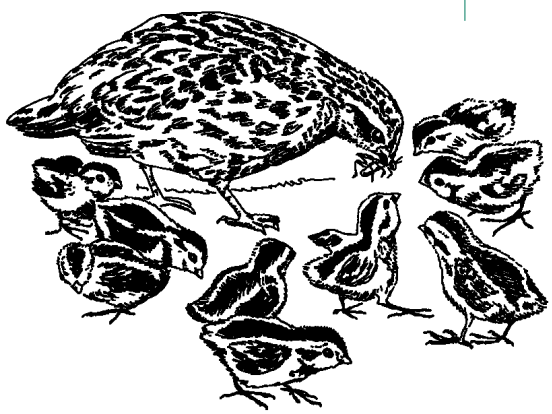
Food and Cover Needs

Bobwhite quail have different food and cover requirements throughout the year. As adults, quail feed mainly on grain crops and weed seeds. Popular weed species include common ragweed, yellow and green foxtail, beggar's tick, hairy vetch, smartweed, yellow nut sedge, wild sweet pea, lespedeza, tick clover, and black medic. Preferred grain crops include soybeans, corn, and grain sorghum. Quail also eat



rose hips, acorns, crabapples, and other shrub fruits. Although ensuring that all needs are met throughout the year is important, winter is the most critical time for food and shelter availability.

Winter severity is a great equalizer in Michigan for the bobwhite quail. A succession of mild winters may improve populations to the point where limited hunting seasons are allowed. Although native to Michigan, quail are limited to those parts of southern Michigan that receive less than 40 inches of snow per year. They cannot endure prolonged conditions of cold, or heavy snow or ice accumulation. Because of their high metabolic rates, bobwhites can starve to death in only three days during severely cold weather, or when ice covers their food. That is why on bitterly cold days, birds may stay in feeding spots all day, stuffing themselves every 90 minutes, which is how long it takes them to empty their crops, and returning to the roost early. By comparison, a ring-necked pheasant can survive up to ten days in winter without eating. Also, pheasants are better equipped than quail for scratching through snow and ice to reach food.



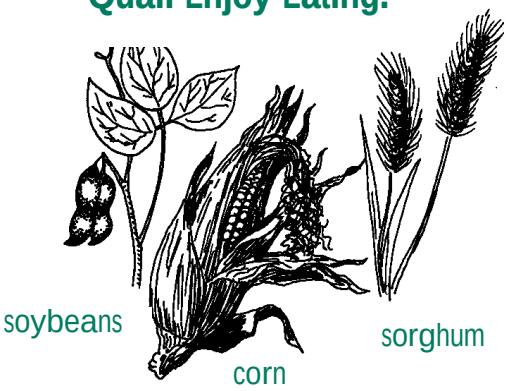
Unharvested crops and grain food plots provide a good source of food for quail during critical winter months. Using minimum tillage practices in the fall leaves waste grain for winter food. Not harvesting a few rows of grain crops next to travel corridors or heavy cover areas will also help quail and other wildlife. Food plots with mature grain mixed with ragweed, lambsquarter, smartweed, and foxtail are optimum.

Nesting cover consists of grassland areas, such as idle fields that have been out of production for one to three years. Good grasses for nesting include timothy, orchard grass, redtop, Canada wild-rye, or mixtures of native warm season grasses.

Optimum escape cover is provided by woody vegetation. This can be in the form of hedgerows and fencerows, irregular-shaped brushlands, and brushpiles. A dense growth of tall weeds such as ragweed can also supply some winter cover.

Loafing cover is anything that gives quail protection from predators and weather, yet is open enough to allow for basking in the sun, preening, and delousing themselves through dust baths. Good loafing cover has some screening protection, such as high weeds or a canopy of leaves or brush.

Agricultural Foods Quail Enjoy Eating.



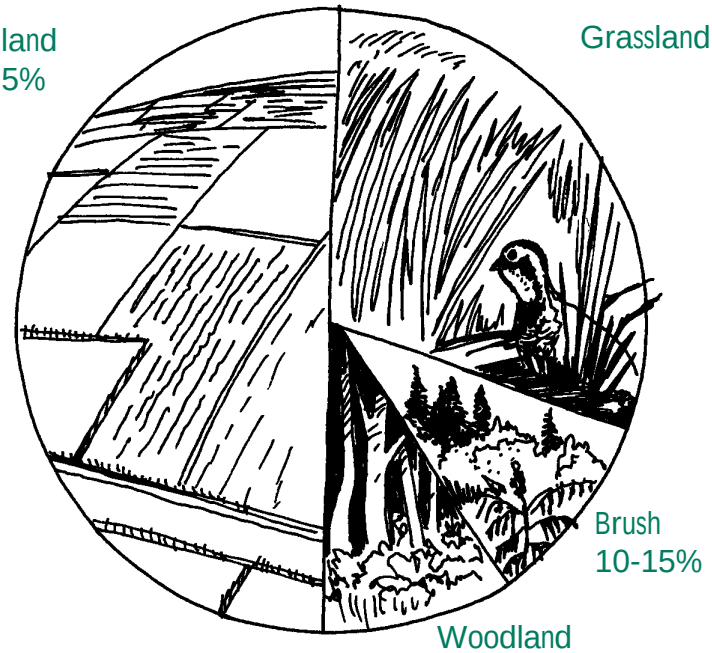
Winter roosting cover is usually open, clumpy vegetation that is not located next to thick escape cover. The best winter roosting areas are provided by erect stands of grasses and weeds, with a southern exposure. These include stands of foxtail, switchgrass, and big and little bluestem. Quail will also use roadside ditches containing bromegrass, or fields of alfalfa or wheat stubble for roosting, although these are usually poor places to sleep.

Bobwhites roost in the form of a circle. The main reasons for this are to conserve body heat and to provide 360-degree surveillance of predators. At least seven quail are needed in the circle so that their tails will converge to trap the heat from the birds' droppings. Feathers and small piles of green-and-white droppings are clues to roosting sites. To ensure winter survival, hunters should be careful not to reduce coveys too low.

Management Considerations

The most ideal land-use pattern for quail is comprised of 25 to 30 percent idled fields and grasslands, 40 to 55 percent croplands, 10 to 15 per-

Ideal Land Use for Quail



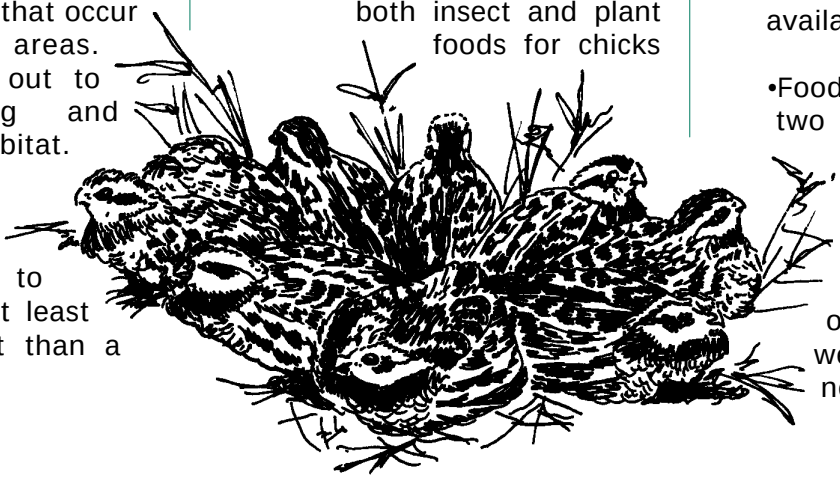
cent brushlands, and 10 to 15 percent woodlands. The more intermixed these components are, the better. These habitats must be available within one-quarter to one-half mile of each other.

The following are options to consider when managing for bobwhite quail:

•Protect any shrubby edges and waste areas that occur around farm areas. Fence livestock out to reduce grazing and improve quail habitat.

•During winter, food and cover should be next to each other, or at least no farther apart than a quarter-mile.

•Provide nesting and foraging areas by planting a warm-season grass mix of little bluestem, big bluestem, Indiangrass, and wildflowers. Orchard grass, timothy, and redtop are also good choices. Legumes and forbs (wildflowers) including sweet peas, coreopsis, hairy vetch, red clover, goldenrod, and black-eyed Susan mixed with the grasses help supply both insect and plant foods for chicks as well as overhead cover. Do not plant in areas that will be wet in the spring.

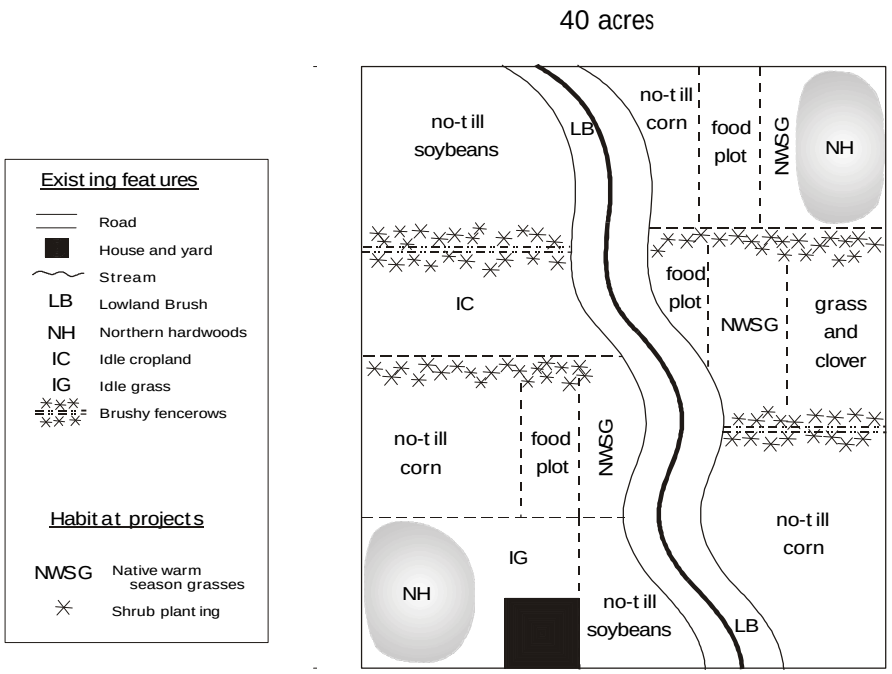


•Nesting and roosting areas should be at least 40 yards wide to make nests more difficult to find by ground searching predators.

•Connect nesting areas with a corridor which will serve as an escape route. Quail will use fencerows and ditch banks as travel lanes between nesting and feeding areas. Maintain them in tall grasses and shrubs such as intermediate wheatgrass, switchgrass, sumac, crabapple, sassafras, and silky dogwood. Corridors should be from 30 to 60 feet wide, and are most beneficial when 60 to 70 percent overhead shrub cover is present.

•Avoid the use of pesticides, if possible, because protein-rich insects are critical to the development of chicks. In order to digest their food, each day quail need to eat at least seven percent of their body weight in moisture. Green plants and insects provide moisture needs when water is not available.

•Food plots should be one to two acres in size and at least forty yards wide. Some weed control may be necessary to get the crop started but once plants are one to two feet high weed control will not be necessary.



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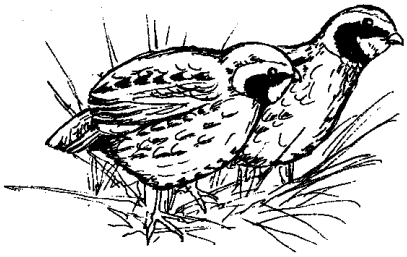
•Roosting areas should be a minimum of 40 yards wide to be of greatest value.

Other Concerns

No matter how you manage your property for wildlife, your decisions will always have impacts. For example, if you manage for grasslands to encourage pheasants, quail, and prairie songbirds, you will discourage forest-loving wildlife such as thrushes, woodpeckers and squirrels. It is important to consider surrounding habitat, and what species currently inhabit the area when deciding on your goals.

You should also be aware that creating or enhancing habitats may invite unwanted guests. For example, if you plant trees and shrubs, in the hopes of attracting wild turkey and songbirds, you most likely will also lure deer, rabbits and mice that can become a nuisance by eating the new plantings and even killing them. Free-roaming dogs and cats may also be attracted to any habitat that suddenly has an abundance of quail or other wildlife.



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EASTERN COTTONTAIL RABBITS

Found throughout the state, eastern cottontail rabbits are most common in southern Michigan landscapes with abundant edge habitat. An edge is the area where two different habitats meet, such as a field and a forest. Cottontails are edge-dependent, and they require a large mix of habitats including sparsely forested areas, brushy thickets, dry and grassy wetland edges, hayfields, grassy cornfields, brushy fencerows, and to the concern of fruit and vegetable growers, densely planted orchards and gardens.

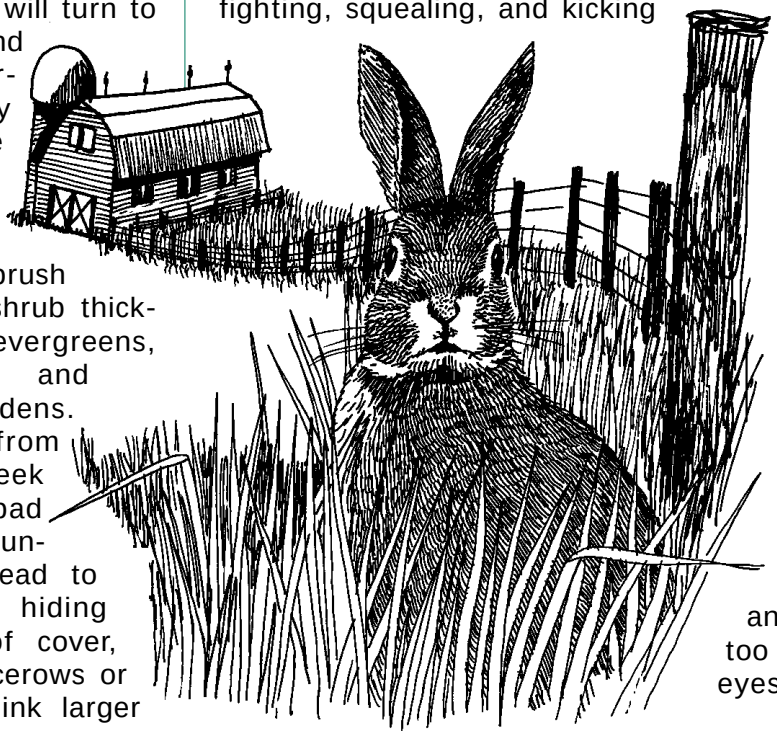
Rabbits need a good supply of food and cover throughout the year. Without an adequate source of food they will turn to landscape plants, and may cause considerable damage. They also need adequate winter and escape cover. This cover includes protected woodlots, rock or brush piles, hollow logs, shrub thickets, low-growing evergreens, woodchuck holes, and other abandoned dens. Here, they hide from predators and seek shelter from bad weather. Distinct "runways" sometimes lead to and from these hiding places. Corridors of cover, such as brushy fencerows or grassy strips that link larger habitats, will also help to increase cottontail numbers. The corridors need only be five to fifteen yards wide.

Although the cottontail's home range may vary from one to sixty acres, it is typically small, averaging six to eight acres for males and two to three acres for females. Young rabbits may move two or three miles in an effort to find suitable habitat, and once they find it they lead a fairly solitary life.

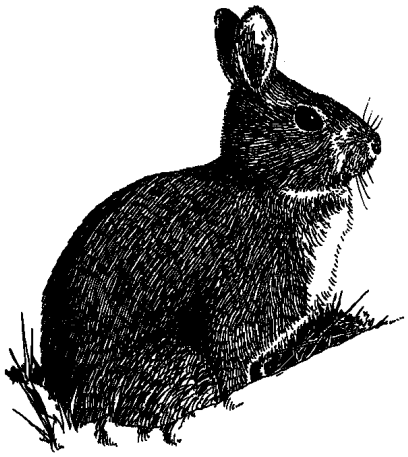
Life Cycle

Cottontails may begin mating as early as February and continue through September. Courtship is best described as a "frolic" of racing, jumping, fighting, squealing, and kicking animals. Dominant males drive off competing bucks for the right to breed. People often mistake the scattered bits of hide and fur resulting from these battles as predator kills.

Cottontail rabbits are very prolific. The average production is three or four litters a year, with four or five young per litter. However, many of these do not survive. The number of young that survive is largely a function of habitat quality; especially the availability of food and shelter within this habitat. Females typically mate again soon after their young are born. The number of times she renests is dependent upon her health and the weather.



First litters usually occur in early April in grassland areas. The mother scrapes out a nest that is four to six inches deep and three to five inches wide. She lines this small, shallow depression first with grass and then with fur from her own body. The young, which weigh only about one ounce and measure four inches in length, are born blind, naked and almost totally helpless. The offspring grow rapidly, and in only 10 or 12 days are too large for the nest. Their eyes are then open and



they begin to forage for grass, clover, and the buds, sprouts, and shoots of woody plants. Mature at four months old, some young cottontails from early litters may breed in their first year of life. Most, however, do not breed until the following spring.

Seasonal Foods

Winter

Winter is the most critical time period for rabbits. When they have to forage far, they become vulnerable to predation. The rate of exposure increases when snow covers the ground because the cottontail does not turn white in winter, as does its larger cousin the snowshoe hare.

If snowfall is persistent, rabbits must shift from tall grasses and other herbaceous foods to agricultural crops and woody foods such as raspberry twigs, stems of wild rose and the bark of sumac. Highbush cranberry, silky and gray dogwood, thornapple, and other planted shrubs will supplement their winter diet. Mixing these shrubs with spruces, junipers, jack pine, Canada yew, balsam fir, black or white spruce, hemlock, or other conifers which retain their lower branches will increase protection. Half-acre food patches of corn or grain sorghum will provide high energy food.

Spring and Summer

Cottontails are animals with constantly growing incisors specially adapted for ripping and gnawing vegetation. Opportunistic vegetarians, cottontails depend on succulent green plants for nutrition and water. However, they will also drink free-standing water when it is available.During spring and summer, their main fare is green plantlife, and they are especially fond of legumes (alfalfa, clover, peas and beans), grasses, dandelions, and domestic garden vegetables.

A mixture of legumes and grasses (timothy grass and orchardgrass), along with tall native grasses such as switchgrass provide food and cover throughout the spring and summer. Clovers such as ladino, medium red, alsike, white dutch, and sweet, mixed with grass, create optimal forage areas for rabbits as well as deer, and are also used as brood sites for pheasants, quail, turkeys, and songbirds.

Autumn

Food and cover change dramatically as the growing season wanes. Cultivated grains ripen, trees and bushes lose their leaves, and lush grasses turn brown and become less palatable causing rabbits to turn to cultivated crops of corn, soybeans, apples, and other fruits. Clovers are also a good autumn food source since they stay green late into the fall.

Brushpiles

Brushpiles provide a hiding place from ground predators (dogs, foxes, coyotes, mink, and weasels) and give rabbits thermal protection during cold weather. Brushpiles should be placed away from the tall edge of the woodlot and closer to an open food source. Doing so denies avian predators (hawks and owls) a perch from which to launch their attack.

The best brushpiles are five feet high and 15 feet wide (about the size of a small car) and have more than one entrance/exit. Build a base of large logs or stumps or use nondecaying materials such as stones, at least six inches in diameter. Criss-cross a second layer of 12-inch diameter logs, and then add a third criss-crossed layer of 6- to 10-inch

diameter logs. Brushpiles can be placed 20-30 yards apart. Succeeding layers become smaller in diameter. Built in this manner, the brushpile should last for several years. As the material decays you can add fresh layers.

For additional cover place live-lopped trees on top of the pile. Live-lopping is the practice of cutting a tree trunk on a 30-degree angle three-fourths of the way through. The tree should be growing next to the brushpile. The best candidates have large side branches and are four to eight inches in diameter. If you make the cut about three feet from the ground, the tree will fall over the brushpile. Because the tree will not be severed, its branches may continue to provide green cover for several years.

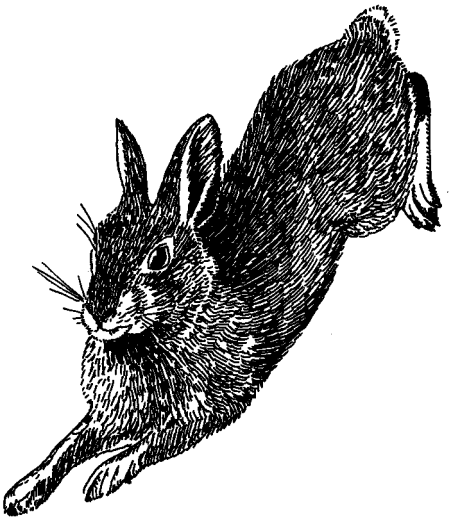
Winter is a good time to build brushpiles from tree-cutting operations on your land. The tops and branches of felled trees make for a ready supply of material. As you thin your woodlot, build a series of brushpiles on the border with an open grass field or grain field. If you don't plan to thin trees throughout the stand, consider felling those immediately next to the open area so as to create favorable edge habitat and to have materials for building brushpiles. Brushpiles in areas with dense saplings or shrubs make outstanding rabbit habitat.

Management Considerations

The following are options to consider when managing for eastern cottontail rabbits:

•Maintain a large amount of edge (a mix of woodlots, brushlands, and grasslands) as rabbits are edge-loving species.

•Provide an adequate source of year-round food (shrubs, grasses, legumes, and grain plots) next to cover (woodlots, rock or brush piles, hollow logs, shrub thickets, and low-growing evergreens).

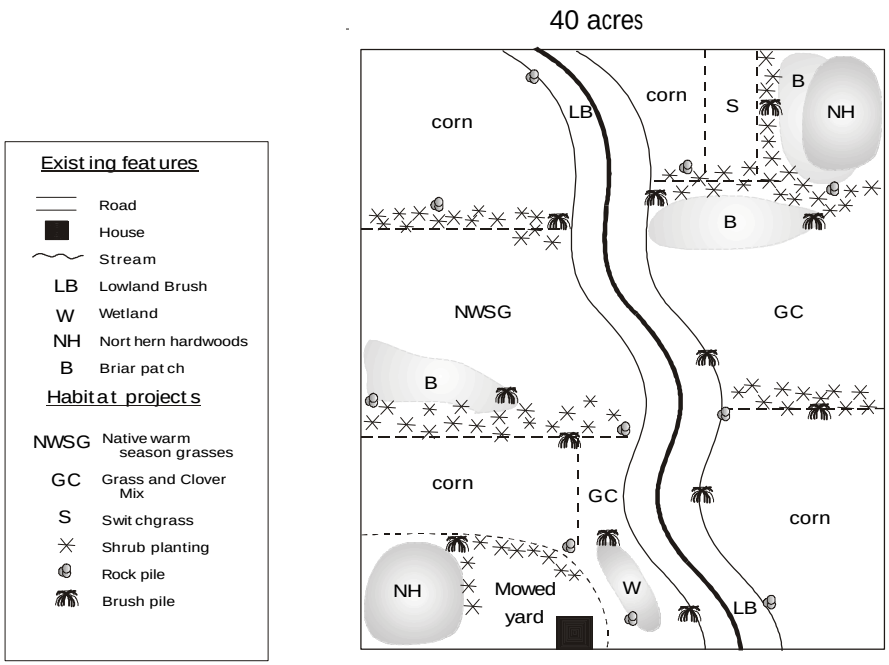


•Do not plant food patches directly next to woodlots. Instead, provide a buffer strip of shrubs between the food source and woods. Make this buffer strip at least fifty yards wide, and be sure to include some brushpiles.

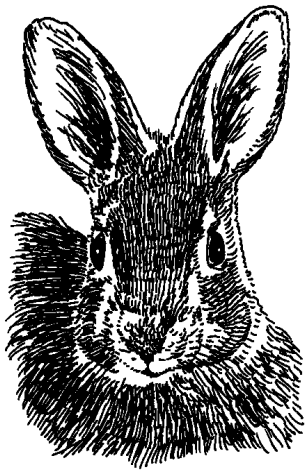
•Plant grasses at least 50 yards wide next to escape cover that contains denning sites, brushpiles, and hedgerows at least 60 feet wide. Grasses will provide food throughout the spring and summer, and if tall grass cover is available in autumn, along with a good food supply, rabbits will go into winter in healthy condition.

•Allow fallow croplands to develop brush. Croplands are not essential to rabbits; however, the habitat created by fallowed or abandoned croplands, with its briers and

Diagram of a brushpile.



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.



brambles, provide excellent habitat.

Concerns

No matter how we manage our property for wildlife, our decisions will always have impacts. For example, if you plant grasses and clovers to encourage rabbits and deer to use the habitat, you will discourage forest-loving wildlife such as thrushes, woodpeckers and squirrels. Cutting trees for brushpiles will eliminate former habitat where turkeys, squirrels, and wood thrushes once lived.

You should be aware that creating or enhancing habitats may invite unwanted guests. For example, if you plant trees and shrubs you will most likely lure deer, rabbits and mice that can become a nuisance by eating the new plantings and even killing them. Rabbits can have a tremendous detrimental impact on woody plant regeneration and establishment. Free-roaming dogs and cats may also be attracted to any habitat that suddenly has an abundance of wildlife. Rabbits are a key prey species for many predators, including these domestic pets.

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SQUIRRELS

Squirrels are wonderful subjects for nature study, photography, wildlife observation, and a favorite pursuit of small game hunters. They also inadvertently help plant forests because the nuts they bury in fall often sprout into seedlings the following spring. There are six species of squirrels in Michigan. The red and eastern gray squirrels can be found in both Michigan Peninsulas, whereas the southern flying, and eastern fox reside only in the Lower Peninsula. Lastly, the northern flying squirrel can found in the northern Lower Peninsula and entire Upper Peninsula. These squirrel species have a variety of habitats and are important parts of our natural heritage. However, this chapter will focus mainly on gray and fox squirrels.

Profiles of the Species

The **eastern gray squirrel** occupies most of eastern North America within mature mixed hard wood and conifer forests and was abundant in Michigan when the first settlers arrived. The gray squirrel has an overall silvery gray body, a generally white belly, and tail hairs that are white-tipped. Grays are eight to 10 inches long (minus the tail) and weigh up to one and a half pounds. Black squirrels are simply melanistic phases of the gray squirrels. The two commonly interbreed and litters may contain both color types. The gray squirrel lives most of its life in and around a single nest tree moving no more than 300 yards in a season and is the least social of all tree squirrels.

At one and a half to two and a half pounds, the **fox squirrel** is heavier than the gray and is also longer at 10 to 15 inches (minus the tail). The fox has a buff- to orange-colored belly, a back of tawny brown, and a long plumed tail of black-brown with rust-tipped guard hairs. Fox squirrels prefer small woodlots of mature trees throughout the Lower Peninsula. Before 1850, the fox squirrel was concentrated around grassland openings in oak forests of southwest Lower Michigan. As the forests were cleared for agriculture and timber, fox squirrels used fence rows as travel routes to expand their range. By 1925 the species was found throughout the Lower Peninsula.

Although both species eat the nuts and fruit of many trees and shrubs, rarely do fox and gray squirrels share the same habitat. Grays like dense stands of timber and will frequent river bottoms of sycamore, swamp white oak, black maple, pin oak, ironwood, and elm. Fox squirrels prefer farm country and are attracted to woodlands next to farm fields. Because of their habitat preferences, they are found in different parts of the state. Today, seventy percent of Michigan's fox squirrels live in the southern Lower Peninsula. By contrast, gray squirrels mainly live in the northern Lower Peninsula. Those that reside in southern Lower Michigan customarily do so in city parks and suburbs with mature trees.

The **red squirrel** lives throughout the state. This small species prefers a forest of conifers or conifers mixed with hardwoods, where it can find both hardwood mast (nuts) and pine seeds.

Few people have seen a **flying squirrel** because they are active only at night. Both northern and southern flying squirrels are found

Flying Squirrel

in Michigan. They are more common than many people think, especially in southern Michigan, and can be attracted to bird feeders placed in woodlots.

The northern flying squirrel thrives in heavily wooded areas containing mixed conifers and northern hardwoods having mature growth. The southern flying squirrel requires trees that produce fruit or nuts.

Life History

The life histories that follow are for fox and gray squirrels, which may live out their lives on only five to 10 acres of habitat if their needs are met. The management prescriptions below are keyed to these two species although red squirrels and flying squirrels may also benefit.

These squirrels mate from January to March and again from June to July, and the gestation period is 44 days. Females, two years of age and older, may bear two litters each year. Males begin to reproduce at 18 months old. In a typical year, about 60 percent of the fall population will be young that were born that year.

Litter size and frequency depend on available food supplies -- the less food, the fewer and smaller the litter. A typical litter contains three or four offspring. Nesting dens are found in tree cavities, which the female lines with feathers, moss, shredded bark, and other soft plant materials.

The young are born hairless with closed eyes and ears. Hair begins to grow on their back in about one week and the eyes open at 35 days. At about two months old, the young may begin exploring outside the den. At this time if the weather is warm, the female may build a leaf nest high in the tree canopy among forked branches. At three months of age, young squirrels can survive on their own, and at 18 weeks they begin building their own leaf nests. These circular leaf nests are compact and waterproof and may be built in both leaf-bearing and evergreen trees.

A Squirrel Nest of Leaves and Twigs

Squirrels forage in tree tops and on the ground. A social hierarchy determines which squirrels get the preferred foods, best nest sites, and mates. Each animal in the local population will have a rank, ranging from the dominant male and female, to the newborn. When food supplies are abundant, squirrels may feed together. During severe winter weather, some even share winter dens which means they can share body warmth. Normally, though, they gather in groups only during mating season.

Management Considerations

A consistent food supply and a selection of good den sites in mature trees will attract squirrels to your land. Although they are omnivorous and opportunistic, squirrels nevertheless have preferred foods. Important hard mast species include the nuts of white oak, red oak, black oak, beech, hickory, walnut, bur oak, pin oak, and butternut. Fox squirrels in particular like walnuts and hickory nuts. The gray squirrel's diet is more varied. Both species, however, also enjoy corn, sunflowers, and soybeans. Squirrels eat the seeds of maple, ash, and tuliptree. They like the soft mast of flowering dogwood, juneberries, thornapples, apples, seasonal mushrooms, the buds and catkins of various shrubs, green grasses, and the leaves of legumes in spring. Sometimes they will eat beetles, salamanders, bird eggs, and nestlings. When very hungry, they will consume the bark and sap of sugar maple.

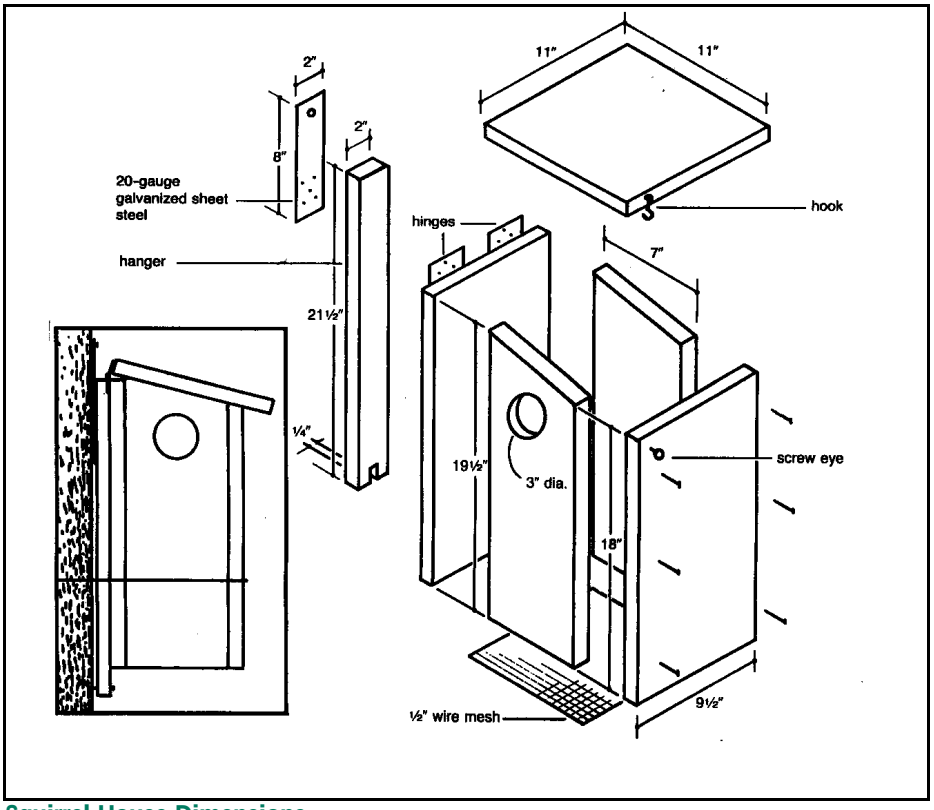
Michigan is at the squirrels' northern range, and it is not unusual for squirrels to die during especially severe winters. About 60 percent live less than one year, but this high mortality rate is also due to predation. Leaving standing corn or soybeans next to woodlots, where they can escape if danger appears, will help them get through lean times. Planting persistent fruit-bearing trees and shrubs along the sunny edge of forest openings or in woodlots will not only help squirrels but other wildlife too, such as grouse, deer, rabbits, raccoons and certain kinds of songbirds. Migrating songbirds, especially thrushes, some vireos and warblers, and finches, will feed extensively on these trees and shrubs. In a similar manner, cutting all trees greater than one inch in diameter in a 30 foot wide strip along the south or west side of a woodlot will lead to the regenera-

tion of shrubs, brush, and brambles which make outstanding habitat.

A healthy forest contains old mast-bearing trees, and younger trees just starting mast production. Older trees are more likely to provide den sites; those with cavities should be spared at the rate of one to three trees per acre. The best den sites are found in ash, beech, basswood, oak, and maple. Den trees can be created by cutting a limb six inches from the trunk or by drilling a two inch wide hole, three inches deep. If you have a choice between leaving a nut-producing den tree (oak or beech, for example) and a tree that does not produce nuts (basswood or maple), leave the nut-bearing tree and cut the non-producing tree.

If you do not have enough trees with cavities, consider building nest boxes, which squirrels will readily occupy. Use cedar, but do not use lumber that has been treated with creosote or some other decay preventive. Build the box as illustrated in the figure below. Attach the box with two aluminum nails to a healthy non-cavity tree that you don't intend to harvest. Insert one nail in the hole at the top of the galvanized strip, and insert the other in the niche at the bottom of the wooden hanger. For gray squirrels, place the box 18 to 20 feet from the ground on the east or south side of the tree. For maximum use by female fox squirrels, anchor the box under a limb high in the canopy of the tree and locate it close to a field edge.

Before cutting trees on your property, it is important to identify them and weigh their value to



Squirrel House Dimensions

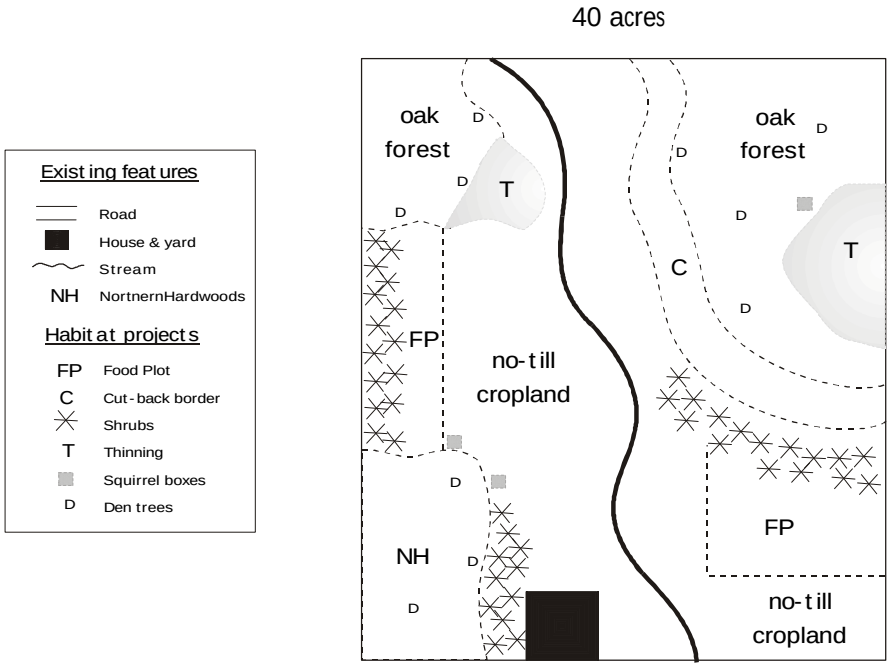
A Variety of Squirrel Foods

squirrels and other wildlife. It is possible to increase mast production if you manage any mast-bearing trees as crops. The idea is not to develop a forest where all the trees are the same age. Instead, periodic selective thinning will diversify homes for squirrels and ensure a steady food supply. A professional forester or wildlife biologist can help you make decisions that benefit wildlife on your property. Also, refer to the section on **Forest Management**.

Oak and hickory are trees that regenerate following a fire. Before the arrival of settlers to Michigan, wild fires swept across large areas, which helped promote oak and hickory regeneration. Removing 30 to 70 percent of the mature trees through selective cutting, mimics natural disturbances. However, because of the perception that fire and timber harvesting are harmful to wildlife these activities have been restricted. But in the long run we have learned that the restriction of their use has reduced the acres of oak and hickory in our state.

By removing about half of the mature trees, you will get increased regeneration of oaks and hickories, healthier trees, and earlier and more consistent seed production. Removing some weak, deformed low quality, low priority, and competing trees can produce more mast. The remaining of these trees should be left for potential den sites. If possible hard mast

SQUIRRELS



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(nuts and acorns) producing trees should be left to provide valuable mast for wildlife. Leave trees with grape vines and/or cavities for wildlife at the rate of one to three per acre. Also, establishing brush-piles will provide cover; use materials removed during improvement work. Brush piles should be at least 15 feet wide and five feet high. More information is available in the **Eastern Cottontail Rabbit** chapter.

Concerns

No matter how we manage our property for wildlife, our decisions will always have impacts. When squirrels enter homes and garages, they tend to annoy homeowners and can create health and safety problems. In farming areas, they sometimes cause damage to corn and other grain crops. Encouraging squirrels may also result in more predation of bird nests or create problems at bird feeders. Lovers of corn and sunflower seeds, squirrels will travel over a quarter-mile from den sites to backyard bird feeders. Here, they can dominate smaller wildlife and sometimes damage feeding structures and frighten away songbirds. One solution is to install squirrel guards (baffles) on the feeders; another is to offer alternative food sources.

When managing your land for squirrels will deter such species as deer and grouse, which could be considered positive or negative. However, some bird species will benefit from squirrel management -- such as pileated, red-bellied, and red-headed woodpeckers, thrushes, many species of warblers and vireos, and wild turkeys.

Because these potential problems are usually limited, most landowners welcome the squirrel as an important part of the wildlife community. They add hours of viewing pleasure to ones backyard or woodlot.

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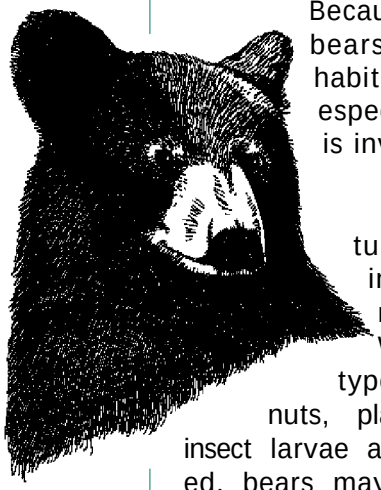
BLACK BEARS

Biologists have been researching black bear in Michigan for nearly one-half century and know more about Michigan's black bear population and distribution than many other wildlife species. Currently, Michigan contains approximately 12,000 bears statewide, with an estimated 10,000 living in the Upper Peninsula and 2,000 residing in the northern Lower Peninsula.



Black bears often appear to be much larger than they are. Females typically weigh from 100 to 250 pounds, and males vary in weight from 150 to 400 pounds. Bears are usually heaviest in late fall prior to hibernating. Although they are large, heavy mammals, bears are suprisingly good swimmers and fast runners. In Wisconsin, one 200-pounder was clocked running 33 miles per hour.

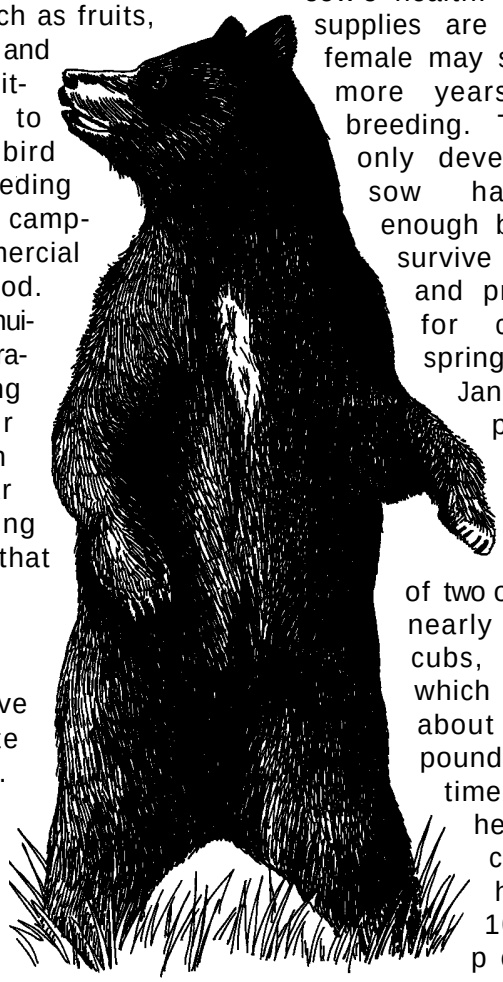
Bears are shy, reclusive animals that avoid direct contact with humans. Non-aggressive by nature, bears rarely attack people, except when threatened. In larger expansive forests, bears tend to live without conflict with humans. However, bear-human conflicts are on the rise due to habitat loss and human encroachment. The conversion of forested and wetland cover types to agriculture and other uses has forced bears to live in smaller geographic areas. Because of this, some bears have become habituated to people, especially when food is involved.

Bears are opportunistic animals taking advantage of many foods. When prime food types such as fruits, nuts, plants, and insect larvae are limited, bears may turn to garbage dumps, bird feeders, livestock feeding stations, farm crops, campgrounds, and commercial bee huts to find food. When this occurs, bear-nuisance complaints rise dramatically. Managing for bears on your property may lessen these human-bear conflicts by providing the natural foods that they need.

Life Cycle

Black bears leave their dens in late March into late April. The breeding season begins in late May and lasts through early July. Females are usually capable of reproducing by age four, and they may breed with several males to ensure conception. By early fall, females begin searching out potential denning sites, which they will enter from mid-October to December. Black bears spend four to seven months of each year in their dens.

Females (sows) produce a litter every other year, depending on food availability and each sow's health. When food supplies are short, the female may skip two or more years between breeding. The fetuses only develop if the sow has stored enough body fat to survive over-winter and provide milk for cubs until spring. By late January most pregnant females have given birth to an average of two or three blind, nearly naked cubs, each of which will weigh about a half-pound. By the time she leaves her den, the cubs will have gained 10 to 12 pounds,



depending on the number of cubs. They will remain with their mother for 1 1/2 years.

In Michigan, den sites are typically brushpiles, open nests, or excavations under standing trees. An open nest is created by bears breaking off twigs or branches for a base and then adding grass, tree bark, and leaves for bedding. Bears will also hibernate in caves, rock crevices, burrows, slash piles, windfalls, and other forest debris. Bears have even been known to den in old beaver houses, road culverts, and basements of abandoned homes.

Seasonal Foods

After emerging from their dens in spring, often lethargic at first, bears turn to small wet areas with vernal ponds. Here they feed on lowland swamp grasses such as bluejoint reedgrass, fowl mannagrass, wild calla, skunk cabbage, jack-in-the-pulpit, clover, and some ferns. In June and early July, when vegetation growth has slowed, bears spend much of their time feeding on ants in logs and stumps, which they find in upland forest openings. They gain weight slowly in spring and early summer. Resting habitats are primarily in upland areas in close association with lowland feeding and escape covers.

In the breeding season, bears begin to look for wild strawberries, raspberries, blackberries, blueberries, thimbleberries, serviceberries, and wild sarsaparilla. These plants thrive in open areas such as clearcuts, abandoned apple orchards, logging roads, rights-of-way, and regenerated openings within hardwood stands.

As summer deepens into fall, bears turn to dogwood berries, pin cherries, chokecherries, acorns, beechnuts, and apples. Weight gain becomes more dramatic because soft mast is high in sugars and carbohydrates, and hard mast is high in fats and protein. These foods allow bears to recover energy deficits that occur in winter and spring. When necessary, bears will also feed on deer fawns, calves of elk and moose, and other weak mammals.

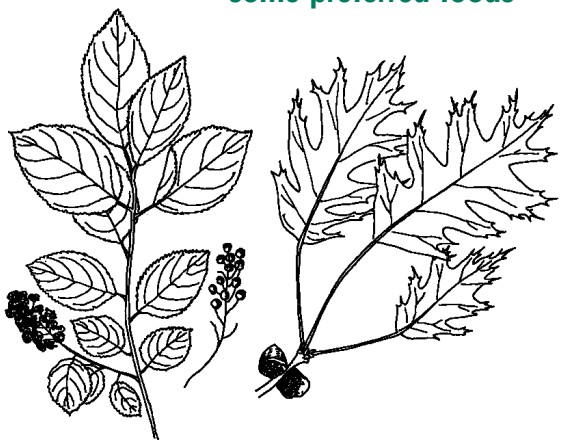
Water must be readily available and well distributed thoughout the year. Black bears drink frequently when feeding on vegetation, nuts, or insects but seldom when eating berries. They wallow to cool off on hot days. Wetlands and wooded stream bottoms provide relief from heat, as well as important seasonal foods and denning sites. Bears use wetlands dominated by balsam fir, black spruce, and tamarack year-round. In the northern Lower Peninsula researchers found 68 percent of den sites in conifer-dominated wetlands, and the same preference is probably true in the Upper Peninsula.

Management Considerations

The home range of the black bear is dependent upon natural food availability, which itself is linked to climate, soil, and topography. Breeding success is also a function of habitat quality. Optimal bear habitat contains unfragmented swamps mixed with upland forests and forest openings. Forest openings are small clearings with plenty of edge and non-forest plant diversity. Bears use these open areas throughout the year for feeding.

Within your forest it is important to maintain both closed and open canopies. Closed canopies (close-growing

some preferred foods



trees whose thick crowns block sunlight) provide important security and escape cover for bears. Open canopies (trees which allow sunlight on the forest ground) support a dense understory that produces berries and other fruit. The understory will be dense with fruiting shrubs and there will be plenty of hard and soft mast food reserves. This combination of adequate food and inaccessible terrain typically includes a large geographic area. When food is not available, bears will wander great distances to find it.

The following are options to consider when managing habitat for black bears:

•Do not fragment woodlands with roads, trails, and homes. Bears prefer connected habitats.

•Maintain diverse forests of many age classes in close proximity, and thin pine stands as they mature to enhance fruit production of understory shrubs.

•Maintain important diversity of plant types and increase or maintain the abundance of key foods. This can be done with responsible logging practices.

•Manage timber cutting rotations in hardwood stands of 60 years or more, or use selective cutting.

•Encourage the growth of both soft mast (blueberries, raspberries, wild grapes, chokecherries) and hard mast (red and white oak acorns, beechnuts, and hickory nuts) food types. Leave downed logs to decay and produce grubs and insects.

•Protect large eastern white pine and eastern hemlock trees in excess of 20 inches in diameter 4 1/2 feet above the ground. Sows with cubs rely on these trees with their rough bark to help cubs escape danger.

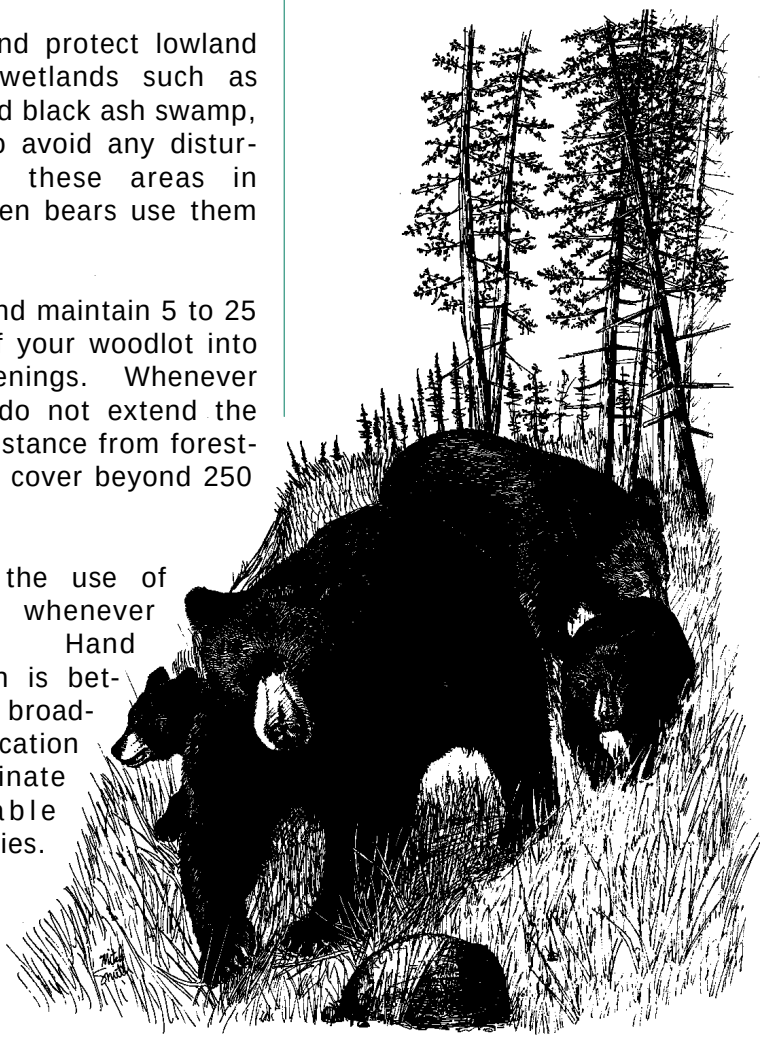
•Retain and protect lowland forested wetlands such as conifer and black ash swamp, and try to avoid any disturbance of these areas in spring when bears use them the most.

•Create and maintain 5 to 25 percent of your woodlot into forest openings. Whenever possible, do not extend the farthest distance from forested escape cover beyond 250 yards.

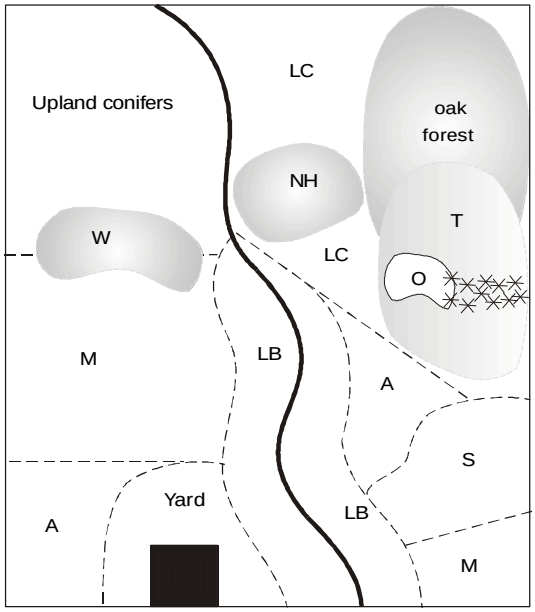
•Restrict the use of pesticides whenever possible. Hand application is better than broadcast application to eliminate undesirable plant species.

•Gate, or otherwise close timber roads and skid trails to human access and revegetate with clover and appropriate grasses as soon as possible. Please see the chapter on **Forest Openings**.

In summary, bears and humans can live without conflict if large expansive forests and swamps are left unfragmented and food producing forest openings are maintained. It is important not to artificially feed bears and attempt to bring them around your house. They are a species that you can share your land with but should be admired from afar.



160 acres



Existing features

- Road
- House
- Stream
- LB Lowland Brush
- NH Northern Hardwoods
- W Wooded Wetland
- LC Lowland Conifers
- M Mature Aspens

Habitat projects

- T Oak Thinning
- O Opening
- Brushy shrubs
- A Aspen clearcut
- S Aspen saplings

This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

FOR ADDITIONAL CHAPTERS CONTACT:
Michigan United Conservation Clubs
PO Box 30235
Lansing, MI 48909
517/371-1041
MUCC

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

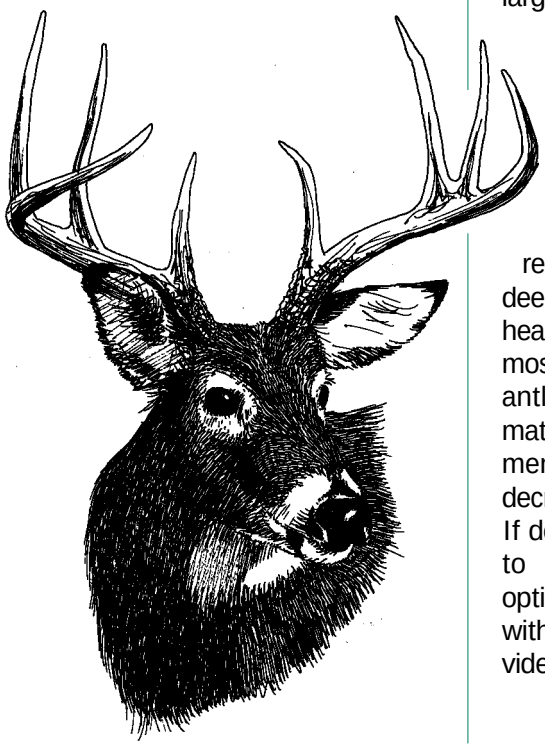
Private Land Partnerships: This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this guide provides you with the knowledge and the motivation to make positive changes for our environment.

FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

WHITE-TAILED DEER

White-tailed deer live in every county in Michigan and use many different habitats across the state. Their ability to use a variety of habitats was one of the factors that allowed the deer herd to grow from a half million animals in 1972 to nearly two million in 1989. To outdoor enthusiasts who watch or hunt deer, this is exciting. However, to others, deer are considered to be a management problem. For instance, many areas of the state are overpopulated with white-tailed deer and for some farmers, fruit growers, and rural landowners, high numbers of white-tails pose an economic problem. They may also have a tremendous negative impact on our plant communities. Therefore, as deer populations increase, there is an inevitable result of habitat deterioration, lowered deer production and health, and frequent deer die-off. Too many deer also make for unsafe driving conditions. Thus, consider these negative impacts before deciding to manage for deer. Remember that your decisions will affect not only yourself, but also your neighbors.



To effectively manage the entire population of white-tailed deer in your area, you would need 600 to 3000 acres. However, if you would like to attract deer to your area you can do this with a minimum of 10 to 20 acres. The number of deer in an area depends on the kind and quality of habitat available, and the rate of deer loss. Currently, there is an annual surplus of deer because there is a large amount of quality habitat.

Since adult deer have few natural predators, harvesting deer through hunting helps to keep the herd in balance. A deer herd can increase rapidly, therefore, it is necessary to remove at least one- quarter of the deer herd each year to maintain a healthy and stable population. In most cases, half of these deer are antlerless. In addition, managing mature forests and discouraging fragmentation will help control or decrease deer numbers in your area. If deer are a problem, you may want to consider these management options. You may also wish to consult with a wildlife biologist who can provide guidance with this problem.

Deer Habitat

Deer thrive best in areas with young forests and brush where they feed on buds, branches, fresh grass, and green leaves that are close to the ground. In an older forest, these resources are not within their reach. If a forest stand is too old to support deer, quality habitat can be created by logging and developing forest openings. If existing habitat is fields, croplands, marshes, or other young cover types, deer habitat improvement may involve the planting of grasses, trees, shrubs, or annual food plots.

It is important to note that habitat needs for whitetails vary by season and area of the state. Deer, in different parts of Michigan, use different types of cover. In northern Michigan, deer may use a conifer swamp during cold winter days and venture out to feed on brush and young trees during milder days. Farmland deer may bed in woodlots, protect their fawns in cattail marshes, and feed in corn fields. Suburban deer may bed in cemeteries, graze on golf courses, and seek cover on a brushy hillside behind a shopping center.

Spring and Summer

When spring arrives, deer are looking for green growth to help them recover from limited and low-quality winter food. Deer feed throughout the early morning and spend the rest of the day bedded down along the edge of a field or in heavy cover such as cattail swales. They feed again from dusk until midnight spending

the remainder of the night resting in seclusion.

During spring and summer, it is important to have fields that green up early. They favor early growing grasses and legumes such as Canada wild-rye, June grass, orchard grass, blue grass, timothy, and clovers like medium-red, alsike, and ladino.

Because of the lower nutrient value of winter foods, it is important for does to increase their nutrient intake in spring to prepare for fawning. Improved nutrition promotes healthier fawns and better antler growth. Mineral blocks placed near field edges can be beneficial only if quality spring food is available.

During late May and early June, does enter the period when birthing and raising this year's fawns are their primary focus. Michigan deer are very productive animals. More than 90 percent of the adult does become pregnant, and most carry twins. The herd size may increase at an average annual rate of 20 to 30 percent. In some areas, the population may double in three years.

During summer, food is much more abundant than at other times of the year. Summer foods include leaves of select trees and shrubs such as aspen, red maple, white ash, blackberries, dogwoods and sassafras. Important grasses for food include orchard grass, timothy, blue grass, redtop, wheat, and oats. Deer also eat agricultural crops of corn, soybeans, buckwheat, clovers, and alfalfa. Common ragweed, lamb's quarter, jewelweed, orchids, garden vegetables, and ornamentals are also heavily grazed.

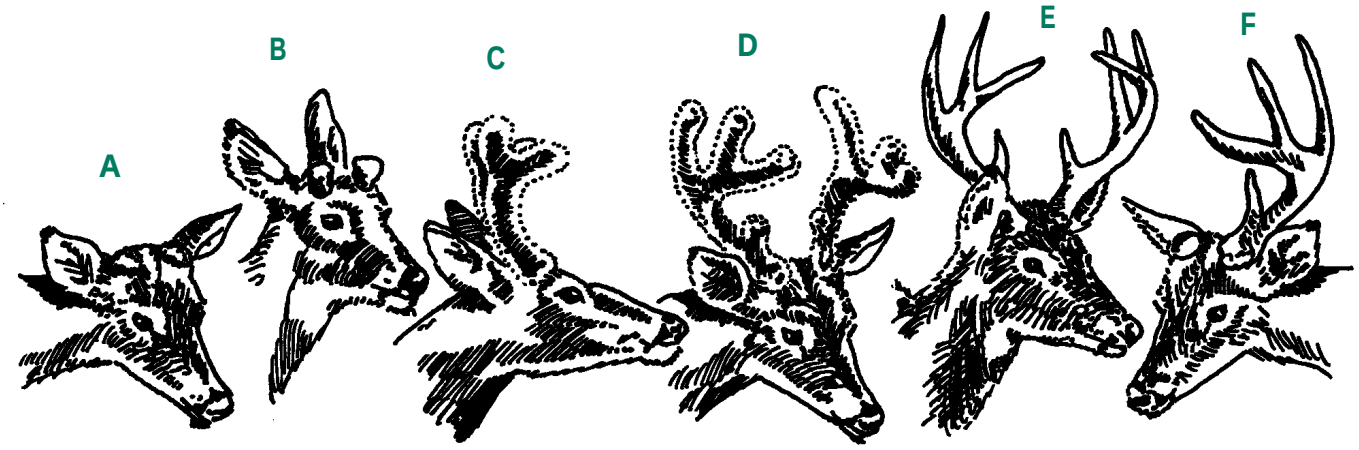
Autumn

The major activity for deer in autumn is breeding. During this time deer move considerable distances as part of their breeding behavior and in response to changes in food supplies. Autumn nutrition is important to deer since their physical condition as they approach winter has a strong bearing on their survival. During this period, deer must build fat reserves to help them survive. Fall foods must be abundant and high in nutritional value. Important foods include acorns, beech nuts, crabapples, maple and dogwood leaves, willow, and brambles. Preferred agricultural crops include corn, soybeans, apples, and fall-planted grains such as wheat.

Vegetative cover used during autumn is similar to that used during summer months. Open areas are used during the night, while in daytime brushy areas are preferred. Standing corn is not only a high quality food source, it is also often used during the fall as escape cover, as well as travel and resting sites. Quality fall cover includes cattail swales, standing corn, switchgrass fields, and plantations of young pines 10 to 20 years old.

Winter

Winter is the most critical season of the year. Deer mortality can be excessive if food and thermal cover are inadequate. Winter losses in local areas can range from as low as five percent in quality food areas to 50



(A) January 30 — Recently shed, pedicles healing.
(B) March 15 — New antler growth beginning.
(C) May 1 — Antlers begin to branch
(D) June 30 — All tines are formed, growth will continue until velvet is shed.
(E) September 15 — Antlers fully developed.
(F) January 15 — Antler shedding occurs.

percent where food resources are severely restricted. Winter mortality depends on winter severity, and quality and quantity of available food.

During winter, protection from the cold and wind is important. Cover can be provided by hardwood and conifer swamps, brushy areas, and dense switchgrass or pines. Swamp conifers and hemlock are important because they help slow the wind and serve as thermal cover. Three to 10 acre dense plantations of spruce or Jack pine, 10 to 25 feet tall, also provide beneficial winter cover.

Important winter food sources include white pine, white cedar, red maple, yellow birch, dogwood, viburnum, sumac, and aspen. Since the major food during this season is woody browse, branches, buds, and leaves must be within reach to provide benefits. These foods are abundant in wooded areas that have had recent logging activity.

Deer movements during the winter months decrease and they may spend most of their time near winter cover. It is important that they find food within one-quarter mile of this cover. In areas of adequate soil quality and growing season length, agricultural crops planted near winter cover are of considerable value.

Management Activities

The following are options to consider when managing for deer:

•*Aspen management:* Clearcut one to ten acre areas on a rotating basis so that the overall stand has a chance to regenerate every 40 years. These cuttings should be at least 100 feet wide, irregularly shaped to provide maximum edge, and well distributed to prevent an over-concentration of deer. The goal is to conduct one or two cuttings within every 40 acres of forest, every ten years. For maximum regeneration, cut the trees in winter. To provide escape cover, leave clumps of aspen or other tree species within clearcuts larger than 15 acres. Also spare one to three standing dead or dying trees per acre because these provide den sites for wildlife.

•*Oak management:* Manage the stand for full crowns and reduced competition from other trees. Thinning oak and beech stands allow the remaining trees to grow into large, more consistent nut-producing trees as well as promoting new growth. Thin 20 - 50% of the canopy every 10 - 20 years. This management option is optimal for areas with lower populations of deer since areas with high populations will have less regeneration because of heavy browsing on saplings.

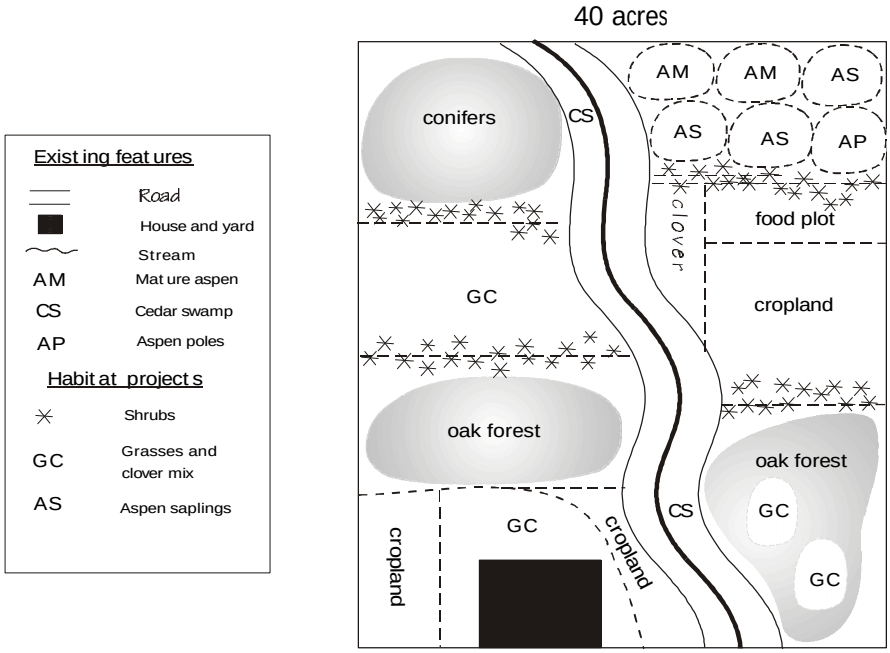
•*Northern forest management (hemlock and white cedar)*: Cutting in these areas is discouraged. These tree species have dif-ficulty regenerating when heavily browsed. The best habitat contains 70 percent canopy closure. These conditions reduce ground-level snow accumulations, provide warmer nighttime temperatures, and decrease wind chills. Deer are able to subsist on the choice woody browse within such stands.

Deer food: Aspen leaves and branches, acorns, and crabapples

•*Grassland management:* Maintain areas one to five acres in size per 40 acres. Openings should be at least 100 feet wide and irregularly shaped. Once established, openings should be maintained by mowing or burning. Plant high quality travel corridors of trees, shrubs, or grasses for food and cover. Plant early growing grasses for spring food near woods, fencerows, wetlands, and brushy areas. These fields should be 1 to 5 acres in size and at least 60 feet wide. Fields on east- or south-facing slopes are preferred since they are likely to green up earlier. Ideal fawning areas consist of grassy areas located next to forest edges, with heavy, concealing ground cover. Fawning areas produce higher quality forage if mowed and fertilized in August every third year.

Techniques to Deter Deer

Where deer are considered a nuisance because of crop damage, many



This map is an example that demonstrates the many management options discussed throughout this chapter. The option(s) you choose should depend not only on your goals, but the location, condition, and present use of your land.

techniques can be practiced to protect crops or reduce crop losses. Planting lure crops of buckwheat, turnips, clover, corn, or soybeans on idle land, or set-aside lands may encourage deer to eat less crops designated for harvest. Plant these lure crops between major woodlands and production fields. Increasing woodland foods may also deter deer from your crops. Although there are some habitat changes and crop management techniques that reduce crop loss to deer, hunting is the most effective and least expensive way to control crop damage.

There may be special hunting permits available for landowners with extensive deer problems. These permits may be obtained by landowners with documented cases of agricultural and horticultural damage. Other permits may be obtained by landowners in areas with documented deer diseases that affect livestock, human health, the welfare of the deer herd or an area of serious deer over population. These special permits may be used to harvest antlerless deer only, and do not count against a hunter's regular bag limit.

In summary, it is relatively easy to attract deer to your property. However, it is difficult for a landowner to manage an entire population. Remember, if you attract deer, there are negative impacts that may occur not only to your land but the surrounding. Choose your management options carefully to either maintain, increase, or decrease deer on your property.

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RECOMMENDED READINGS

The following is a list of books, magazines, bulletins, and journals that provide additional information on the various subjects presented in this manual. Books marked with an asteric (*) are highly recommended.

Books

Landscapes and Ecosystems

Environmental Restoration: Landscape, by F.A. Cerver (Arco Editorial, 1996).

Landscape Restoration Handbook (Lewis Publishers, 1993).

Wildlife and Habitats in Managed Landscapes (Island Press, 1991).

Forests

Conifers: The Illustrated Encyclopedia, by D.M. vanGelderen (Timber Press, 1996).

Managing Small Woodlands for Wildlife (Cornell University, 1979).

*Michigan Trees, by B. Barnes and H. Warren (University of Michigan Press, 1984).

Northwoods Wildlife, by J.M. Benyus (Northword Press Inc., 1989).

Trees of the Central Hardwood Forests of North America: an identification and cultivation guide, by D.J. Leopold (1998).

Wetlands

Freshwater Marshes, by M.W. Weller (University of Minnesota Press, 1994).

*Living With Michigan's Wetlands: A Landowner's Guide, by W. Cwikiel (Tip of the Mitt Watershed Council, 1996).

The Natural Water Garden, by ED. C.C. Burrell (Brooklyn Botanical Garden, 1997).

Plants in Wetlands, by C.B. Redington (Kendall/Hunt Pub. Co., 1994).

*The Pond Doctor, by H. Nash (Sterling Publication Co., Inc., 1994).

Walking the Wetlands, by J. Lyons and S. Jordan (John Wiley and Sons Inc., 1989).

Wetlands, by W. Mitsch and J. Gosselink (Van Norstrand Reinhold, 1993).

Grasslands

*Grasses. An Identification Guide, by L. Brown (Houghton Mifflin Co., 1979).

Planting Grasslands for Wildlife Habitat, by M.I. Meyer (U.S. Fish and Wildlife Service, 1987).

The Prairie Garden, by R.I. and B.S. Smith (University of Wisconsin Press, 1980).

Prairie Plants of the Midwest: identification and ecology, by R.R. Kirt (Stipes Publications, 1995).

The Shortgrass Prairie, by R.C. Cushman and S.R. Jones (Pruett Pub. Co., 1989).

*Tallgrass Restoration Handbook, by ED. S. Packard and C.F. Mutel (Island Press, 1997).

Wildflowers of the Tallgrass Prairie, by S.T. Runket and D.M. Roosa (Iowa State University, 1989).

Croplands

Agriculture and Wildlife Management, by A.N. Moen (Corner Brook Press, 1983).

Conservation on Your Own: How to Plant and Maintain a Field Windbreak, by USDA Soil Conservation Service, 1990.

Backyard Habitat

*Attracting Backyard Wildlife: A guide for nature lover's, by Bill Merilees (Voyager Press, 1989).

Conservation on Private Lands: An Owner's Manual, by ED. C.E. Hunt (World Wildlife Fund, 1997).

Gardening for Wildlife, by C. Tufts and P. Loewer (Rodale Press Inc., 1995).

Gardening Success with Difficult Soils, by Scott Ogden (Taylor Pub. Co., 1992).

*Landscaping for Wildlife, by Carrol L. Henderson (Minnesota DNR, 1987).

Landscaping With Nature: using nature's design to plan your yard, by J. Cox (Rodale Press Inc., 1991).

Natural Gardening, by J. Knopf et al. (Weldon Owen Pty Limited, 1995).

The Natural Habitat Garden, by Ken Druse (Clarkston N. Potter, 1994).

The Wildlife Garden. Planning Backyard Habitats, by Charlotte Seidenberg (University Press of Mississippi, 1995).

*The Wildlife Gardener, by John V. Dennis (Alfred A. Knopf Inc., 1985).

Wildlife in Your Garden, by Gene Logsdon (Rodale Press Inc., 1983).

Your Backyard Wildlife Year, by Marcus Schneck (Rodale Press, 1996).

Wildflowers, Shrubs, and Trees

*American Wildlife and Plants. A Guide to Wildlife Food and Habits, by A. Martin, H. Zim and A. Nelson (General Publishing Co., 1951).

Flowers For All Seasons, by J. Cox and M. Cox (Rodale Press Inc., 1987).

Fruit Key and Twig Key to Trees and Shrubs, by W.M. Harlow (Dover Publications, Inc., 1946).

A Gardener's Encyclopedia of Wildflowers, by C.C. Burrell (Rodale Press Inc., 1997).

A Guide to Enjoying Wildflowers, by D.W. Stokes and L.Q. Stokes (Little, Brown & Co., 1985).

*The Hillier Gardener's Guide to Trees and Shrubs, by ED. John Kelly (The Reader's Digest Association, Inc., 1997).

The Hillier Book of Tree Planting and Management, by K. Rushforth (David and Charles, 1987).

The Illustrated Book of Wildflowers and Shrubs, by W.C. Grimm (Stackpole Books, 1993).

Landscaping With Wildflowers, by Jim Wilson (Houghton Mifflin Co., 1992).

Lawns, Grasses and Groundcovers, by L. Hill and N. Hill (Rodale Press Inc., 1995).

Michigan Flora (3 volumes), by E.G. Voss (Regents of University of Michigan, 1997).

Butterflies and Hummingbirds

The Audubon Society Handbook for Butterfly Watchers, by R.M. Pyle (Charles Scriber's Sons, 1984).

Butterflies and Moths, by J. Brewer and D. Winter (Prentice-Hall Inc., 1986).

Butterflies-how to identify and attract them to your garden, by M. Schneck (Rodale Press Inc., 1990).

Butterfly Gardens: luring nature's loveliest pollinators to your yard, by A.C. Lewis (Brooklyn Botanic Garden, 1995).

The Butterfly Garden, by M. Tekulsky (Harvard Common Press, 1985).

How to Attract Hummingbirds and Butterflies, by J. Dennis and M. Tekulsky (Ortho Books, 1991).

Hummingbirds: A Wildlife Handbook, by Kim Long (Johnson Books, 1997).

Birds

*The Atlas of Breeding Birds of Michigan, by R. Brewer, G. McPeek, and R. Adams Jr. (Michigan State University Press, 1991).

The Audubon Society Guide to Attracting Birds, by S.W. Kress (Scribner, 1985).

The Birdfeeder Book: an easy guide to attracting, identifying, and understanding your feeder birds, by D. Stokes and L. Stokes (Little, Brown & Co., 1987).

The Birds of Michigan, by ED. G.A. McPeek (Indiana University Press, 1994).

The Bird Table Book, by T. Soper (David and Charles, 1986).

Garden Birds of America, by G.H. Harrison (Willow Creek Press, 1996).

Making Birdhouses and Feeders, by C.R. Self (Sterling Pub. Co., 1985).

National Audubon Society North American Birdfeeder Handbook, by R. Burton (Houghton Mifflin Co., 1995).

Wildlife

*Amphibians and Reptiles of the Great Lakes Region, by J. Harding (University of Michigan Press, 1997).

Endangered and Threatened Wildlife of Michigan, by D. Evers (University of Michigan Press, 1997).

*Mammals of the Great Lakes Region, by Allan Kurta (University of Michigan Press, 1995).

Michigan's Turtles, by J.A. Holman and J.H. Harding (Stone Printing Co., 1977).

The National Wildlife Federation's Wildlife Watcher's Handbook: A Guide to Observing Animals in the Wild, by J. La Tourette (Henry Holt, 1997).

Reptiles of North America, by H.M. Smith and E.D. Brodie Jr. (Golden Press, 1982).

Understanding the Michigan Black Bear, by R.P. Smith (Smith Publications, 1995).

The Wildlife Observer's Guidebook, by C.E. Roth (Prentice-Hall Inc., 1982).

*Woodworking for Wildlife, by C.L. Henderson (Minnesota DNR, 1992).

Field Guides

A Field Guide to Wildlife Habitats of the Eastern United States, by Janine Benyus (Fireside Books, 1989).

A Field Guide to Your Own Back Yard, by J.H. Mitchell (W.W. Norton and Co., 1985).

The National Audubon Society Field Guides: including Birds-Eastern Region, Butterflies, Insects and Spiders, Mammals, Reptiles and Amphibians, Rocks and Minerals, Tree-Eastern Region, Weather, and Wildflowers-Eastern Region. Various authors (Alfred A. Knopf).

*Newcomb's Wildflower Guide by Laurence Newcomb (Little, Brown and Co., 1997).

*The Peterson Field Guide Series including Birds, Butterflies, Mammals, Animal Tracks, Trees and Shrubs, Reptiles and Amphibians, Wildflowers, Insects, Bird's Nests, Edible Wild Plants, and Atmosphere. Various authors (Houghton Mifflin Co.)

Magazines

The following is a list of magazines that are published regularly and may be obtained either through subscription or at the local library.

American Agriculturist
P.O. Box 37191
Boone, IA 50037

American Forests
910 17th St. NW Suite 600
Washington D.C. 20006

The American Gardener
7931 E. Boulevard Dr.
Alexandria, VA 22308-1300

Audubon
P.O. Box 52529
Boulder, CO 80322

Bird Conservation
1250 24th St. NW Suite 400
Washington D.C. 20037

Fine Gardening
63 S. Main St. P.O. Box 5507
Newton, CT 06470-9846

Fisheries
5410 Grosvenor Lane Suite 110
Bethesda, MD 20814-2199

The Gardener
TGOA/MGCA
5560 Merle Hay Rd.
Johnston, IA 50131

Gardens Illustrated
3330 Pacific Ave. Suite 404
Virginia Beach, VA 23451-2983

Michigan Out-of-Doors
Michigan United Conservation Clubs
2101 Wood St.
Lansing, MI 48912

RECOMMENDED READINGS

The Nature Conservancy
4245 N. Fairfax Dr.
Arlington, VA 22203

Pheasants Forever
P.O. Box 75473
St. Paul, MN 55175

Quail Unlimited
National Headquarters
P.O. Box 10041
Augusta, GA 30903-2641

Ruffed Grouse Society
451 McCormick Road
Coraopolis, PA 15108

Turkey Call
P.O. Box 530
Edgefield, SC 29824

Bulletins and Journals

Agriculture Ecosystems and Environment
Elsevier Science
P.O. Box 945
New York, NY 10159-0945

Agronomy
American Society of Agronomy
677 S. Segoe Rd.
Madison, WS 53711

American Fisheries Society
5410 Grosvenor Lane Suite 110
Bethesda, MD 20814-2199

Biological Conservation
Elsevier Science
P.O. Box 945
New York, NY 10010

Conservation Biology
Journals Subscription Dept.
Blackwell Science Inc.
Commerce Place
350 Main St.
Malden, MA 02148

Ecology
Ecological Society of America
Member and Subscriber Services
2010 Massachusettes Ave.
NW Suite 400
Washington D.C. 20036

Endangered Species Update
School of Natural Resources
The University of Michigan
Ann Arbor, MI 48109-1115

The Great Lakes Bulletin
Michigan Land Use Institute
P.O. Box 228 845 Michigan Ave.
Benzonia, MI 49616

Journal of Forestry
5400 Grosvenor Lane
Bethesda, MD 20814-2198

Journal of Soil and Water Conservation
7515 NE Ankeny Rd.
Ankeny, IA 50021-9764

Michigan Birds and Natural History
MAS/Michigan Birds
6011 W. St. Joseph Suite 403
P.O. Box 80527
Lansing, MI 48909-0527

Michigan Forester Bulletin
Society of American Foresters
5400 Grosvenor Lane
Bethesda, MD 20814-2198

The Wildlife Society Bulletin
5410 Grosvenor Lane
Bethesda, MD 20814-2197

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CONSERVATION ORGANIZATIONS

Private Conservation Organizations

Ducks Unlimited, Inc.
Great Lakes/Atlantic Region
331 Metty Dr. #4
Ann Arbor, MI 48130
Telephone: 734-623-2000
Fax: 734-623-2035
Ducks Unlimited, Inc. is a private, nonprofit organization dedicated to conserving wetland habitat for waterfowl and other wildlife. The mission of Ducks Unlimited is to support the habitat needs of North America's waterfowl and other wildlife by protecting, enhancing, restoring, and managing important wetlands and associated uplands.

Michigan Association of Conservation Districts
101 S. Main, P.O. Box 539
Lake City, MI 49651-0539
Telephone: 616-839-6161
Fax: 616-639-3361
E-mail: mdistricts@aol.com
Website: www.mcad.org
The Michigan Association of Conservation Districts has a conservation office serving each of Michigan's 83 counties. For wildlife habitat management assistance on your property, including tree and shrub planting, native plant recommendations, wetland restoration, or other assistance, call the MACD main office at (616) 839-6161. We can put you in contact with the local office and cotact person for your area.

Michigan Audubon Society
6011 W. St. Joseph Hwy.
Lansing, MI 48917
Telephone: 517-886-9144
Fax: 517-886-9466
Michigan Audubon Society is a nonprofit organization that promotes the awareness, understanding, enjoyment, and stewardship of the environment and natural resources of the upper Great Lakes region by educating the public, supporting ecological research, maintaining sanctuaries, and by taking part in appropriate advocacy to protect the environment, with an emphasis on birds and their habitats.

Michigan Duck Hunter's Association
7220 Green Valley Drive
Grand Blanc, MI 48439
Telephone: 810-694-2751
Fax: 810-694-0198
Michigan Duck Hunter's Association works for the protection and restoration of wetlands, with an emphasis on waterfowl habitat.

Michigan State University Extension Office
48 Agricutural Hall
East Lansing, MI 48824
Telephone: 517-355-2308
Located in each Michigan county, these offices are listed in your local telephone book under County government as MSU Extension Office or Cooperative Extension Office. The offices provide helpful information and assistance to landowners on fish, wildlife, soil, habitat and many other related issues.

Michigan Sharptailed Grouse Association
11237 Geddes Road
Freeland, MI 48623
Telephone: 517-781-0809
The gradual disappearance of grass and brush land ecosystems threatens not only Michigan's sharptails, but also many other bird, plant, and animal species. The loss of these unique environments reduces ecological diversity and diminishes the range of outdoor experiences for Michigan citizens. The Michigan Sharptailed Grouse Association was formed to protect and restore these precious resources for present and future generations.

Michigan Trappers Association
440 Pritchardville
Hastings, MI 49058
Telephone: 616-945-9218
The purpose of Michigan Trappers Association Inc., is to promote sound conservation legislation and adminintrative procedures; to save and faithfully defend from waste the natural resources of Michigan; to promote sound environmental education programs; and to promote a continued annual fur harvest using the best tools presently available for that purpose.

Michigan United Conservation Clubs
2101 Wood Street
P.O. Box 3023 Lansing, MI 48909
Telephone: 517-371-1041
Michigan United Conservation Clubs is a statewide organization dedicated to furthering and advancing the cause of the environment and conservation in all phases and to promoting programs designed to educate citizens in natural resource conservation and environmental protection and enhancement.

Michigan Wildlife Habitat Foundation
6425 S. Pennsylvania, Suite 9
Lansing, MI 48911-5975
Telephone: 517-882-3110
Fax: 517-882-3687
E-mail: wildlife@mwhf.org
Website: www.mwhf.org
Michigan has suffered enormous changes since settlement- loss of wetlands, water pollution and the degradation of productive wildlife habitats. We in the Foundation resolve to bequeath future generations a world full of natural experiences. To do so will require the reversal of many detrimental changes and the restoration of degraded fish and wildlife habitats. We will endeavor to complete worthwhile habitat improvement projects in a cost-effective manner. We will utilize volunteers in unique ways and form innovative partnerships to work for wildlife.

Through the Michigan Wildlife Habitat Foundation citizens have the opportunity to restore degraded habitats and provide living space for the wild creatures that enrich our lives. The Foundation specializes in helping private landowners to realize their wildlife management objectives.

National Wildlife Federation
Great Lakes Natural Resource Center
506 East Liberty, 2nd Floor
Ann Arbor, MI 48104-2210
Telephone: 734-769-3351
Website: www.nwf.org./greatlakes
The Great Lakes Natural Resource Center unites people throughout the eight-state Great Lakes region, the U.S. and Canada to protect the world's greatest freshwater seas, the surrounding ecosystem, and the benefits they provide to people and wildlife.

National Wild Turkey Federation
770 Augusta Road
Edgefield, SC 29824
Telephone: 803-637-3106
Fax: 803-637-0034
E-mail: NWTF@gabn.net
Website: www.nwtf.org
The National Wild Turkey Federation is dedicated to the conservation of the wild turkey and the preservation of the turkey hunting tradition.

The Nature Conservancy
2840 East Grand River Ave., Suite 5
East Lansing, MI 48823
Telephone: 517-332-1741
Fax: 517-332-8382
The mission of The Nature Conservancy, is to preserve plants, animals, and the natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

Pheasants Forever, Inc.
1783 Buerkle Circle
St. Paul, MN 55110
Telephone: 651-773-2000
Fax: 612-773-5500
E-mail: pf@pheasantsforever.org
Website: www.pheasantsforever.org
The purpose of Pheasants Forever is to protect and enhance pheasant and other wildlife populations throughout North America through public awareness and education, habitat restoration, development and maintenance, and improvements in land and water management policies.

Quail Unlimited National Headquarters
P.O. Box 610
Edgefield, SC 29824-0610
Telephone: 803-637-5731
E-mail: Quail1@jetbn.net
Website: www.qu.org
Quail Unlimited is dedicated to the preservation and reestabishment of crucial upland game bird habitat vitally needed to sustain healthy populations of quail and other upland game bird species. These goals are achieved through comprehensive habitat management, research and public education programs conducted both by the national organization and its nationwide network of local chapters.

Ruffed Grouse Society
451 McCormick Road
Coraopolis, PA 15108
Telephone: 412-262-4044
Fax: 412-262-9207
E-mail: rgshq@aol.com
Website: www.ruffedgrousesociety.com
The Ruffed Grouse Society is a nonprofit corporation dedicated to improving the environment for ruffed grouse, American woodcock and other forest wildlife through maintenance, improvement and expansion of woodland habitat.

Whitetails Unlimited, Inc.
1715 Rhode Island Street
P.O. Box 720
Sturgeon Bay, WI 54235
Telephone: 920-743-6777
Fax: 920-743-4658
Whitetails Unlimited, Inc's purpose is to raise funds in support of: (1) educational programs; (2) habitat conservation, and (3) preservation of the hunting tradition for the direct benefit of the white-tailed deer and other wildlife. GOAL 1: A National educational campaign designed to address and instill in the general public, with emphasis on youth, a basic understanding of practical conservation measures. GOAL 2: Promote the acquisition, restoration, and management of wildlife habitat. GOAL 3: Preserve the hunting tradition for future generations.

Local Agencies

County Conservation Districts
Located in most Michigan counties, these local government offices provide advice and assistance to landowners regarding land-use proactices. To locate your county Conservation District look in your local phone directory under Government services.

State Agencies

Michigan Department of Environmental Quality
Land and Water Management Division
116 W. Allegan Street
P.O. Box 30458
Lansing, MI 48909-7958
Telephone: 517-373-1170
Website: www.deq.state.mi.us
Our mission is to drive improvements in environmental quality for the protection of public health and natural resources to benefit current and future generations. This will be accomplished through effective administration of agency programs, providing for the use of innovative strategies, while helping to foster a strong and sustainable economy.

Michigan Department of Natural Resources
Fisheries Division
Mason Building
P.O. Box 30446
Lansing, MI 48909
Telephone: 517-373-1280
Website: www.dnr.state.mi.us
Our mission is to protect and enhance the public trust in populations and habitat of fishes and other forms of aquatic life, and promote optimum use of these resources.

CONSERVATION ORGANIZATIONS

Michigan Department of Natural Resources
Forest Management Division
Mason Building 8th floor
P.O. Box 30452
Lansing, MI 48909-7952
Telephone: 517-373-1275
Website: www.dnr.state.mi.us
Our mission is to provide for the protection, integrated management, and responsible use of a healthy, productive, and undiminished forest resource base for the social, recreational, environmental, and economic benefit of the people of the State of Michigan.

Michigan Department of Natural Resources
Wildlife Division
Mason Building 8th floor
P.O. Box 30444
Lansing, MI 48909-7944
Telephone: 517-373-1263
Website: www.dnr.state.mi.us
Our mission is to enhance, restore, and conserve the State's wildlife resources, natural communities, and ecosystems for the benefit of Michigan's citizens, visitors, and future generations.

Federal Agencies

U.S. Department of Agriculture
Farm Service Agency
3001 Coolidge
East Lansing, MI 48823
Telephone: 517-324-5100
The Farm Service Agency (FSA) of the U.S. Department of Agriculture ensures the well-being of American agriculture, the environment and the American public through efficient and equitable administration of farm commodity programs; farm ownership, operating and emergency loans; conservation and environmental programs; emergency and disaster assistance; domestic and international food assistance and international export credit programs.
FSA enhances the environment by the development and implementation of programs to ensure adequate protection of our natural, cultural, and historic resources. We assist agricultural producers and landowners in achieving a high level of stewardship of soil, water, air, and wildlife resources on America's farmland and ranches.

U.S.Department of Agriculture
Natural Resource Conservation Service
1405 S. Harrison Road, Rm. 101
East Lansing, MI 48823-5243
Telephone: 517-337-6701
Website: www.mi.nrcs.usda.gov
Our vision is to be the leaders in providing innovative assistance to the people of Michigan for the care, use and conservation of our natural resources.

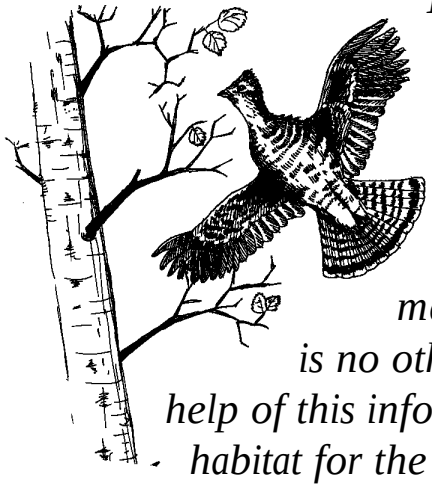
U.S. Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road
East Lansing, MI 48823
Telephone: 517-351-4230
Website: www.fws.gov
The U.S. Fish and Wildlife's mission is to conserve, protect and enhance fish and wildlife, and their habitats, including wetlands, for the continuing benefit of people. They provide technical assistance and consultation on wetland restorations, federal endangered and threatened species, and environmental contaminant issues.

FOR ADDITIONAL CHAPTERS CONTACT:
Michigan United Conservation Clubs
PO Box 30235
Lansing, MI 48909
517/371-1041
MUCC

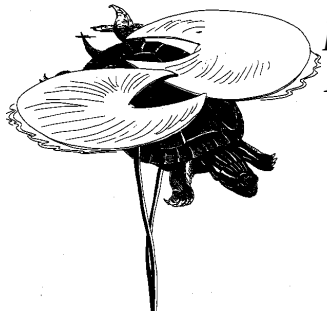
Private Land Partnerships: This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information, and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this guide provides you with the knowledge and the motivation to make positive changes for our environment.

FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*

Managing Michigan's Wildlife: A landowner's guide



Learn how to manage your land for wildlife with the use of this new 73 chapter landowner's guide. This guide includes chapters on habitat planning, forestry, wetlands, grasslands, croplands, backyards, and particular wildlife species. Step by step this resource tool will teach you everything from how to plant a tree to how to manage a grassland prairie for songbirds. There is no other book like this on the market. With the help of this information guide you can provide beautiful habitat for the wildlife in your area. This guide was created by a variety of conservation organizations in order to enhance or maintain wildlife habitat on private lands throughout Michigan. Purchase a copy for you and a friend today. Enjoy !!!



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