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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Michigan Department of Natural Resources

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FOREWORD

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

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.

Private Lands Working Group Members:

Ms. Kathie Arney, MDNR, Forest Management Division
Mr. Dave Brakhage, Ducks Unlimited
Dr. Henry Campa III, Michigan State University, Department of Fisheries and Wildlife
Mr. Dan Dessecker, The Ruffed Grouse Society
Dr. Glen Dudderar, Michigan State University, Department of Fisheries and Wildlife
Mr. Dave Ewert, The Nature Conservancy
Mr. Jim Goodheart, Pheasants Forever

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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.

Financial Contributors:

The Hal and Jean Glassen Memorial Foundation
Michigan Department of Natural Resources, Wildlife Division, Private Lands Program and Non-game Wildlife Program
Michigan Department of Environmental Quality, Land and Water Management Division, Coastal Zone Management Program
Michigan Duck Hunters; Flint and Muskegon Chapters
Michigan Farmers Union
Michigan National Wild Turkey Federation
The Nature Conservancy
Pheasants Forever; Calhoun, Clinton, Genesee, Hillsdale, Ingham, Lenawee, Montcalm, Saginaw, St. Clair, and Washtenaw Chapters
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,

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.

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.

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

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

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•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-
4 1.2 -12.48 d0252 Tc 0.15ing costs

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

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, clay4615 .3935Tc 6Mand Cas rea

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

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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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

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 sm168.5046 -12.48 al beauty, providing wildlife2e,

vide two acres of high quality foraging habitat within three years.

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

The first step in the planning process is to evaluate the current types of habitat, wildlife

•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 writej 0 -12

mal signs you can find. Add them to

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

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 considerD -0.043.043.4oons

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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

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 pro duce 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

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

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.

WRITING A MANAGEMENT PLAN

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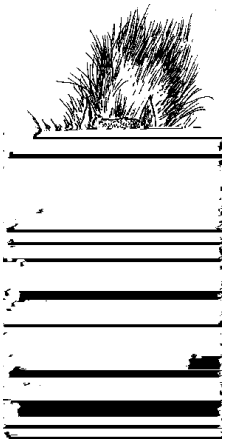
provide more sun for your neighbor's wildflowers.

If you do not know who your neighbors are, you can find out by consulting

WORKING WITH NEIGHBORS



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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 pant, elk,

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 surveettle

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 grass-

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

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

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

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

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

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, winterberry, 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

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 cre

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

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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

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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.

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

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

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.

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 -

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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.

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- and t the fo Tw sowth,

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Dry pine forests include pure

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 pa <<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

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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 w (scribt) Tj 159.84 0 Tnshbt
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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

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.

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 providura69e<ual providura69e<ual p1b8n6owledgTj 0 -p1b8motlifes

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

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

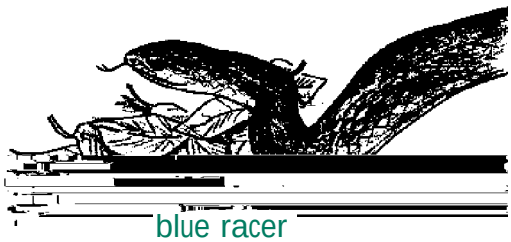
If you own a stand of white pine mixed with some hardwoods in a multiple-aged forest of seedlings, saplings, mature trees, and dead trees, then your forest is high-quality habitat and little further management may be needed at this time. However, in most cases you will probably need further management 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 eh251318 c 3.2(see the,oups of) Tj T*3 0.0067 Tc wTw considebe oftersYpine,eep buhelpr value toestent orests,whit eh25

DRY MESIC CONIFERS

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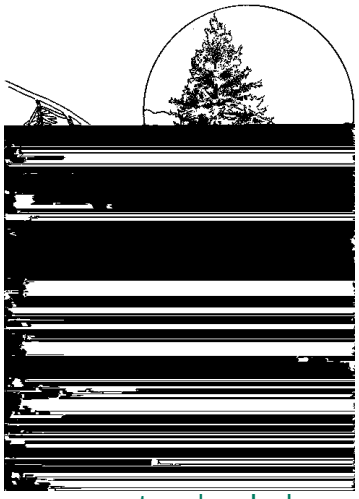
Private Land Partnerships: This partnership was form
and public organizations in order to address private lands wildlife iss
resources, information, and expertise. This landowner's guide has
between these groups working towards one goal: Natural Resou
manual provides you with the knowledge and the motivation
environment.

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.



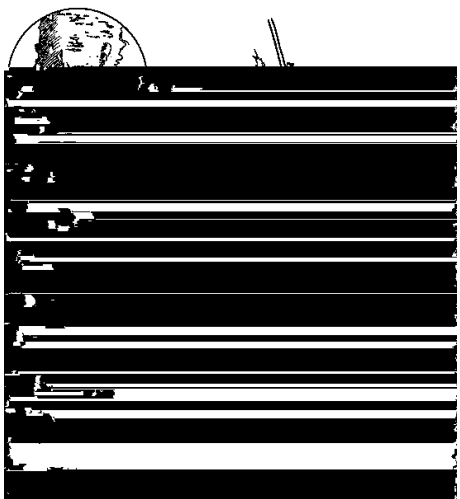
eastern hemlock

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

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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.

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 sin-

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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

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.

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

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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, swamps are also found with balsam fir

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.

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

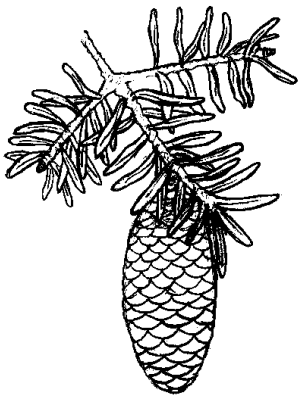
Forests of lowland conifers are susceptible to windthrow, fire, insect damage, and water level fluctuations. Small-scale disturbances from insects and fire open up the canopy, allowing sunlight to reach the forest floor and develop a diverse understory of shrubs and other plants. Larger scale disturbances such as logging, road building, or intense beaver activity can have vast negative effects on low-

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.

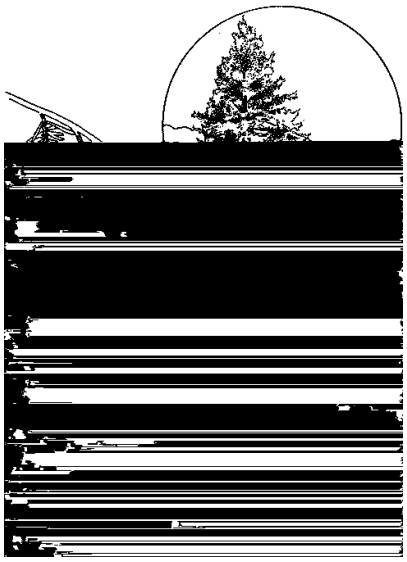


balsam fir

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-

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 bene-

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.

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, Wi tic294 and b265ns

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 harvesttrbu bu.8ection, s

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 sm8ue2uah8Tw (acre6cif6c -w (acrhe trees Tj T* 1445:r032Tme

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.

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 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

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Seed tree and shelterwood harvests can help maintain the diversi-

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**

conditions. Connecting other woodlands can greatly benefit wildlife,

from prevailing west winds. Retain some swamp white oak and pin oak within the strips, because these trees provide important mast (nuts)

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.

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.

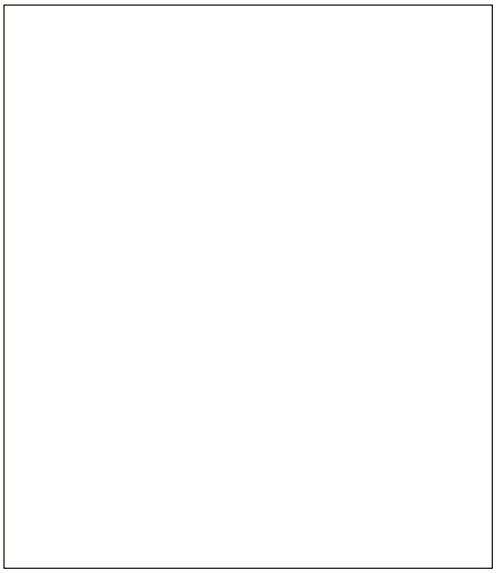
However, upland stands of red and white pine on dry soils, and lowland stands of northern white cedar and white spruce-balsam fir presented a different scenario as aspen had a larger impact on these forests. When natural disturbances produced openings in these forest types, aspen quickly colonized to 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

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

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



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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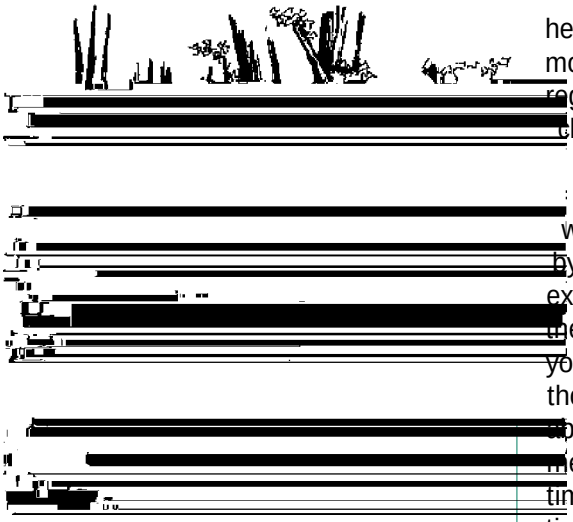
TIMBER HARVESTING



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 allowp forwardremov1.798e intol as itto grow-0.00 -yre cei2798.50Howei.04mpor.0304 Tc 0.971

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.

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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.

should be taken into consideration before any opening is planned. Maintaining and restoring these types of forest may be the best

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

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 Eurondteac3ytlers 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

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 crea-

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

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 Environ-

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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.

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.

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

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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 inch-

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 r

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.

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 tech-

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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.

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

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

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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.

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.

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 exam-
dogwood oft

mimic natural disturbances such as lightning strikes and severe storms that topple trees. This method of

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 ally i5wat8067 Tc ffect4vnal to578Tc

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.

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 diversi-

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,

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

marsh aster, and other wet meadow plants begin to dominate. Bottlebrush sedge, lake sedge, and other sedges then take over where the soils are saturated most of the year. Depending upon the slope of the shoreline and the water table, this zone between wet prairies and sedges

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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 manual provides you with the knowledge and the motivation to make positive changes for our environment.

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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.

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 ha628 mach9376cee.71and bas -0.0irTfw

dikes, or spillways. Finally, local,

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

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 temestock, to provide fire

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

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.

FOR ADDITIONAL CHAPTERS CONTACT:
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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 sn44 Tc 5g(-) Tj* -0.0573 T

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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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

provides good nesting and roosting cover

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

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.

Grasslands are areas often referred to as prairies or meadows, consisting primar

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 hillper1nnatif /F10.00tiremallyriversloamsw togeths0.0-inchlly inI/Fsyt
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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 veg-

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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

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 annb6ls

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sources of planting stock, and ground preparation are best answered by your Conservation District wildlife biologist, local extension agent, or NRCS staff.

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,

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.D

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

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 reproduc-

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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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

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

You can allow livestock to graze

Prescribed burning is a very important management tool for maintaining and enhancing grasslands. Fire was an important natural part in the devel-

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

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

crop and animal production practices and wildlife conservation.

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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.

• Plow across slopes (contour plowing to reduce erosion, which conserves valuable topsoil and prevents sediment from washing into unfarmed areas.

• 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.

• 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.

• Leave a few rows of grain on field perimeters to help feed wildlife in winter.

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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

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

see the respective **Warm** and **Cool Season Grass**

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.

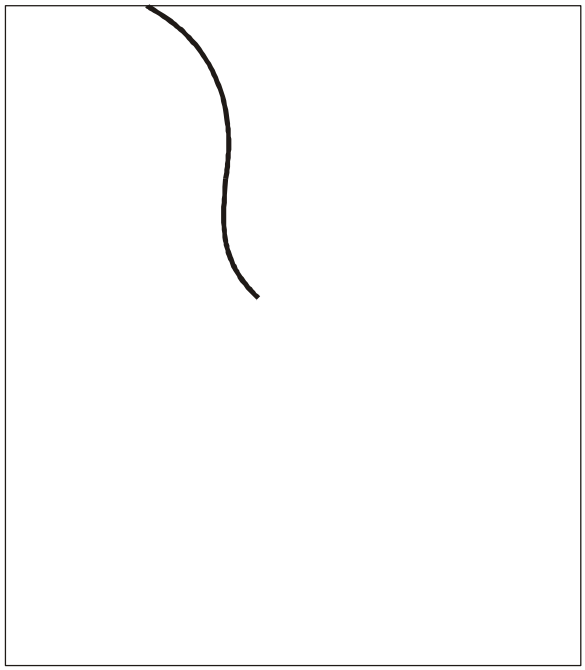
Hedgerows

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 trethinn -0j Tr2e

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).

FIELD BORDERS AND CORRIDORS



•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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Annual grain crops such as corn, sunflowers, buckwheat, millet, wheat, and grain sorghum can provide food for wildlife in late fall, winter, and early

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.

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.

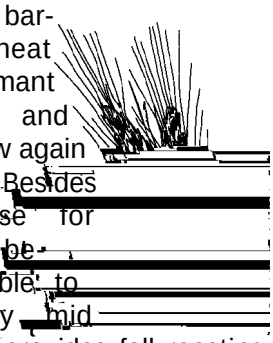
The black oil variety of **sunflowers** provides an outstanding source of fall food for songbirds, upland birds, mice, and other small mammals. Drought-tolerant and early maturing, the four to six feet tall plants are so highly favored that--on the negative side--little or no seeds are left when winter 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.

Seed	Planting Rate/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.

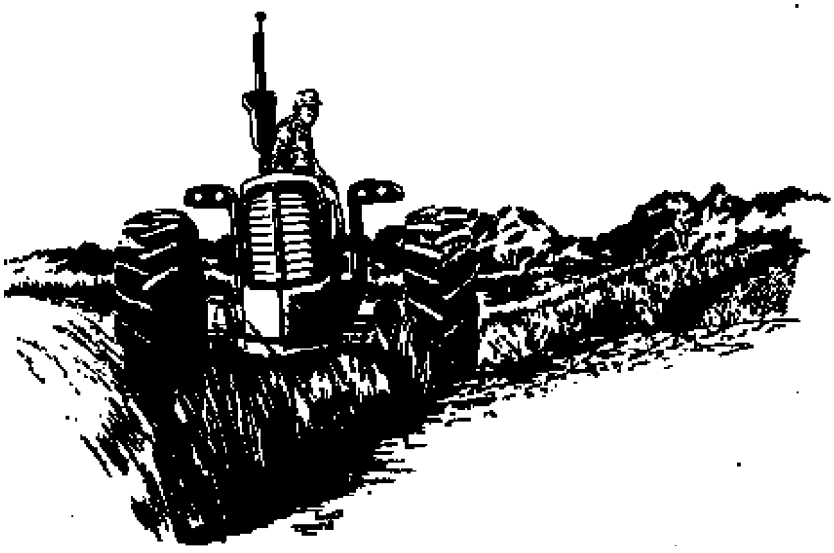
Planting and Managing

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".



GRAIN PLOT PLANTING

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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 manual provides you with the knowledge and the motivation to make positive changes for our environment.

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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,

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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What better way to create beauty and wildlife habitat, along with contributing to Michigan's natural heritage, than by planting native wildflowers on your property? 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. An increasing number of property owners are converting all or portions of their large, high-maintenance lawns to plantings of wildflowers. Wildflowers can be established either from seed in larger

flowers will be planted. A soil survey map can give you that information and should be available at the

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.

Site Consideration

If the area you have selected is capable of growing a healthy lawn, it will most2 5 -

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 effecTc 4.659.84 -D -0. (ply Tpends on the)41

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

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 planting1j T* -0.018e /.sit46ee to feP.F0 10.56 Tf -0.0105 Tc phirde tha0 tha81 T

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. a e s t 2 0 a n d s c a p v i s u a l 1) r h a r 1 4 w i n t e

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:

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.

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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.

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,

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 service-berry 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

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

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 dor-

accompanying panel. Do not plant stems and rows too close together.

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 simi-

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

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,

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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doses of insecticides can be directly lethal to the birds themselves.

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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

prairie andccunlydocks, wamp milk
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.

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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.

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, whitetailed deer, squirrels, chipmunks, rabbits, raccoons, butterflies, and moths. When food supplies are arom. 3.sThis T5m

materials such as plastic tubes; ceramic and terra cotta; woods such as red-wood, cedar, birch, g Tc 4.50iaa such as red

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

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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 edators (ja mixt9.my54srTj 57 35.28 61.9285 Tw (squirwnal

Wildlife depends on four habitat components for survival: food, water, cover

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 sho8 to dervat.ost

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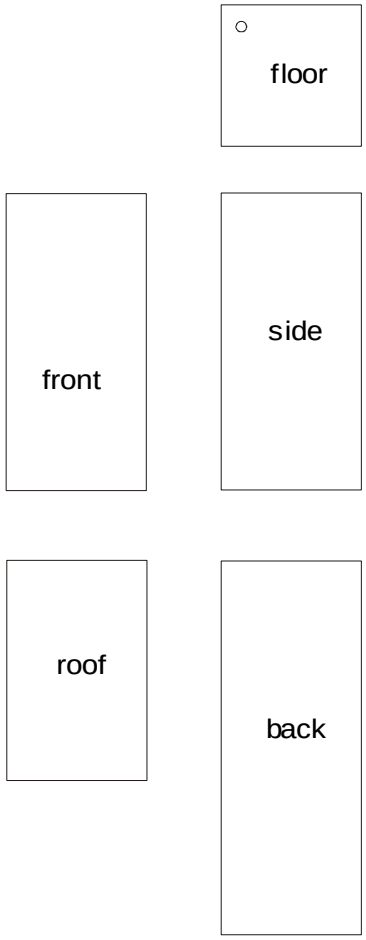
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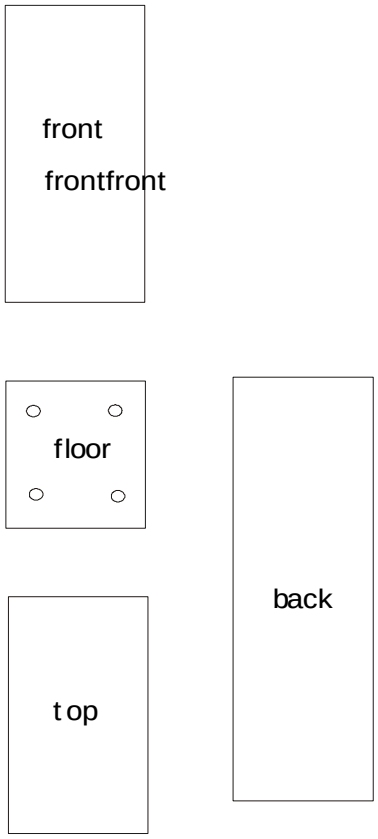
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Old tires can be reused to construct a squirrel den. Use a regular, non-steel belted, tire. A) remove the bead from both sides of the tire, and cut the tire in half. B) cut a 3" triangle from each corner of the bottom of the tire. C) In the same end, cut a 3" diameter semicircle (this is the entrance hole). D) Cut 3" e009 Ti1 Tc Tc208 Tc 0 Tw0(t) Tj -n 0.328 2L .1

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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

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

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 near

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 littlebatreughout acolonitts. Thesp

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.

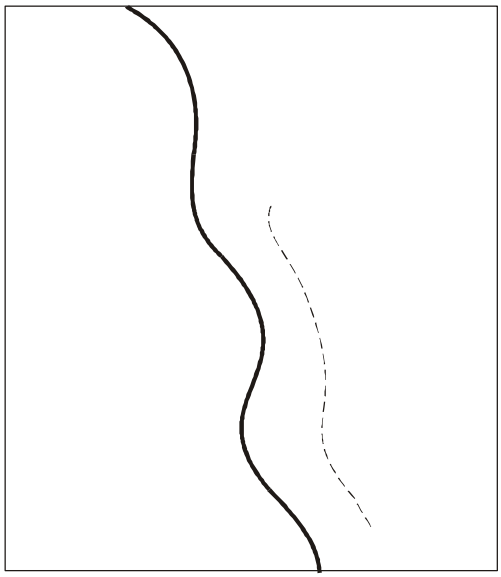
•Minimize the use of insecticides. Their broad use can seriously impact bats. Although there may be an increase in insects near your home, maintaining natural conditions will increase food not only for bats, but for birds and even dragon flies.

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



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.

FOR ADDITIONAL CHAPTERS CONTACT:
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MUCC

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Michigan reptiles include turtles, snakes, and one lizard species.

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

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

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

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.

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

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

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.

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 g4lian w2 2ate fraytain and enhance eA4 153.36 Tm -0.00

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

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.

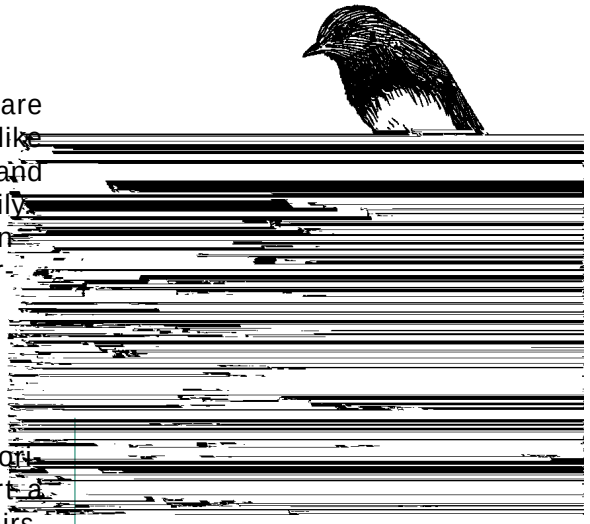
Management Considerations

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

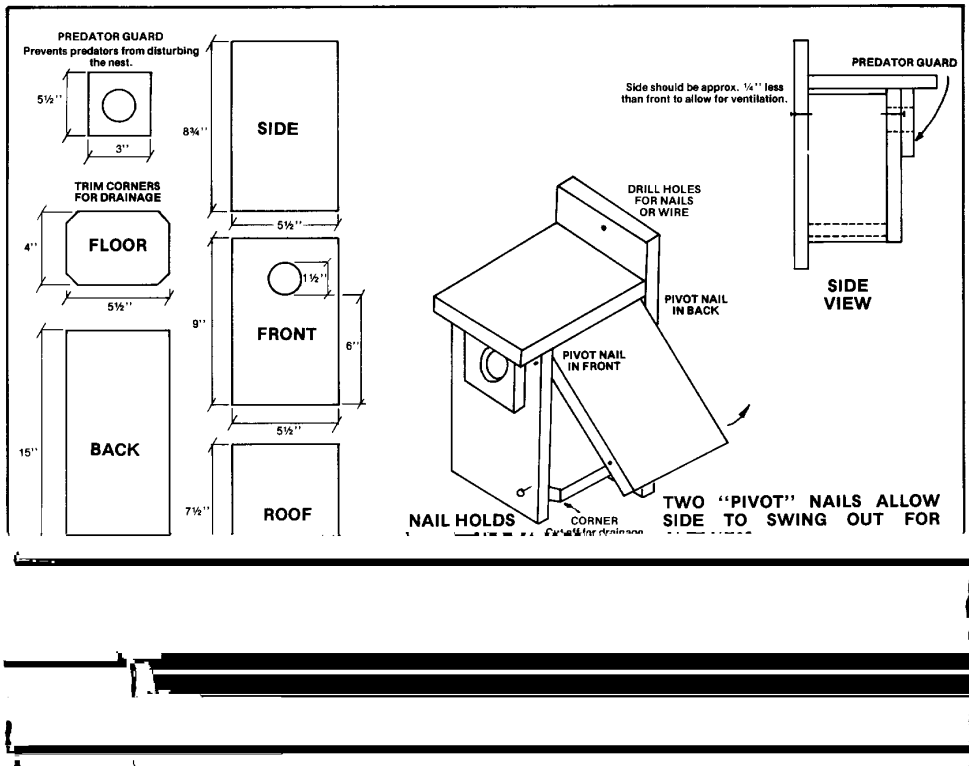
Materials: Use 1/2 inch or 3/4 inch wood such as cedar or exterior-grade plywood. Treat pine or other wood on the outside only to protect it from the weather. If you paint the box, use a drab color such as gray, green or tan, which will help the box to blend into surroundings and help protect it from 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

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.

Succession

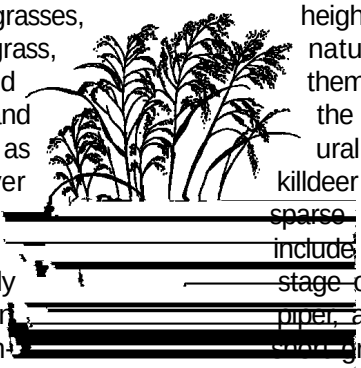
Large grasslands support more bird species than small grasslands. Because of the massive decline of native grasslands in Michigan, it is critical to grassland bird survival that large blocks of this habitat be maintained and managed. Before management begins, it is necessary to understand the natural 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.

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

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.



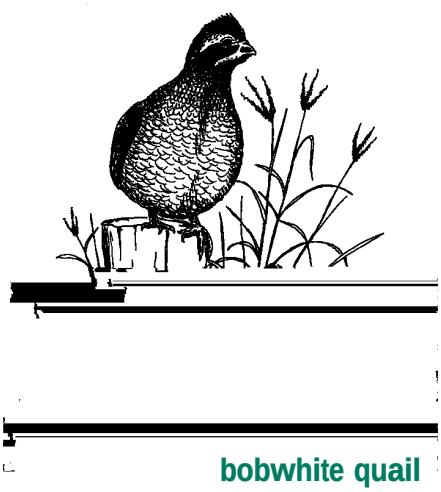
switchgrass

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.

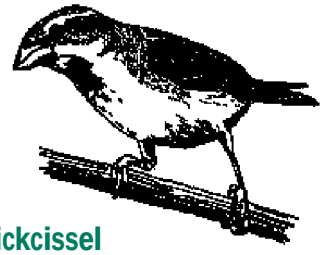


bobwhite quail

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.

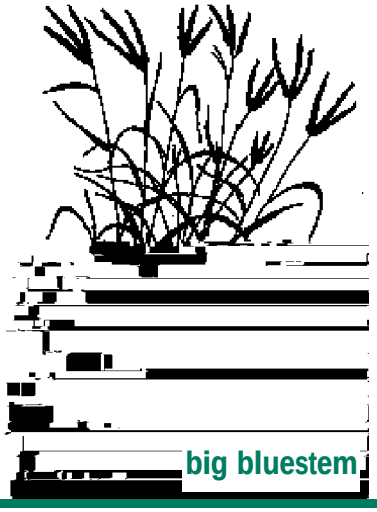


dickcissel

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, vespe

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.

•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,

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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.

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.

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.

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

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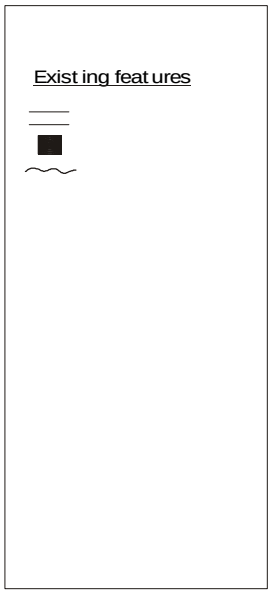

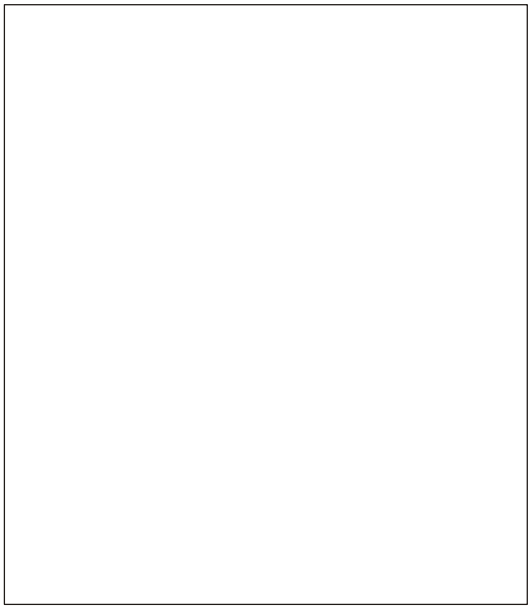

nothing to your wooded property will encourage some kinds of birds and discourage others. Specific management prescriptions will have a similar effect. For these reasons, it is important to classify the type of woodland habitat you own as well as properties adjacent to yours. You can then develop goals 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.

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Michigan United Conservation Clubs
PO Box 30235
Lansing, MI 48909
517/371-1041

MUCC

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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.

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 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

each yea

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

What to plant in an opening depends on your goals and turkey needs. Do you want to provide an

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 establishhen
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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

be attracted to any habitat that suddenly has an abundance of wildlife.

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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.

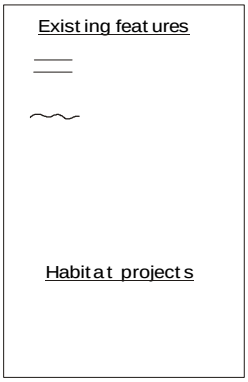
2)Young, second-growth shrubs such as alders, and hardwoods of mostly birch and aspen (poplar) in northern Michigan, or young stands of maple and ash in southern Michigan that provide nesting and brood-rearing cover.

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

shrubs and ground cover can provide good habitat for woodcock. Forests



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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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.

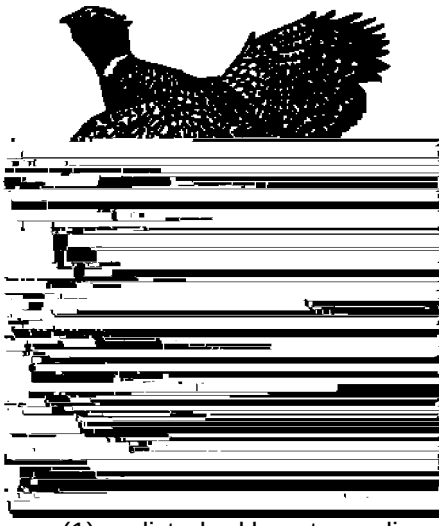
However, by the 1960's farmland began to change and people weren't seeing as many pheasants. The number of farms fell from 190,000 in 1940 to less than 60,000 by 1990. The amount of land farmed also decreased from more than 18 million acres in 1940 to less than 11 million acres in 1990. Although predation, 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

•Alternate strips of corn, soybeans, and other row crops with wheat, legumes, or grass.

•Maintain field borders of brush, grass and shrubs.

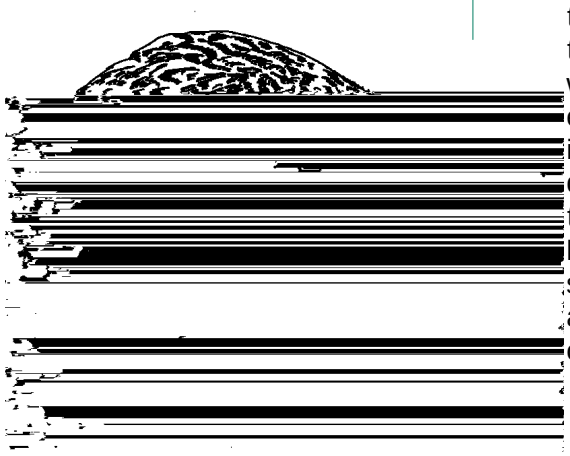
•Plant idle land with grassland or

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 rows,39aIcs8s88 549eev25 4 18 Tw (ers w20 -14.64 Tm 0 0.4863 0.3804BDC77 0 -11.84 101D 0.25314Tj -

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 pt <s 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 spo<s 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 compt ison, 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.



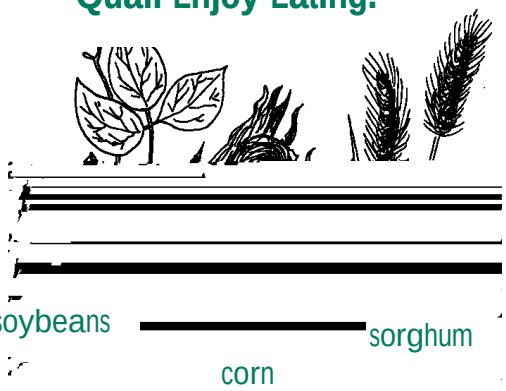
Unharvested crops and grain food plo<s provide a good source of food for quail during critical winter months. Using minimum tillage practices in the fall leaves waste grain for winter food. Not harvesting a few rows of grain crops next to travel corridors or heavy cover areas will also help quail and other wildlife. Food plo<s with mature grain mixed with ragweed, lambsquarter, smartweed, and foxtail are optimum.

Nesting cover consis<s 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-

cent brushlands, and 10 to 15

•Roosting areas should be a minimum of 40 yards wide to be of greatest value.

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,

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

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

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 -

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

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.

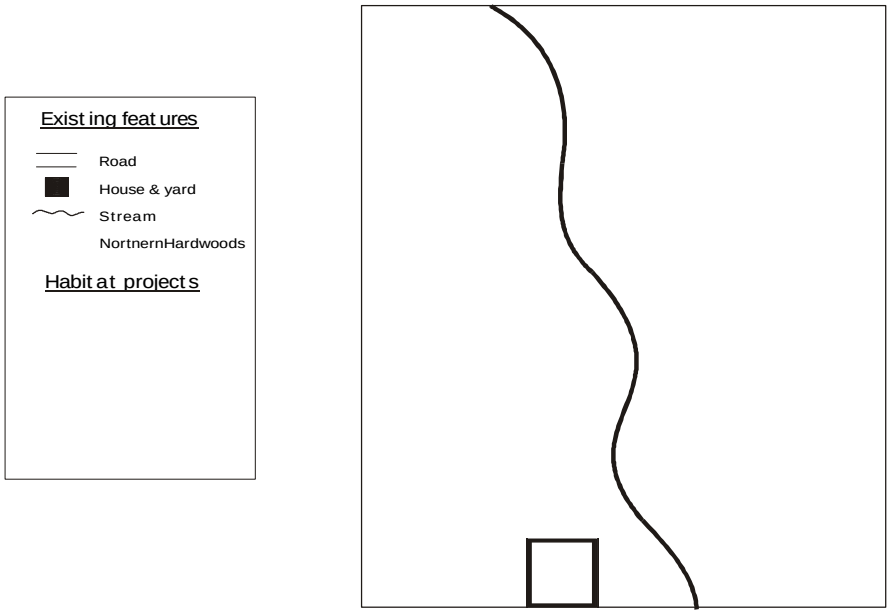
Life History

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

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



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.

(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 brushpiles 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.

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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.

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, sen0007 Tw1h6Tc mer -

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 insecDo .3937 Ts 869owned logsark9 0.373 Tc aEcut Twclude
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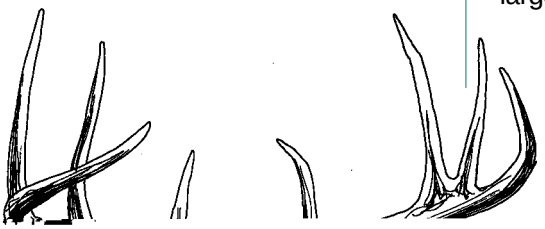
WHITE-TAILED DEER

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

techniques can be practiced to protect crops or reduce crop losses. Planting lure crops of buckwheat,

The following is a list of books, magazines, bul-

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).

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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.

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
Coraopolois, 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

FOR ADDITIONAL CHAPTERS CONTACT:
Michigan United Conservation Clubs
PO Box 30235
Lansing, MI 48909
517/371-1041

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 Conservation Organizations

Ducks Unlimited, Inc.
Great Lakes/Atlantic Region
331 Metty Dr. #4

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

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

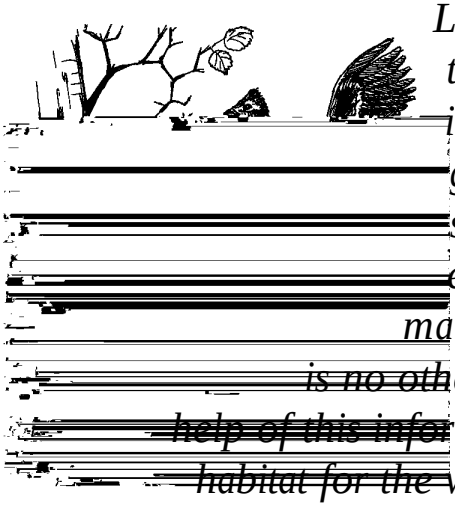
U.S. Department of Agriculture
Farm Service Agency
3001 Coolidge
East Lansing, MI 48823
Telephone: 517-324-5100
The Farm Service Agency (FSA) of the U.S. Department of Agriculture ensures the well-being of American agriculture, the environment and the American public through efficient and equitable administration 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.

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.

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 !!!