WILDLIFE MANAGEMENT

for Missouri Landowners

Fourth Edition

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Cover photo by David Stonner

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Missouri Department of Conservation
Wildlife Management for Missouri Landowners
PO Box 180
Jefferson City, MO 65102

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LANDOWNERS ARE THE KEY TO CONSERVATION

Throughout the years, Missouri landowners have contributed greatly to our state's quality of life, economy, and many conservation success stories. Landowners' habitat improvements have strengthened our wildlife populations, made our woods healthier and more profitable, and improved our water quality. The dedicated efforts of individual landowners are the heart of conservation success in Missouri.

Missouri is a state with less than 10 percent of its land in public ownership. That means the rest, and the biggest bulk, is owned by landowners just like you. You play a critical role in conservation. While your land is a place for family enjoyment and perhaps even financial support, it is our strong hope that at the same time it can be managed to sustain healthy fish, forests, and wildlife for future generations to enjoy. The Missouri Department of Conservation wants to partner with you to offer the resources and support needed to make that happen.

One of the great things about conservation is that the positive and notable changes we've made in Missouri, going back to the 1930s, allow our children and grandchildren to experience our rich and diverse natural resources. We are only successful when we work together toward a shared vision. Thank you for your support and partnership, and for continuing to make the future of conservation a bright one.

Making a Place for Wildlife on Your Land

If you're holding this booklet, chances are you appreciate the value of Missouri's rich wildlife heritage — the amazing diversity of plants and animals that make our state a great place to hunt, fish, and enjoy nature. This guide is for landowners like you who want to conserve that heritage. Please use it as you start the important and gratifying task of making a place for wildlife on your land.


Eastern wild turkey

Missouri's wildlife resources have taken a roller coaster ride since pioneers first settled west of the Mississippi River. Settlers found abundant wildlife, and they often took it for granted. A Montgomery County report from about 1830 says that "turkeys were so numerous and so easily obtained as scarcely to be worthy of consideration." That changed by the mid-to-late 1800s when the ax, plow, and wildfire were destroying forests and prairies. Market hunting for meat and fur exacted a heavy toll. Deer and turkey dwindled, and elk, antelope, and other species disappeared from the Missouri landscape. At the same time, the many small private farms that settlers carved out of the wilderness proved to be good habitat for smaller wildlife such as quail, rabbit, squirrel, and dove. Those early farmers planted islands of grain and grass, creating a healthy mix of woods, brush, brushy fencerows, crops, and grasses.

The wildlife roller coaster has continued through the years. Many species like white-tailed deer and turkey have been restored to abundance in Missouri, thanks to public support for wildlife research and controlled harvest. Recently, however, some wildlife populations have declined as land management has changed. In many locations, fields have been enlarged, fencerows removed, woodlands grazed or cleared, and formerly neglected areas put into agricultural production. Additionally, changing landownership patterns have resulted in large single-owner properties divided into smaller parcels with multiple landowners managing each parcel differently. With the concurrent loss of habitat, some wildlife on private land have declined.

Soil erosion over the decades also has hurt wildlife. Erosion removes vital soil and lowers the basic productivity of the land, ultimately depriving quail and other wildlife of food, water, and cover. When one or more of these elements are missing, survival declines as animals become vulnerable to prey, weather, and nature's other perils.

The decline of many wildlife populations is disturbing, but it's by no means irreversible. The United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS) and the Missouri Department of Natural Resources (DNR), working in concert with landowners, has already made great strides to reduce soil erosion. And there is much Missouri landowners can do to benefit wildlife simply by improving habitat on their land. This handbook describes a number of techniques — many of them quite simple — that you can use to increase wildlife diversity and abundance.

The many benefits of good wildlife habitat don't come free. Fortunately, many state and federal agencies offer partial reimbursement to landowners willing to manage for wildlife. Additionally, these management practices yield practical economic returns, such as improved timber, better forage, lowered soil erosion, and improved water quality, as well as long-term benefits to our valuable natural resources.

If Missouri were a giant puzzle with tens of thousands of pieces, each of which represented a parcel of land, more than 90 percent of these pieces would be privately owned. That is why wildlife depends on Missouri landowners to play a leading role in habitat conservation. This handbook is a starting place for improving your piece of the puzzle. *Your efforts can and do make a difference!*

More than 90% of Missouri's land is privately owned.

Use this handbook to deepen your knowledge of the balance between wildlife and the land. Study the importance of quality habitat for wildlife survival and production. Once you've browsed the book, turn to Chapter 9 and give your county private land conservationist (PLC) a call. They can help you get started making a management plan that works for wildlife and helps meet your production goals.

Note: We have printed uncommon terms in boldface the first time they appear in each chapter. You can find definitions for them in the Glossary of Terms.

Land Planning for Wildlife 1

White-tailed deer

Successful habitat improvement begins with a thorough evaluation of your land for its wildlife potential. After making a wildlife habitat inventory, you can create a management plan that will not only increase the number and diversity of wildlife on your land but also increase its overall productivity and value.

EVALUATING YOUR LAND'S HABITAT POTENTIAL

The three essential ingredients of good wildlife habitat are:

- Food
- Water
- Cover

Always keep them in mind when evaluating your land.

Look first at the plants on your property — the amount and distribution of trees, crops, shrubs, and grass. Vegetation largely determines the types of animals that can live on a plot of land. Plants are the foundation of nature's food web, of which every animal is a part. Plant-eating animals — such as deer, rabbits, and many insects — convert plant energy to protein and fats. Carnivores — hawks, owls, bobcats, predatory insects, and insect-eating birds — feed on the plant eaters. This complex food web will collapse without plants.

Also note the sources of water. Wildlife in Missouri have varied water requirements. Salamanders need a fish-free pond for spawning. Species such as deer and turkey need water daily. Water may become the focal point of a wildlife plan because it is a limiting factor for some animals.

Cover is essential and will be discussed throughout this handbook. Both natural and man-made cover provide resting, roosting, nesting, protection, and foraging areas. You can manage natural cover by planting, pruning, thinning, burning, or clearing. Man-made cover includes downed tree structures, feathered edges, nesting boxes, rock piles, log piles, and similar structures.

Familiarizing yourself with your land will help you know what animals live there and what others you would be able to attract. For more help with this task, browse Chapter 7 to learn the habitat needs of the kinds of wildlife you find on your land. As you walk your land, take notes often and during all seasons. Land and animals change through the year, and you will see new signs during each trip. Look for scratch marks, tracks, burrows, nests, and other signs. Note the kinds of animals on your land, the areas they are using, and the times you observe them. In your evaluation, it may help to divide your property into wildlife habitat types: cropland, grassland (including pasture), forests, savannas, glades, wetlands, and possibly some unique habitats, such as fens and bogs.

The following questions will help you evaluate your current management of these habitat types in terms of benefits to wildlife. Ideally, you should answer, "Yes" to every question.

Cropland

- Do you avoid fall tillage? The fall plowing of sloping cropland increases erosion and eliminates crop residues that feed wildlife during the winter.
- At harvest, do you leave a few rows of grain at the field edge? This standing grain provides food and cover for wildlife during winter months.
- Do you avoid heavy herbicide and insecticide applications? When applied in excess of label instructions, herbicides and insecticides eliminate important wildlife food sources by destroying food plants and insects in non-crop areas.
- Do you plant cover crops that improve soil structure, provide wildlife value, and reduce soil loss?
- Do you have strips of grass or trees alongside crop fields to prevent sediment, herbicides, and pesticides from entering streams, ponds, and lakes?

Healthy grasslands provide excellent wildlife habitat and quality livestock forage.

Grassland and Pasture

- Do you graze livestock on a rotation among several pastures? Rotating cattle through different pastures to leave residual cover can improve both beef production and wildlife habitat.
- Do you use soil tests to manage soil fertility? Improved soil fertility can contribute to both wildlife and domestic livestock productivity depending on the types of grasses present. It is important that you first have the soil tested to know if nutrients may be lacking.
- Are **native** warm-season grasses included in your grazing system? Grasses such as big bluestem, Indian grass, and switch grass that grow during the hot summer months provide summer livestock grazing and wildlife food and cover.
- Is there a variety of **forbs** in your pastures? Many forbs such as prairie blazing star, milkweed, and coneflower provide wildlife food and support insects such as butterflies and pollinating bees.
- Are there **legumes** in your pastures? Legumes such as beggar's lice, partridge pea, and Korean lespedeza add nitrogen to the soil, help improve forage for cattle, and attract insects on which wildlife feed.
- Do you wait until after July 15 to harvest hay or mow grassland? Mowing later in the summer is less harmful to nesting birds and young wildlife that are vulnerable earlier in the spring.
- Do you search for and eliminate **noxious**/**invasive** plants growing on your grassland areas? Teasel, spotted knapweed, sericea lespedeza, and musk thistles are examples of plants that must be controlled.
- Do you use prescribed fire in your grassland management? Controlled burning can promote plants that are beneficial to both wildlife and livestock. Fire also removes dead plant litter and recycles nutrients back into the soil.

Healthy woodlands need periodic fire and selective thinning.

Forests and Woodlands

- Do you prevent cattle grazing in your woodland and woodland edges? Forests and woodlands should be protected from grazing cattle. Too many grazing animals compact the soil, damage tree roots, and trample or eat tree seedlings.
- When you harvest timber or cut firewood, do you build downed tree structures (DTS) from the trimmings rather than burning them? Leaving DTS around a woodland creates an uneven, shrubby edge that provides food and cover for wildlife.
- When harvesting timber, do you use best management practices to control soil erosion? Examples include proper construction of logging trails and stream crossings and protecting stream buffers.
- Have you maintained a border or edge between the woodland and other habitat types? Fields that adjoin a wooded area are more attractive to wildlife when a grassy or shrubby border is established and maintained.

Savannas and Open Woodlands

- Do you have grassland areas with widely scattered oak and hickory trees? Savannas are unique habitats that transition between prairie and forest and are dominated by native grasses and wildflowers.
- If you have savanna and open woodland habitat, have you maintained it with prescribed burning?

Glades

- Are there rocky areas on your property with thin soils?
- Have you kept these areas open and dominated by native grasses and forbs? Neglected glade habitat is often overgrown by cedar trees. Careful removal of the cedar and prescribed burning can revive glade habitat.

Restored glade in Taney County

Wetlands

- Are there areas on your property with soils that remain moist or wet for much or all of the year? These areas may be wetlands, dominated by plants that tolerate excessive moisture. They make excellent habitat for all kinds of waterfowl, shorebirds, and songbirds. Natural wetlands along streams and rivers are important as fish spawning and rearing areas.
- Are these naturally wet areas or a result of man-made structures such as levees or water-control devices? If you have permanently moist areas created naturally or by man-made structures, they can be managed for wetland benefits.
- Are there fields on your property too wet to farm? These wet fields are the best sites for restoring or developing wetlands on private property.

Fencerows and Other Unique Habitats

- Have you allowed fencerows to grow up in shrubs, vines, and small trees? Fencerows provide travel lanes between different habitat types if woody plants are present.
- Do you avoid applying herbicides to fencerows? Destroying fencerow vegetation reduces both the food supply and the cover that these areas provide. However, light application can set back edge growth and provide better cover.
- Are brushy, weedy, or grassy strips present between crops, pastures, and woodlands? These buffer strips provide necessary cover, nesting, and feeding areas for wildlife.

Fencerow habitat provides necessary cover for quail and rabbits.

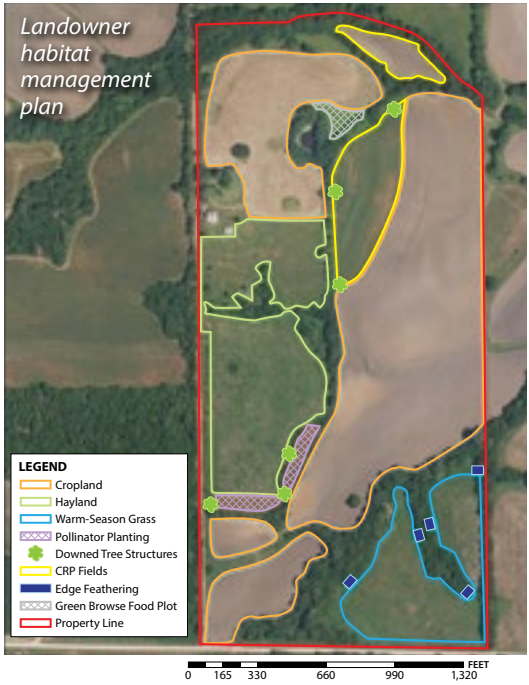
MAKING A WILDLIFE MANAGEMENT PLAN

Begin your management plan by obtaining a drawing, map, or aerial photo of your land. Aerial photographs of your land are available at no charge from the Farm Service Agency (FSA) office in each county. High-quality maps are also available through online mapping services such as Google Maps and Bing Maps.

On the map or photo, mark different habitat types with colored pens. Each type of habitat meets different wildlife needs, so for best results they should be intermixed on your property. Note areas that are isolated from other habitat types. Animals such as quail and rabbits require that the habitat types be close together. Others, like deer and turkey, can easily travel several hundred yards to find food, cover, or water.

Next, mark areas that might be improved for wildlife. Land can be improved in a general way — for instance, by letting field areas grow up — or it can be improved

to attract, maintain, or increase certain species of animals. In the latter case, you'll need to learn the animals' habitat requirements: how much territory they need, what they eat, and where they find cover. The requirements of some common wildlife species are given in Chapter 7.



Usually your habitat improvement plan will involve adding or removing vegetation. In fact, wildlife management is basically plant management. Landowners can change wildlife numbers on their property by changing the supply and arrangement of plants that attract, feed, and shelter them.

You can add plants that provide food for rabbits and other ground feeders if that's what you are interested in. Or you may want to cater to deer or other animals that eat higher on brush and trees. Your wildlife plan should ensure an all-season variety of seeds, berries, and plants. This sometimes means controlling the growth of some trees and bushes.

A soils map can help you find the best locations for plantings and will indicate their potential for growing various plants and the suitability of sites for pond construction. A detailed soils map of your area is available from the NRCS at ***USDA.gov***. You can also search for their *Web Soil Survey*.

Keep a notebook of your progress, including when, where, and how you carried out the plantings and other improvements. This record will help you plan ahead to avoid placing plants in an area where they grow poorly or where they might encroach on other habitats. Take photos of habitat changes. Before and after pictures of the land show whether or not you are getting results. You also can talk to neighbors and several government and nongovernment agencies with professionals who can offer insights on the long-term soundness of your plan (see Chapter 9).

Often landowners wrongly assume that if they improve food and cover areas, large numbers of wildlife will remain permanently on their property. Usually, wildlife response is less dramatic. Your acreage may not gain a permanent flock of turkeys or a herd of deer, but it may become an important part of their range. Your efforts make a difference, even if wildlife uses your land only seasonally or temporarily.

The following chapters describe a large number of management practices you can include in your habitat improvement plan. Wildlife sometimes responds slowly to changes in habitat, so the main thing is to get started now.

Cropland Management 2

Rising land values, fluctuating commodity prices, and increased input costs have led farmers to maximize production from every potential cropland acre of the farm, creating a delicate balancing act between economics and good resource management. The slightest alteration in a crop field's structure can have a major impact on wildlife calling the area home.

The cropland management practices listed below can help you maximize production while providing essential wildlife habitat.

CROP FIELDS

No-Till Planting System

In modern agriculture no-till planting has replaced conventional tillage and planting as the preferred method for planting row crops. In no-till planting systems, crops are planted

directly into an undisturbed seedbed with a specially designed seed drill or planter. Some of the benefits of no-till planting include reduced soil erosion, increased soil organic matter, moisture conservation, reduced labor costs, and increased use by wildlife. Residue from no-till provides both food and cover for wildlife. In particular, waste grain and weed seeds left after harvest are staple foods for wildlife in winter.

No-till planting in corn stubble

PHOTO BY USDA NRCS

If you don't want to bear the expense of owning and maintaining a no-till drill, you may be able to find custom no-till drilling services through your local USDA service center.

Crop Rotation

The practice of planting different crops in the same field from year to year is known as crop rotation. It is the opposite of continuous cropping — planting the same crop in the same field year after year. Of the two practices, continuous cropping is more common, and experts report that it results in the highest risk for crop disease. They also note that insect problems are more prevalent under a continuous system, increasing insecticide use. Recent research indicates that insecticides are one of the prevailing factors impacting the general declining health of honeybees. A simple corn-and-soybean crop rotation can control associated insect pests and reduce risks to valuable insect pollinators, increase cropping system health, and increase plant diversity. A well-planned rotation will also address specific soil deficiencies and improve soil properties.

A common crop rotation is one year of corn followed by two years of beans. Diversify the rotation by adding additional crops for greater benefit. Consider including a small grain such as milo, wheat, or oats or a **legume** such as red clover. Legumes and small grains help prevent soil erosion, and legumes add nitrogen to the soil, reducing fertilizer requirements the following year. Many legumes also make ideal wildlife brood-rearing cover and food — if mowing or haying is delayed until after July 15.

Small grain crops such as wheat and oats provide nesting cover throughout the spring and summer. The stubble of these crops, cut high and left undisturbed, makes excellent brood-rearing habitat for quail and pheasants. The seeds of annual plants associated with small-grain stubble provide additional food and cover for wildlife. Your local NRCS office can assist with development of a crop rotation that will best suit your field's soil type, slope, and farming operation.

Cover Crops

Cover crops are grasses, small grains, legumes, or brassicas (plants like turnips and kale) that are sown immediately after the crop has been harvested or shortly before. The cover crop is then terminated by a winter freeze or a spring herbicide application the following year before planting begins. Cover crops control erosion, add fertility and organic material to the soil, improve tilled-soil condition, increase infiltration and aeration of the soil, and improve overall soil health.

A traditional practice, cover crops were an integral part of the American farmer's crop rotation through the 1950s. The availability and convenience of synthetic fertilizer has since reduced the use of cover crops and significantly altered how cropland is managed. For more information, see *Organic Production: Using NRCS Practice Standards to Support Organic Growers* at ***USDA.gov***.

If wildlife habitat is a goal, it is recommended that cover crops be terminated with a herbicide application, if necessary, before the start of nesting season on May 1. This will decrease the probability of destroying nests. You should also consider planting a mixture of two or more cover crop species targeted toward the particular kinds of wildlife you are managing for. See a PLC or NRCS agent.

The practice of cover cropping has evolved significantly since granddad seeded winter rye on his field following harvest. While there are still challenges to be solved with application timing and methods, the use of cover crops shows significant benefit to the farming operation and wildlife.

GRASSED WATERWAYS

A grassed waterway is a shaped and graded channel seeded to vegetation that carries surface water runoff to a stable outlet. Waterways reduce soil erosion, improve water quality by acting as a filter for runoff, and can serve as a stable outlet for gradient terraces or drain tile. Waterways are more economical to construct than terraces.

The primary function of a waterway is erosion control. Therefore avegetative cover known for its erosion control properties should be established in the waterway. Selection of a suitable plant for ground cover depends on the area where it will be grown. There are many wildlife-friendly cool-season grasses and **native** warm-season grasses that provide good erosion control. Consult your local Soil and Water Conservation District (SWCD), NRCS, or University of Missouri Extension (MU Extension) office for more

SCOTT SUDKAMP

Grassed waterway established to native warm-season grasses

information on appropriate erosion control plants for your area. Waterways can be mowed or hayed, but only after the primary upland bird nesting season date of July 15.

Finally, grassed waterways will require maintenance every few years to keep them functioning properly. Over time, waterways collect silt, which limits their function. It may be necessary to clean out this excess silt and return it to the field. If wildlife is a priority, do not destroy woody draws to install waterways because these areas are valuable wildlife habitat.

FIELD BORDERS AND TURN ROWS

Typically, a field border consists of a strip of non-crop **herbaceous** or shrubby vegetation that runs alongside the field margin. These areas can be intentionally managed around crop fields to create edge and increase plant diversity and interspersion within the agricultural landscape. Field borders composed of grasses, **forbs**, legumes, and shrubs can provide valuable food and cover resources for wildlife.

When planted around a crop field, hay field, or pasture field, borders can serve as valuable nesting, brood-rearing, and concealment cover for wildlife. Field borders can be seeded to grass/legume mixtures that are beneficial to wildlife (see Chapter 8). These areas should not be mowed unless absolutely necessary and only after the end of the primary nesting season — July 15. Field borders next to woodlands, wooded fencerows, hedgerows, and other brushy areas offer more opportunities for wildlife.

An idle field border can be just as beneficial to wildlife as a planted border. This type of border can be created next to a crop field simply by not tilling and then planting a strip at least 30 feet wide. In a pasture or hay field, the desired width can either be moderately disked or sprayed with herbicide to set back the grass. The following year idle field borders will regenerate with beneficial seed-producing annual broadleaf plants and weedy grasses. Cattle should be excluded from both a planted or idled field border for maximum wildlife benefit.

Turn-rows planted to a wildlife-friendly grass/legume mixture provide space to turn equipment and serve as a roadway along the field edge. Grass/legume borders provide cover for ground-nesting wildlife such as cottontail rabbits, meadowlarks, pheasant, and quail. These areas can be mowed, hayed, or burned every two years to prevent woody sprout invasion.

Pollinator-friendly field border

PHOTO BY USDA NRCS

FIELD SHELTERBELTS, WINDBREAKS, AND FENCEROWS

A combination of trees and shrubs planted as windbreaks can reduce wind velocities on the downwind side for a distance up to 10–20 times the height of the trees, depending on the species and density.

Hardwoods, or deciduous trees, which shed their leaves in the fall, are not as effective as evergreens for winter protection. However, their bare limbs do reduce wind velocities and offer some amount of protection. The advantages of hardwood trees are that they are hardier and taller at maturity than evergreens. Field windbreaks reduce soil erosion, conserve soil moisture, and provide food and cover for wildlife. A combination of deciduous, evergreen, and shrub species is preferable. See Chapter 8 for information on designing windbreaks.

Windbreaks alongside crop fields help conserve moisture and trap snow.

Woody fencerows next to crop fields or pastures provide many of the same benefits as windbreaks. Natural woody fencerows can be encouraged by not mowing next to the fence or spraying with a brush herbicide and allowing beneficial native shrubs such as American plum, gray dogwood, and blackberry to grow. When protected from overgrazing and mowing, fencerows can develop into natural travel corridors for wildlife. To further encourage native shrubs, spray cool-season grasses in the fencerow with an appropriate herbicide in late fall after shrub dormancy or in early spring prior to bud break.

Wildlife-friendly shrub planting

CROP GROUND RENTAL CONTRACTS AND STRATEGIES

Many landowners purchase farms with a return on investment as one of their objectives. Some choose to crop or run livestock themselves, but the majority often cash rent the acreage to a local farmer. Some benefits to leasing your land for farming include management that meets your stewardship goals, annual revenue, providing opportunity to a beginning farmer, and keeping your landscape open and in production.

Lease agreements range from annual to multi-year contracts, flexible cash rent, and sharecropping. Each has advantages and disadvantages. MU Extension has several publications pertaining to different types of lease agreements and sample lease agreements on their website. MU Extension also employs farm management specialists to help you with contract decisions and preparation. To find the specialist for your area, contact your local county MU Extension office.

You may also be able to use a short-term cropping contract to help meet resource objectives such as **invasive-species** eradication, old-field reclamation, and cool-season-to-warm-season grass conversions, which can be expensive. Cropping these problem areas for two or three years might save you money. Another strategy is to trade or offer your renter a reduced rate for installation or completion of other habitat practices, such as food plots, seeding warm-season grass, or woody cover control.

CROPLAND MANAGEMENT TIPS

- Use a no-till system. Avoid fall tillage. Crop residue protects the soil, and wildlife use the grain left behind from harvest throughout the winter.
- Follow soil test recommendations and use variable-rate fertilizer application.
- Follow best management practices for pest management.
- Use a crop rotation system that includes small grains and forage crops.
- Use cover crops for winter erosion control, soil health, and wildlife benefit.
- Plant native warm-season grass or wildlife-friendly cool-season grass field borders around all or a portion of your crop fields.
- Establish wildlife-friendly grass filter strips around ponds and along creeks to reduce sedimentation, trap nutrients, and add wildlife cover.
- Seed waterways to wildlife-friendly grass/legume mixtures. Mow or hay after the primary nesting period of May 1 to July 15.
- Protect woody draws and fencerows. Spray these areas mid-to-late October with a herbicide to set back grass encroachment and encourage shrubby cover.
- Leave a minimum of ¼ acre of unharvested standing crop for every 40 acres of crop field adjacent to good cover.

Cover crop mix of legumes, cereal rye, and oats

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Grassland Management 3

Many species of wildlife use grasslands for food, cover, and nesting. The greater prairie chicken, upland sandpiper, and meadowlark are but a few of the many species that are almost totally dependent on open grasslands for their habitat requirements. Rabbits, bobwhite quail, turkeys, and pheasants also use grasslands for nesting and roosting cover, but they usually do not stray very far from woody or shrubby cover. In addition, well-managed grasslands benefit all living species, including humans, by controlling soil erosion and storing carbon.

Grasslands can be divided into three categories:

1) Cool-season grasslands can include native grasses like wild ryes and Junegrass and nonnative grasses like orchard grass, timothy, fescue, smooth brome, and Kentucky bluegrass. All these are adapted to growing in the cooler weather of spring and fall.

2) Warm-season grasslands are usually native grasses composed of big and little bluestem, sideoats grama, eastern gama grass, Indian grass, and switch grass, which are adapted to growing in the warmer summer months.
3) Native grasslands are unplowed prairie remnants dominated by many species of warm-season grasses, sedges, and **forbs**. Before Missouri was settled, these native grasslands covered about one-third of the state. Now, less than 0.5 percent of these remain statewide, *and they are the most rare cover type in the world*.

This chapter explores the management opportunities on the nearly 17 million acres of grasslands in Missouri. The first section describes some general management techniques for pastures and grasslands. Not all of these techniques are suitable for all grasslands. Specific management techniques for each of the grassland types appear in the following sections and are detailed in Chapter 8.

In Missouri, nonnative tall fescue used primarily for grazing and lawns has become the predominant grassland plant species. This is because it is relatively easy to establish, and once established it does not require as much management as other grass species. As a result, it has replaced a lot of diverse plant communities at the expense of many native species of plants and animals.

Fescue is a sod-forming grass. It forms a dense, solid mass of vegetation at ground level that ground-nesting wildlife cannot use. Dense sods are difficult, if not nearly impossible, for adults — let alone the young hatchlings — to maneuver through. In addition, the dense growth tends to crowd out other beneficial plants, resulting in less diverse grasslands. In north Missouri, brome has a similar negative impact on wildlife. This is one reason many grassland-dependent species have declined in numbers over the last few decades.

Fescue crowds out wildlife-friendly plants.

Fescue can create some nutritional problems not only for wildlife, including cottontail rabbits, voles, and white-footed deer mice, but for cattle as well. Fescue is often infected with an endophyte (a fungus) that creates health problems for many animals that ingest it. A Tennessee study even concluded that endophyte-infected fescue could reduce or eliminate burrowing animals from orchards, tree farms, and golf courses.

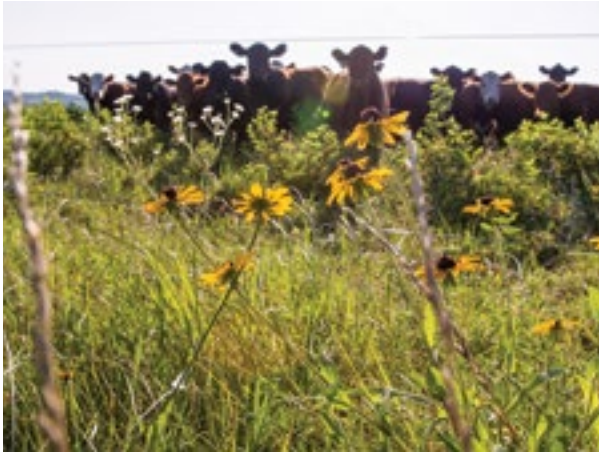
In addition to creating health problems for the many kinds of animals that eat it, fescue also harms the plants around it.

Fescue is allelopathic, which means it can exude toxins into the soil that kill or restrict the growth of competing plants. This is one way it spreads into adjoining areas, even if that area may be of higher quality habitat. Planting small trees or shrubs into fescue sod without eradicating the fescue first ensures slow growth or even poor survival.

GRASSLANDS IN GENERAL

Grasslands need management to stay productive. Idled grasslands tend to build up excess litter, which benefits rodents, but restricts use by other wildlife such as bobwhite quail and rabbits. The following is a list of five methods commonly used to manage grasslands. **Note:** Remnant prairies may require special management practices, which are discussed at the end of this chapter.

GRAZING



Rotational grazing benefits livestock and wildlife.

This practice can be done on a continuous or rotational basis. "Continuous" means keeping livestock on a single field over an extended period of time, if not permanently. This usually results in poor forage production, overgrazing of palatable plants, and soil erosion, allowing unwanted vegetation such as woody plants to grow and thrive. When grasses are overgrazed, livestock suffers from lower forage production, and wildlife suffers because little habitat remains for them to use. To maintain their vigor, all plants need to have enough leaf area left on them (usually a minimum of 2–4 inches) to allow photosynthesis to occur.

Rotational grazing involves moving livestock between at least two pasture units. Moving livestock periodically allows grasses in those units to recover from grazing, maintaining good, healthy root systems. Rotational grazing can be used in several units, which can make it an even better management tool. When forages are allowed to grow and recover, they provide better forage during the next grazing period. In spring, allowing grazing units to rest also gives wildlife a better opportunity to use residual growth for nesting and cover. While a large, multi-unit grazing system takes more time and effort to build and manage, it pays off in better forage, livestock production, and wildlife habitat.

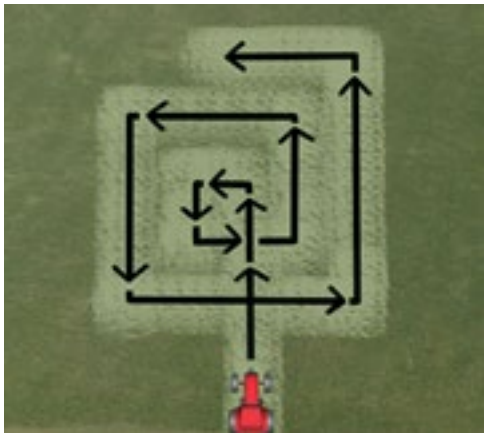
Proper grazing is all about the stocking rate. If you allow too many cow-calf pairs to graze one or several units, then it probably won't make any difference what grazing system you use — you still won't have enough forage. It is very important to balance the

size of your herd with available forage. Overstocking, and therefore overgrazing, leads to decreased grass production, forcing you to use more fertilizer to try and improve the pasture and feed more hay during times when you would not normally need to do so. Information and workshops on managed grazing systems are available from your county USDA service center. See Chapter 9 for details.

HAYING

Timing is one of the most important factors in haying. Cutting too early will reduce production, and cutting too late will decrease quality and prevent grasses from building up root reserves before winter dormancy. This weakens the stand of grass and reduces or eliminates cover for wildlife. It is important to hay when quality and quantity can be optimized. If you're not sure when to hay, MU Extension can advise you about the best times.

Cutting height is an important factor to keep in mind as well, but most managers ignore it. With today's disk mowers that cut nearly at ground level, it is even more important to cut hay at a height that will allow those grasses enough time to regrow and build up their root reserves before winter. Try to leave 4–6 inches above the ground.



Wildlife are often killed during haying operations, which continuously herd them toward the middle of the field as it is cut. Then panicked animals are often killed outright during the final passes with the mower, or they are subject to predation as they try to flee across the recently mowed field. Consider mowing hayfields from the inside out to help reduce wildlife losses as shown here.

FERTILIZING

Both haying and grazing remove nutrients from the soil. You can apply fertilizer and agricultural limestone to a field, but it's best to do these practices only after conducting a soil test. This will tell you what nutrients, if any, are low in your soil. Test results will allow you to know the optimum amount of a particular fertilizer you will need to apply. This can be cheaper for you and also better for the environment since you won't be using more than the soil needs. Excess fertilizer will usually run off and get into ponds and streams, which can cause environmental harm. The soil test will also show you if your soil is acid, and if so, how much lime will be required to bring the soil back to a desirable level. You can get more help in interpreting the soil test from your local MU Extension office. More information on testing soil samples can be found in Chapter 8. Refer to the Remnant Prairies and Grasslands section at the end of this chapter for information about fertilizing remnant native prairies.

OVERSEEDING WITH LEGUMES

Legumes, such as clovers and lespedezas, are nitrogen-fixing plants, which means they can remove nitrogen from the air and add it to the soil, thus making nitrogen available for other plants to use. This can reduce the amount of fertilizer you may need to apply to your grassland and also improve the forage quality (forage legumes are very palatable and high in protein). Several factors can affect the success of overseeding an existing grassland with legumes and include the method used to overseed, soil moisture levels, timing of the overseeding, and other factors. For the best results, consult your local NRCS office or MU Extension office for the best advice on which species of legumes to use and what time and method to plant them. Remember, managing your grassland, even with legumes added, is very important. Like grasses, if legumes are mowed and/or grazed too short, too often, or too late in the year, they will die.

COOL-SEASON GRASSLANDS

Cool-season grasses, such as timothy, orchard grass, Kentucky bluegrass, redtop, smooth brome grass, and tall fescue, start growing early in the spring when soil temperatures reach 40 F. These grasses will then slow down growth or even go dormant during the warm summer months when soil temperatures reach 78 F. As soils cool down again during late summer or early fall, these grasses will then start growing again until they go dormant during the cold winter months.

Cool-season grasses have been popular choices for landowners in the past due to ease of establishment, ability to withstand heavier grazing pressure, and positive response to fertilization. Because these grasses put on heavy growth during the cooler springtime, farmers like to cut them for hay. Unfortunately, spring is also peak nesting time. When cool-season grasses are cut for hay in the spring, there is little opportunity for ground-nesting wildlife to be productive using them.

Tall fescue is generally too thick for species such as bobwhite quail, making it impossible for their chicks to navigate and covering essential bare ground.

Species like big blue-stem and partridge pea support wildlife and make good forage and hay.

NATIVE WARM-SEASON GRASSLANDS

Established warm-season grasslands consist of a few species of native grasses and forbs, usually planted by the landowner or a contractor. This is in contrast to a native prairie, which is composed of many grasses, sedges, rushes, and forbs. These native prairies have evolved over many centuries and are very complex, diverse ecosystems. They will be discussed in Remnant Prairies and Grasslands.

Many landowners are rediscovering the benefits of Missouri's native warm-season grasses for livestock forage and wildlife habitat. Species include big and little bluestem, Indian grass, switch grass, and eastern gama grass. The growth pattern of these grasses is compatible with legumes and other native forbs, both of which are important for livestock and wildlife. See Establishing Native Warm-Season Grasses in Chapter 8.

When the soil reaches around 60 F in the spring, warm-season grasses begin growing. They are adapted to grow during the warmest months of the year, when the soil is about 90 F. Thus, these grasses can provide a much-needed source of forage during summer, when the cool-season grasses are less productive. Although native warm-season grasses have a shorter growing season, their deep root systems make more efficient use of water and soil nutrients. This characteristic is what has made these grasses survive, and even thrive, over the centuries.

Grazing

For optimal livestock gains, plant 20–30 percent of grazing land to native warm-season grasses. Because their growth points occur higher up the stem, native warm-season grasses should not be grazed lower than 6–8 inches. As a general rule, these grasses can be grazed from around early May through mid-September in southern Missouri. In northern Missouri, the dates in general are from mid-May through early September. Do not graze grasses to ground level. Stop grazing these grasses several weeks before they go dormant, so they can build up root reserves before winter and maintain a vigorous growth capability the following year.

Haying

Native warm-season grasses are usually hayed in July or early August after most ground-nesting birds have hatched broods. This also allows the native grasses to have sufficient regrowth before winter dormancy. In addition, this regrowth will provide some cover during the winter months and also provide nesting material the following spring. A second cutting of hay is not recommended. It will reduce the vigor and weaken the stand of grass. Studies have shown that yield losses the year following a second cutting offset the extra hay produced by a second hay harvest.

Fertilizing

Native warm-season grasses are very efficient at using soil nutrients, but they may need some fertilizer applied at times. Usually this involves phosphate and potassium. Even if these grasses do need some of these nutrients, they still usually do not require as much fertilizer as do cool-season grasses. Applying nitrogen can improve yields, crude protein, estimated net energy, digestibility, and relative feeding value of some native warm-season grasses. The greatest return on investment for applying nitrogen occurred with the application of 50 pounds per acre. Timing is very important when applying nitrogen. It should be applied just at the time of green up, usually around mid-to-late April.

Prescribed Burning

This is a very important tool for managing native grass pasture or hay units and remnant prairies. Find prescribed burning management instructions in Chapter 8. Fire releases nutrients, controls ground litter and some unwanted plants, stimulates seed production, and helps improve plant diversity. Conducting a prescribed fire is about timing — the fire must be done at the correct time to meet the management objective.

REMNANT PRAIRIES AND GRASSLANDS

As we emphasized at the beginning of this chapter, Missouri's native prairies once covered nearly one-third of the state. A diverse mixture of grasses, sedges, rushes, and forbs dominated these prairies. Today, less than 0.5 percent of the original native prairie remains. Most of the native prairies have been plowed up and planted to crops or cool-season grasses. The small remaining tracts are referred to as remnants, and these are vital to many grassland dependent species of mammals, birds, insects, and microorganisms.

Proper management will make a native prairie more productive and protect a valuable, dwindling resource. Experienced personnel can provide information about the special management needed on native prairies. If you are fortunate enough to own a tract

of native prairie, contact MDC's Private Land Services Division for advice on prairie management. See Chapter 9 for contact information.

When grazed moderately, prairie remnants will provide excellent summer forage. The prairie should never be grazed lower than 6–8 inches tall. You can start grazing these tracts around early May. Be sure to remove cattle by early to mid-September. This will allow enough time for the prairie to rebuild its plant vigor before going dormant for the winter.

Native prairie remnants provide quality hay. However, haying dates are more critical in native prairies, because they affect not only the yield and quality of the forage but also the types of plants that will persist.

Use fertilizer and lime with caution on a native prairie. Perform a soil test before putting any fertilizer and/or lime on any field so that the correct amount of all nutrients can be applied. Refer to Chapter 8 for details about how to conduct a soil sample test. As a general rule, nitrogen is not as critical on a native prairie, since there are usually many native legumes that can help supply nitrogen in the soil. Phosphate, potash, and lime, however, can be in short supply, depending on how the native prairie was historically managed. If your soil test results confirm the need for fertilizer, apply it just as the native prairie is greening up, usually in April.

Prescribed Burning

This great management tool can enhance the productivity of native prairies (see Chapter 8 for prescribed fire instructions). Timing of the prescribed burn is very important and depends on your objectives, such as increased forage production, setting back grass growth, enhancing forb growth, or setting back woody growth. For potential assistance with a burn plan or conducting a prescribed burn, contact your local MDC office.

GRASSLAND MANAGEMENT TIPS

- Use both native warm-season-grasses and cool-season grasses in a rotational grazing system.
- Investigate the use of rotational grazing systems, using several paddocks or grazing units, rather than one large grazing unit.
- If you have a hay field or grazing unit with only one species of grass in it, consider adding more species to it, especially legumes (clovers, lespedezas).
- Protect shrubby vegetation or wooded areas next to grazing units with permanent fence. In many cases, cost-share assistance can be acquired to accomplish this. Contact your PLC for more information.
- Allow warm-season grasses, whether it is in a planting or a native prairie, to regrow to 12–15 inches tall before the fall dormancy period. Do not cut or graze within six weeks of the average first frost.
- Consult your local PLC for professional assistance in managing native prairie remnants.
- Establish green firebreaks around warm-season grass pastures and hayfields using wildlife-friendly cool-season grasses and legumes.

Forest and Woodland Management 4

Eastern wild turkey

The wooded areas on Missouri's landscape have great potential as habitat for a variety of wildlife species. When managed well, the forests and woodlands provide food and cover for deer and turkey, den trees for squirrels and furbearers, and snags for nesting woodpeckers. Wooded edge produces browse for deer and nesting areas for songbirds and game birds alike.

The difference between a good wildlife woodland and a poor one may be nothing more than a fence and proper management of the trees. Many animals are generalists and use all wooded areas: forest, woodland, and savanna. This chapter offers ideas for managing your wooded areas for both wildlife and timber production.

Our understanding of wooded areas has grown over the years, allowing us to describe and define "the woods" in more specific terms than previously. *The Terrestrial Natural Communities of Missouri* describes seven broad categories of forests, eight categories of woodlands, and five categories of savannas found throughout Missouri. A brief description of these three different wooded ecosystems follows.

Woodland restored with timber stand improvement (TSI) and prescribed burning.

FORESTS

A relatively large area (typically over 10 acres and generally much larger), a forest is dominated by trees forming a closed canopy and interspersed with multilayered, shade-tolerant sub-canopy trees, shrubs, vines, ferns, and herbs. Trees attain heights of 60 to over 100 feet. Because little sunlight reaches through the dense canopy, sub-canopy trees, shrubs, and vines are sparse, with a limited shade-tolerant ground flora. Canopy trees characteristically have narrow crowns and limbless, shade-pruned trunks due to intense competition for sunlight. Forests are restricted to those landscapes where natural or man-caused fires were infrequent and are generally found on north and east slopes where soil moisture is greater. The absence of fire resulted in forests primarily in regions of rugged hills, floodplains, and swamplands.

Forest managers commonly pursue a mix of objectives, such as high-quality timber production and wildlife management. In addition to producing tall, straight trees fit for the wood-products industry, forests typically yield a good mix of hard- and soft-mast (nut- and fruit-bearing) trees, which provide wildlife forage during various times of the year. The forest floor is generally comprised of patchy **herbaceous** plants, ferns, mosses, fungi, springtime herbs, and plants that grow from bulbs or shoots that push up through the deep leaf litter. Wildlife use these for food and habitat.

WOODLANDS

Woodlands are characterized by a canopy of trees ranging from 30- to 100-percent closure, allowing plenty of sunlight to reach the ground and resulting in a dense ground cover rich in **forbs**, grasses, sedges, and other herbaceous plants. Woodlands are highly

variable in canopy structure, but they have a comparable open understory and diverse vegetative ground layer. Woodlands characteristically have thin soils. They are generally found on southern slopes with low soil moisture.

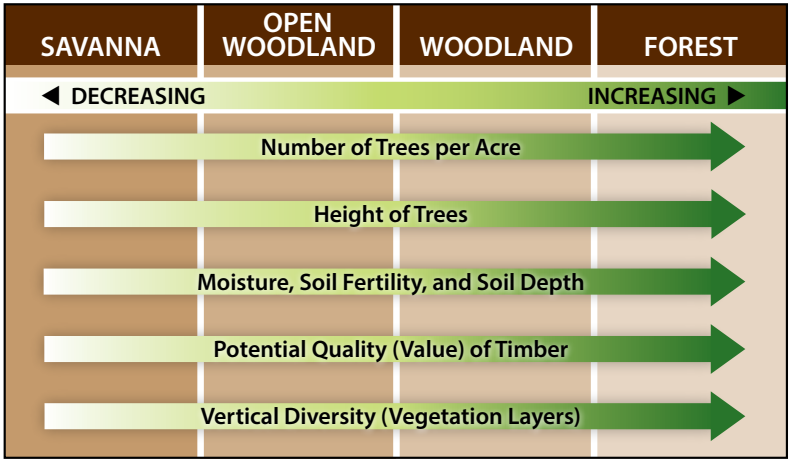
Commonly, woodland managers' primary objectives include a mix of low-value timber production and wildlife management. Woodlands, because of the increased fire frequency, generally have a good mix of hard mast over-story trees and possibly shortleaf pine in the southern Ozarks. When managed well with proper thinning and prescribed fire, these woodlands have a more abundant understory mix of grasses, forbs, and woody sprouts with a less prominent mid-story. These dry woodlands can respond to thinning, mostly in ways that increase wildlife value, such as increased hard-mast yield and increased browse due to woody sprout and forb development.

SAVANNAS AND OPEN WOODLANDS

Savannas are grasslands interspersed with scattered trees, groups of trees of various ages, and shrubs. These take on the appearance of widely spaced, orchard-like groves or individual trees. Savannas are different from woodlands because they are strongly associated with large prairies and are thus dominated by grasses and forbs. Savannas are species-rich, with most diversity found in the understory layer. Both plants and animals of the savanna are adapted to full sun, frequent fire, and grazing by **native** (before settlement) herbivores.

Only fragmented examples of former savannas exist in Missouri today because of suppression of natural and man-made fires. Remnant savannas are restricted to prairie regions and upland plains. Many animals use savannas, but only a few are strictly tied to this natural community.

Unlike savannas, open woodlands, such as those of the Ozark Highlands, have more old-growth, scattered, open-grown trees often surrounded by even-age young tree species. The ground in open woodlands has far less cover and fewer species than savannas because heavy leaf litter and dense underbrush shade it out. Get more information on open woodland management from NRCS or MDC.



FOREST MANAGEMENT PLAN

Your wooded-land management objectives should be defined within the limits of what your land is capable of sustaining. For example, don't try to create an open woodland from a high-quality forest or manage high-quality timber on woodland sites with low growth potential.

A great way to start in the process of learning about your forest and wooded areas and their potential to meet your goals is to consult a professional forester. He or she can help you plan how to accomplish your goals based on a thorough assessment of your forest or woodlands by management units, called "stands." Management units share similar characteristics, and a detailed inventory of each one will provide information the forester can use to recommend improvements. A management plan will guide you toward achieving your forest and wildlife management goals over a 10-year period.

PROTECTION FROM GRAZING

Over-grazing by livestock can do serious damage to wooded areas. Much of this damage is not immediately visible and shows up only as long-term effects, such as tree decline, loss of timber value, tree mortality, soil erosion and compaction, and wildlife habitat destruction.

Tree seedlings and saplings are often the first to be eaten or destroyed. Livestock break saplings, strip them of bark, and trample them. Even large trees can suffer wounds from rubbing and the chipping of hooves at the base of the tree.

Livestock hooves mix the leaf litter into the soil, speeding decomposition, and exposing bare soil to erosion. The pores in the soil that allow air and water transport to tree roots are sealed off, suffocating the roots below. Rainwater that should infiltrate into the soil runs off the surface. The fine, hair-like feeder roots located several inches under the ground are exposed and damaged. Trees become weakened, and growth rate slows. Damaged and exposed tree roots are excellent entry points for insect and disease pests.

The appearance of a grazed woodland changes as trees are harvested or die of old age and there are no young trees to take their place. Often, trees more resistant to grazing increase in number as the less resistant but more valuable trees are eradicated. Hickories, with their taproot, can tolerate more soil compaction than oaks and will increase in number. Honey locust seedlings are thorny and seldom eaten by livestock and, therefore, thrive in grazed woodlands.

Since there is little else for cattle to eat in the woods, they eat plants from the ground up to as high as they can reach, creating a browse line. Wildlife needing dense brush and low-growing plants for food and protective cover have difficulty surviving in grazed woodland.

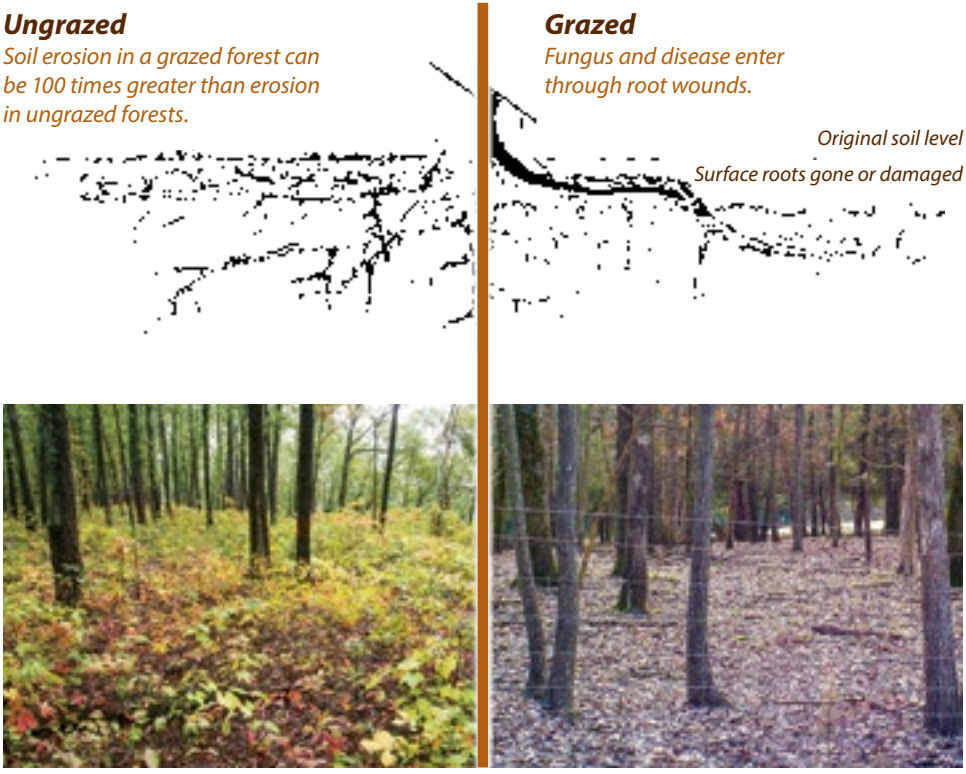
The ability of trees to produce fruit depends on their vigor and health. Grazed woodlands are less vigorous, and the trees produce fewer seeds, including acorns, which are a staple food for woodland wildlife. Cattle grazing in a woodland may eat the entire acorn crop, leaving nothing for wildlife.

Ungrazed forestland provides excellent protection for the soil. In contrast, the soil erosion on grazed woodland can be as much as 110 times greater than on ungrazed woodland. Furthermore, hardwood forests produce poor-quality forage for livestock. One acre of a managed pasture produces the grazing equivalent of 20–40 acres of woodland grazing. The best investment is to manage existing pastureland and allow the woodlands to grow trees and wildlife.

To restore grazed woodland to better wildlife habitat, fence out your livestock. Financial assistance for fencing may be available through your county USDA service center.

Influence of Grazing on Erosion Potential in Forest Land

	Percent Ground Cover	Erosion Potential
Non-grazed	95+	Minimal
Lightly grazed	85–95 percent	8 times
Moderately grazed	50–85 percent	30 times
Heavily grazed	0–50 percent	110 times



Heavy prolonged grazing of forests eliminates food and cover plants for wildlife.

Leaving trees where you drop them creates wildlife cover.

FOREST THINNING

Thinning rates for your forest or woodland depend on your objectives and the type of wooded site. Depending on current condition and trees per acre, different types and amounts of thinning may be necessary to improve a forest stand or create a more open woodland. In forest or woodland stands where timber production or simply growing vigorous, healthy trees or wildlife is your goal, then forest thinning may be the appropriate management tool.

There are basically two general types of forest and woodland thinning: commercial and noncommercial. A commercial thinning, or timber harvest, is an excellent forest and wildlife management tool if it is planned and administered properly. If the trees to be thinned are of marketable size and quality, they can be selectively sold and removed from the stand to achieve your management goals. Income from the sale can be used to accomplish other habitat projects. If a timber harvest is not an option, then a non-commercial thinning, or timber stand improvement (TSI), can be performed to achieve many of the same results.

TSI is the removal of selected trees from a timber stand to improve the health and growth of the remaining trees that may or may not be harvested in the future. As the name implies, this practice is conducted on forested sites where improving timber production is a priority. However, it is also used simply to promote forest health and increase wildlife habitat. Most unmanaged timber stands become overcrowded, causing a shortage of water, nutrients, and sunlight for all trees. TSI reduces competition in a stand and allows you to decide which trees to keep based on your management goals.

Proper spacing of trees is the key to any TSI. Trees too closely spaced will soon become crowded, slowing their growth. Trees spaced too far apart waste growing space and encourage larger crowns at the expense of taller, straighter trunks. To estimate the best distance between trees in a stand, measure one or several trees at a height of 4½ feet above the ground — a measurement known as "diameter at breast height," or DBH. Multiply the average DBH (in inches) by two and use that number as the distance in feet to leave between trees. For example, if a tree is 11 inches in diameter, multiply by two, such that 22 feet is the proper spacing to leave between that tree and the trunk of its nearest competitor tree.

Adjustments to thinning levels will be based on landowner objectives. If more accuracy is desired in managing forest stands for maximum timber benefit, then the detailed descriptions of thinning levels outlined in a forest management plan can be implemented by a professional forester or a skilled TSI contractor.

When you are thinning a timber stand, the most important trees to leave uncut are the trees with the best health, growth form, and value — or "crop trees." These trees will live longer, provide the greatest food value for wildlife, and will often have the highest value as wood products when mature. Other trees to leave standing are those that will be removed in future thinning but are needed in the meantime to fill growing space. This leaves the least desirable surplus trees, which can be cut for firewood or other purposes. Characteristics of surplus trees include the following:

- Poor-quality wood due to species of the tree
- Multiple sprouts from one stump
- Swellings or bumps on the trunk indicating internal damage
- Fire scars or other damage to the trunk
- Many wide-spreading branches low on the trunk

Leave these trees for wildlife habitat:

- Den trees — those with an opening leading into a hollow interior
- Wolf trees — those with a short trunk but wide, spreading crown. These are especially important if they produce large amounts of mast (acorns and nuts) and are in an area dominated primarily by small trees that have not reached mast-producing age. Leave at least one for every two acres
- Tall, fruiting trees — including hackberry, black cherry, mulberry, black gum, and persimmon

PROTECTING DEN TREES AND SNAGS

Den trees are live trees with a natural hollow in the trunk or limbs, while a snag is a standing dead tree. Both are essential habitat for many kinds of woodland wildlife.

Once a tree dies, the slow process of decay begins. As the heartwood in a snag softens, woodpeckers excavate nest holes, which other wildlife use later on. Many birds, mammals, and reptiles use tree cavities throughout the year for nesting, feeding, perching, escape cover, and protection from the weather. Few or no den trees usually means less wildlife in an area.

In a typical woodland, trees with cavities are often in short supply, so it is important to protect both existing and potential den trees. Old, open-grown, large-crowned trees should be protected because they are likely to become good den trees. They also produce nuts, seeds, and fruits, making them doubly valuable for wildlife.

White oak, post oak, and other members of the long-lived white oak group make the best den trees, but black or red oak, hickory, American elm, sugar maple, American sycamore, eastern cottonwood, black gum, ash, and basswood also are excellent.

As a general rule, seven snags or living den trees per acre provide an adequate number of cavities. Live den trees will last longer and are often fruit or nut producers. Standing dead trees attract insects and do not compete with other trees for water, nutrients, and sunlight. Consider the option of deadening undesirable trees but not removing them.


Great horned owls

Preserving existing snags and den trees, as well as protecting potential den trees, helps the woodland become a productive wildlife area for many years to come. A woodland management plan for wildlife should include the following practices for protecting snags and den trees within a woodland:

- Leave at least one snag and one den tree larger than 20 inches at DBH for every acre of woodland.
- Leave at least four snags ranging between 10 and 20 inches at DBH per acre.
- Leave at least two snags and two den trees ranging between 6 and 10 inches at DBH.
- Create den trees and snags by wounding selected trees. Open wounds allow fungi to enter the tree and begin the decay process. It may take several years for trees to develop cavities. This process can be hastened through the following techniques:
    - Cut a limb (the larger the better) about 6 inches from the trunk of the tree. Ash, elm, cottonwood, sycamore, silver maple, and basswood are especially prone to develop natural cavities from cuts.
    - Chop a section of bark from the trunk of a suitable tree, preferably one that already shows signs of damage or decay. Select trees at about 100-foot intervals.
    - Drill a hole at least 2 inches in diameter and 3 inches deep into the trunk of a tree. If possible, make the hole under a limb that is 3 inches or more in diameter.
    - For more immediate results, put up birdhouses and den boxes. Building plans can be found in *Woodworking for Wildlife* listed in Recommended References at the end of the booklet.

WOODLAND EDGES AND OPENINGS

Edge is the transition zone between habitat types. This zone offers critical wildlife food and cover. The amount, diversity, and quality of the edge directly affect wildlife populations.

High-quality edge is a wide band of plants that gradually changes from one cover type to another. It has grasses, weeds, shrubs, vines, and small trees that provide wildlife foods, such as berries, seeds, browse, and insects. It also offers cover for nesting and protection from weather and predators.

An ideal edge has crops, shrubs, small trees, and large trees.

Good edge usually requires deliberate action on the part of the landowner. High-quality woodland edge can be created by planting shrubs or small trees in a 30-foot or wider strip at the edge of the field. Alternately, you can install a management practice called edge feathering as described in Chapter 8. Another option is to allow the border to revert naturally to native plants and supplement with plantings if necessary. The natural process usually is rapid and reliable after excluding grazing, plowing, and mowing. Conversion of heavy sod, such as fescue, to edge habitat can be hastened by plowing, disking, or applying herbicide to the border strip, which allows native species to propagate. Details for applying these practices appear in Chapter 8.

Some crop field acreage is considered too valuable to remove from production. An alternative in such areas is to create edge in the woodland by removing additional trees within 30–50 feet from the field border.

If trees border a field and affect crop growth, you may find it cost-efficient to let an edge develop between the trees and the field because the return from low-yield field edges often does not offset the cost of seed, fertilizer, and site preparation.

Large woodland tracts can lack the variety of plants necessary to support diverse wildlife populations. A 1-acre opening in a forest often provides as much as 10 times the amount of plants used by wildlife as 1 acre of mature timber. Annual weeds, grasses, and seedlings found in these openings produce food, nesting sites, and escape cover for wildlife.

Five to 10 acres of small clearings per 100 acres of woods is desirable. These openings should range from 1–3 acres in size. Smaller woodlands surrounded by pastures and farm fields will reduce the need for forest openings. On larger woodlands, roads, utility rights-of-way, log landings, or small clear-cuts provide open space.

GLADES OR BALDS

Glades, often called balds, are rocky openings in forested areas. Glade features include exposed bedrock of limestone, sandstone, igneous rock, or dolomite and plant communities of native prairie grasses and wildflowers. More common in southern Missouri, glades usually occur on south- or west-facing slopes, but they can occur on any aspect. They can be as small as ¼ acre or cover hundreds of acres.

Encroaching red cedar has been removed and prescribed fire applied to restore this native glade.

Glades are home to many uncommon animals such as collared lizards, eastern narrow-mouthed toads, and roadrunners. Some of the more common glade animals are speckled king snakes, fence lizards, and six-lined race runners. In southwest Missouri, glades are home to endangered plants such as Missouri bladderpod (a small member of the mustard family) and geocarpon (a tiny relative of carnations). Glades in the St. Louis area harbor the beautiful Fremont's leather flower, found only in Missouri and Kansas. A healthy glade will frequently have more than 100 species of plants, including pale purple coneflower, Missouri black-eyed Susan, and Missouri evening primrose.

Many glades on private land are overgrown with eastern red cedar trees due to continuous livestock grazing and lack of periodic fire, which historically controlled cedar invasions. With a little work, you can restore a glade to its relatively open condition, making it more valuable to wildlife. Protect a glade with few or no cedars and a wide variety of plants from extensive grazing, and it will remain in good condition with nothing more required than an occasional prescribed burn.

Heavy cedar growth must be cut with a chainsaw. Drop the cedars and allow them to cure for a year before burning. Because burning several cured cedars can produce a fire that can damage other nearby trees or cause a wildfire, use caution and plan extensively. Contact your local MDC resource forester, wildlife management biologist, or PLC (see Chapter 9) for guidance about using prescribed fire and to see if the cedar logs might have market value.

FOREST MANAGEMENT TIPS

- Protect forests and woodlands from grazing.
- Deaden large trees along edge of wooded areas.
- Plant 30-foot-wide strip of shrubs along mature forest edge.
- Create woodland/field edge habitat using edge feathering and field borders.
- Create small openings within large timber blocks.
- Encourage native vines and fruiting shrubs.
- Apply timber stand improvement practices.
- Do not cut den trees and snags; install squirrel den boxes.
- Leave downed tree structures (DTS) that result from firewood cutting.
- Fence a 50- to 100-foot-wide zone along all wooded stream banks to exclude livestock.

Wetland Management 5

Great blue heron, blue-winged teal

Wetlands mean different things to different people. Some envision dark, murky swamps while others think of them as places to enjoy an early morning duck hunt or an afternoon of wildlife watching.

By definition, a wetland is a tract of land containing adequate soil moisture to support certain types of water-tolerant vegetation. Lands that fit this description can vary from permanently flooded sloughs to areas that only have saturated soil during part of the year.

Wetlands function as biological filters that remove sediments and pollutants from surface waters. They also act as natural sponges, reducing flood severity by slowly releasing excess water back into the stream or groundwater table.

Wetlands are biologically productive, with a greater diversity of plants and animals than is found in drier habitats. They are excellent habitat for all kinds of waterfowl, shorebirds, and songbirds. Natural wetlands along streams and rivers are important fish-spawning and -rearing areas.

Historically, natural wetlands dominated the floodplains and river deltas in Missouri. During the past few decades, many were converted to agricultural land. However, many of these fields continued to be too wet to farm, even after they were cleared and drained. These wet fields are the best sites for restoring or developing wetlands on private property. As we look toward the future, we realize how important it is to preserve our few remaining natural wetlands, restore degraded wetlands if feasible, and develop new wetlands wherever possible.

Many of the wetlands in Missouri today are man-made. That is, they were constructed on previously dry or seasonally flooded land and are maintained by levees and water-control devices. For information on construction and development of private wetlands, see Chapter 8.

Most wetland management today is directed toward creating habitat for fall-migrating and overwintering waterfowl. In this type of management, production of food for waterfowl is a primary concern. Providing high quality habitat for waterfowl during the spring migration is also very important. A good duck season depends on a good nesting season. Providing high quality habitat during the spring migration ensures the ducks will be in better physical condition when they arrive on the breeding grounds. This will improve nesting success and ultimately provide better hunting opportunities the following fall.

Diverse groups of plants grow naturally on moist or wet soil. These plants produce seeds that provide energy and contain essential nutrients for waterfowl. They also provide excellent growing conditions for invertebrates, such as small snails, clams, and insects, which are also good waterfowl foods. Wetland management techniques, such as manipulating the water levels, varying the timing of the water drawdowns from year to year, and disturbing the soil in the wetland on a rotational basis will encourage the growth of these moist-soil plants. In some cases, you can use domestic grains to set back **succession** to promote annual **native** plants the following year and provide a supplemental food source the immediate fall. If domestic grains are planted, take care to ensure they do not compromise the functions and values of the wetlands.

Following are some procedures that produce many kinds of waterfowl foods, both natural and cultivated, under a variety of wetland conditions. Details on developing a wetland are presented in Chapter 8.

MOIST-SOIL AREAS

Encourage moist-soil plants in wetland basins by drawing the water from the fields during the growing season. This replicates the seasonal drying effect that would have occurred in natural wetlands through the summer or in drought years. Wetlands typically have diverse seed banks in the soil that are viable and will germinate if given the right conditions. Areas that have experienced large inputs of sediment may need to be excavated or disturbed to expose or mix up the seed bank.

The timing and rate of the drawdown are important for good plant growth. Wetland drawdown times should vary from year to year to stay productive. Early drawdowns (March through early April) promote the germination of broadleaf plants like smartweed.

Mid-season drawdowns (mid-April to mid-May) will result in some smartweeds and more sedges and grasses like wild millet. Late drawdowns (late May to June) favor more of the grasses and sedges, like wild millet and chufa (flat sedge). Every three to five years, it is good to leave the water on the wetland to evaporate on its own.

Begin the drawdown by opening the water-control structure a small amount. The rate of the drawdown should be slow enough to prevent rapid drying of the soil, usually about 1 inch per day. This will discourage undesirable species like cockleburs from germinating while stimulating desirable moist-soil plants. Following germination of desired plants, manipulate water levels throughout the summer as necessary to keep soil moist. A slow, progressive second flooding of the marsh is best, starting around September 1 for teal or October 1 for many other waterfowl species.

Disking in late summer or early fall is another tool to enhance a moist-soil wetland's productivity. By breaking the soil and churning up the standing vegetation, conditions are set to give the aquatic insects a jump-start once water is added. These open patches show water earlier as flooding occurs that may not be visible from the air under the thick summer growth of plants. The long-term advantage of this strategy is that it sets the stage for annual plants to germinate the following year and breaks up the root structure of perennial plants that begin to dominate when disturbance is absent.

FLOODED CROPS

Flooded grain crops can be very beneficial for waterfowl. They provide a source of high-energy food, especially late in the winter when the weather is extremely cold. Flooded grain crops can be a wetland-management tool, but they should not be used as the only wetland management practice. Scattering food plots throughout a wetland can help set back plant succession in the following growing season and can provide hunting cover and waterfowl food in the upcoming fall.

Cropfield reflooding provides high-energy food for migrating waterfowl.

Corn or grain sorghum should be flooded from October 15 to March 30. Crops planted specifically for waterfowl need not be clean-tilled because the weeds will provide additional food. It is important to remember that grain crops are a source of high energy and will not provide all the nutritional requirements of migrating waterfowl. This combination of agricultural crop and natural foods provides a more balanced diet that is critical for ducks moving through Missouri by meeting their energetic needs for migration and essential nutrients and amino acids to molt feathers.

If the wetland pool experiences a late summer flood and vegetation is damaged or killed, all may not be lost. Late-season grasses like sprangletop or sedges may germinate in the moist soil of the food plots after the flood and offset the loss of crops. Another option is to broadcast wild or Japanese millet (15 pounds per acre) on the mudflats. The plants will be small but will provide food for the fall migrating birds. Holding water from a late summer flood is another way to make the best of a bad situation and reduce the need for flooding later that fall. Aquatic invertebrates (water animals without backbones), fish, and wetland plants may thrive in these conditions. Each flood and year is different. It is necessary to remain flexible with management strategy and desired plant community when managing wetlands over time.

TIMBERED WETLANDS (GREEN TREE RESERVOIRS)

Bottomland forests are an important wetland habitat type. The management plan for a bottomland forest should protect the health of the trees; therefore, no flooding should occur during the growing season. To put it simply, if there are leaves on the trees, do not flood the timber, because it is easy to damage and kill the timber in these areas. Do not look at just the overstory, because the seedlings, which are the forest of the future, typically hold onto their leaves a little bit longer and should be evaluated prior to fall flood up. Flooding dates, depths, and duration should vary from year to year to maintain the productivity of the forest. The management schedule should include one year in every three or four years where there is no artificial flooding.

In northern Missouri, consideration should be given to the damage thick ice can do to tree health. Timbered wetlands in northern Missouri usually can be flooded from November 1 to February 15. Timbered wetlands in southern Missouri should be flooded no earlier than November 15, and draining should start by February 1. The water should be drained before the trees leaf out. A slow drawdown is better than a rapid one with the forested wetland because of the potential to produce moist soil plants in these low, open areas. Open areas in the forest can be planted in Japanese millet or managed for natural foods.

Green tree reservoir

WET PRAIRIE, FENS, AND TEMPORARY WETLANDS


Fen

There are a range of other wetlands, including wet prairies, fens, and temporary, or ephemeral wetlands that are important breeding sites for various frogs and salamanders. Reptiles, migrating shorebirds, waterfowl, and insects — all of which are important to the local ecosystem — also use these wetlands. Many formerly temporary wetlands have become permanent pools of water that people have stocked with fish. This limits their usefulness for frogs and salamanders because fish prey upon the eggs and the young of amphibians. It's no coincidence that most of the rare amphibians in Missouri use temporary pools for breeding. Some of the common species that use these areas are western chorus frogs, spring peepers, southern leopard frogs, and tiger salamanders. In prairie areas, the northern crawfish frog and the Great Plains narrow-mouthed toad will use these pools.

To select a site for your pool, you should look for natural low spots or dips in the landscape that may hold water for short periods of time, particularly during the spring. These sites can occur almost anywhere — on flood plains, uplands, forests, fields, or pastures. Areas on flood plains are especially attractive because they can fill up from multiple sources: precipitation, run-off from the hills, seep water, or overland flow. These areas may already have wetland plants, such as smartweed, sedges, and wetland-adapted grasses. If the site holds water for two or three months, there is a good chance it is already a functioning wetland and improvements such as levees and water control structures are not needed. Remember, unaltered, naturally occurring wetlands are often highly functional, diverse habitats. This fact should be given a great deal of consideration before conducting any "improvements," which may actually damage or degrade the wetland.

Ditches, tile drains, spoil piles, or levees are typical alterations that have modified a wetland's hydrology. Filling in ditches, flattening out spoil piles or levees, and breaking tile lines are common practices to restore the groundwater table or overland flow of water to these sites. A small depression can be enhanced or constructed in less than a day using a small bulldozer or a tractor and blade. A depth of 1–2 feet is ideal, and the pool should have sloping sides (at least a 4:1 slope or flatter). Pools can be of almost any size or shape, depending on the site. Trees around the site should be left in place. Flatten out the sides of the spoil piles (removed material) to a 4:1 slope or flatter.

Once the pool is constructed, there is usually no need to introduce aquatic plants or animals. The soil in a seasonally wet area will frequently have an existing seed bank of wetland plants, and animals are good at finding wetlands on their own. If plants are introduced to provide a jump-start or add wetland species that are now rare in the region, care should be taken not to use aggressive species such as cattails, purple loosestrife, or common reed (phragmites). These species will reduce the plant diversity and form less productive monocultures.

If done correctly, your wetland will dry up or become wet as the climate allows and be used by a range of wetland plants and animals.

NATURAL SLOUGHS AND SMALL PONDS

If draining a pond or lake is possible, it should be drawn down 1–2 feet in early June to encourage beneficial moist soil plants, then allowed to refill with rainfall and runoff. Mudflats around ponds can be seeded to Japanese millet or buckwheat, but this does not have to be done every year.

If water control is possible, sloughs can be managed as described above. Be careful not to expose mussel beds or cause fish kills when lowering water levels in sloughs. If water control is not possible, the following techniques can be used where feasible:


Natural slough

- Plant food and cover strips, and encourage native plants along edges of wetland.
- Plant bottom-rooted plants, such as duck potato, in shallow-water areas.
- Plant bottomland tree species according to their flood tolerance levels along the water's edge.
- Control bottom-feeding fish to allow aquatic plants and insects to thrive.

WETLAND MANAGEMENT TIPS

- Nesting structures for wood ducks can be constructed from plans provided in *Woodworking for Wildlife* listed in Recommended References at the end of the booklet.
- Find more tips for managing wetlands at ***mdc.mo.gov***.

Managing Unique Habitats 6

Urban native plant landscaping

Nearly every property has some land that is unsuitable for cultivation, grazing, or haying due to its steepness, soil type, wetness, or small size. These fallow areas — old fields, abandoned house sites, pond edges, wetlands, stream banks or corridors, brushy draws, ditch banks, erosive areas, and even your lawn — can be useful to wildlife. With a little management, they can provide wildlife food, sites for nesting and brood rearing, and protection. This chapter contains information on developing these unique areas for wildlife.

OLD FIELDS

Abandoned pastures and crop fields can provide excellent wildlife habitat, but you may feel inclined or pressured to "clean these areas up to make them look better." While a few trails will make them more accessible for you, mowing and clearing large areas will simply destroy the seed- and fruit-producing plants that several animals depend upon for food and cover. These areas naturally produce plants such as goldenrod, wild aster,

strawberry, ragweed, blackberry, sumac, coral berry (buckbrush), wild plum, and red cedar. All of these plants provide some food and protection during the year for several species of wildlife. Many songbirds use wild plum and other low-growing shrubs for nesting — quail use them for escape cover and deer browse on their twigs.

Old fields are usually in the early-to-middle stages of plant **succession**, the natural process by which an area passes from bare ground to the most complex or climax stage of vegetation. The earlier stages are more productive for upland wildlife, such as quail and rabbit. Soil disturbance is good in these areas. Otherwise, the old field tends to stagnate in one of the plant succession stages. Disking and fire will help start the process all over again, making the area more productive. These stages can be encouraged in an old field by using some of the following techniques:

- Use a herbicide to kill any tall fescue in old fields. Fescue can inhibit the growth of other plants, and it produces little food or cover for wildlife.
- Some bare ground is important. Studies show that most quail nests are located within a few feet of bare ground. The hen quail will move her chicks immediately after hatching to bare ground in search of grit and insects.
- Disk strips through the field on the contour to expose 75–80 percent of the soil. Allow weeds to grow. You may want to frost seed (frost seeding is to broadcast forage seed in the early spring when the ground freezes at night and thaws during the day) some of the strips at the rate of 3 pounds of Korean lespedeza and ½ pound of ladino clover per acre.
- Burn areas between the disked strips. Burned areas stimulate annual plants, which attract insects that are important to quail chicks and songbirds.
- Burn at different intervals and at different times of the year. Burning the ground litter aids in quail chick movement and exposes seeds.
- Mow and disk 30-foot strips and leave 30-foot strips in late fall to stimulate new growth. After three years, mow the uncut strips again to generate new growth.
- Leave clumps of woody growth about 30-by-50 feet in size (1,500 square feet) to provide wildlife cover.
- Construct downed tree structures. Discarded Christmas trees, smaller trees from forest thinning, and limbs from tree trimming make ideal wildlife cover. Protect these from burning.
- Plant a green-browse plot, a grain food plot, or plant **native** warm-season grass strips (see Chapter 8).

LANDSCAPING YOUR HOME FOR WILDLIFE

Landscaping your homesite with native wildflowers and shrubs will make it attractive to many species of butterflies, hummingbirds, and other wildlife that call Missouri home during the summer. Hummingbirds are particularly attracted to red or orange tubular flowers, such as trumpet creeper, Missouri native honeysuckles (trumpet, grape, yellow, and limber), cardinal flower, columbine, bergamot, and red buckeye. Caution should be used with some of the above species, such as honeysuckle, being certain it is a native species, and trumpet creeper, which grows quickly and can sometimes crowd other plants. Butterflies are attracted to flowers such as milkweeds, coneflowers, phlox, mints, blazing stars, and asters. Monarch butterflies use milkweed both as a nectar

source and as a food source for the caterpillars. More detailed information about planting butterfly gardens is available in *Butterfly Gardening and Conservation* listed in Recommended References at the end of the booklet. A great online resource for landscaping with native plants is ***GrowNative.org***.


Indian pink

ABANDONED HOUSE SITES

The shrubs, lawn grasses, fruit trees, and weeds found around old homesites are beneficial to wildlife. The stately old trees with their many cavities and high production of nuts, fruits, and seeds are attractive to squirrels, rabbits, quail, deer, and songbirds. Old concrete and rock foundations attract groundhogs, whose burrows provide homes and cover for rabbits, raccoons, and red foxes. Deer eat lawn grasses and shrubs, and quail and turkey broods eat grasshoppers and other insects found around these sites. However, many times invasive **nonnative species** such as fescue, tree of heaven, autumn olive, and bush honeysuckle, along with many others, are present around abandoned homesites. Familiarize yourself with these undesirable **invasive species** and control or eliminate them. See MU Extension's free publication *Noxious Weeds of Missouri* for more information.

Improve old house sites by placing tree limbs and old lumber on the foundations for wildlife cover, and plant fruit-bearing shrubs and trees such as walnuts, hazelnut, hawthorn, and wild plum. Disk strips around and through the lot to stimulate new growth of grasses and **legumes**. Early spring or early fall is the best time for disking. Be careful not to mow too much of the area.

POND AREAS

You should develop the area around your pond according to what you and your family enjoy. A pond site can be developed for wildlife habitat, fishing, or other types of recreation.

Plant trees and shrubs around the pond for protection and cover. Windbreaks help check wave erosion and provide food and nesting areas for wildlife. To avoid damage to the dam by root

penetration, do not plant trees on the dam. They also should be planted far enough from the shore so that they do not interfere with fishing. You can purchase trees and shrubs at low cost from the Missouri state nursery at ***mdc.mo.gov/seedlings***.

Because wildlife use ponds, locate your pond near good wildlife cover or develop good cover around the pond to increase this use. If you will use the pond's watershed for grazing, fencing around the pond one to one and a half times the pond's water acreage permits the development of ideal wildlife cover. The larger the area, the more attractive it will be to songbirds, furbearers, deer, and wild turkeys.

STREAM BANKS OR RIPARIAN CORRIDORS

Trees and shrubs that grow along streams (the riparian corridor) provide an important wildlife habitat component. Several wildlife species depend on riparian corridors for all or part of their habitat needs. Some species spend their entire lives within this zone. Practice timber stand improvement (see Forest Thinning in Chapter 4) in riparian corridors to produce early successional stages of plant and tree growth. This helps to reduce water velocities and drop out sediments, producing food and cover for wildlife.

In the crop-farming regions of Missouri, a strip of riparian corridor may be the only woody cover found on the farm. In heavily forested portions of Missouri, the forest cover could include the bottoms along streams. The kinds of trees that grow along the stream on bottomland soils, however, are different from those on the adjoining slopes. This makes riparian corridors unique. The water and the variety of trees, shrubs, and other plants make riparian woodlands important to wildlife.

Riparian corridors are important for wildlife and water quality.

The riparian corridor should be at least 50 to 100 feet wide on each side of the stream. Where the riparian strip is very narrow or nonexistent, you can improve it by spreading seeds from nearby trees and shrubs. Cottonwoods, green ash, silver maple, willows, sycamore, elm, sweet gum, and yellow poplar have light windborne seeds that germinate if they land on bare soil. Use a herbicide to kill the tall fescue within these areas. Trees such as pin oak, pecan, black walnut, silver maple, cottonwood, sycamore, yellow poplar, river birch, and sweet gum can be successfully grown from seedlings. Many of these trees make excellent cavity trees at maturity, providing nesting for birds and mammals. A mixture of these trees is ideal because some, such as cottonwood and sycamore, grow fast and provide cavities earlier. Slower-growing long-lived trees, such as sugar maple and swamp white oak, will replace the faster growing trees in later years. Tree seedlings must be maintained and can be mulched with straw or composted sawdust to conserve moisture and reduce grass competition.

On large streams, do not remove trees that have fallen into the stream or appear ready to do so. The tree and shrub roots are keeping the bank from eroding. When a tree eventually falls, it creates important in-stream habitat for fish and other aquatic life. On smaller streams, each situation requires evaluation on whether the benefits of the fallen tree outweigh any potential damage to the stream or stream bank. Consult your MDC fisheries management biologist or private land conservationist if uncertain. Never use heavy equipment to remove trees or dredge the stream channel.

Livestock that graze along stream banks can destroy trees and shrubs and cause stream bank erosion. Fence cattle away from stream banks. Where access to water is needed, cattle can be restricted to one watering area to reduce potential erosion.

BRUSHY DRAWS

Brushy draws that extend well into crop or hay fields can provide quality habitat for wildlife and help control soil erosion. A brushy draw should contain vines, brush, grasses, and only an occasional large tree. These areas are even more attractive to wildlife when planted in more desirable cool-season grasses such as orchard grass, timothy, or redtop, or wildlife-friendly warm-season grasses. Korean lespedeza and ladino clover provide desirable wildlife food.

Livestock should be fenced out or excluded from these draws. Cattle can quickly destroy the low-growing shrubs important to wildlife as sources of food and cover.

Downed tree structures (DTS) can be constructed along the edges and at the head of the draws. To avoid clogging the drainage, don't place a DTS in the bottom of the draw.

Springs are important wildlife habitat, and livestock should be excluded from them.

SPRINGS, SEEPS, AND FENS

Springs, seeps and fens (upland marshes) are found throughout Missouri but are more common in the Ozarks. These are valuable watering areas for wildlife. Many rare and endangered plants, including orchids, are associated with these unique sites. They are fragile and subject to erosion when livestock are allowed access. If water for wildlife or livestock is a limiting factor on the farm, water holes should be constructed on other, more suitable sites. Many times fens have been invaded by fescue. Contact your local MDC natural history biologist, wildlife management biologist, or private land conservationist (see Chapter 9) for management recommendations. For more information about managing wetlands, see chapters 5 and 8.

EROSIVE AREAS

Certain field areas will erode more than others, depending on the soil type, steepness of slope, and land use. Erosion-prone land can be seeded to various plants that will benefit wildlife and help save the soil.

Select a good seed mixture appropriate to the soil type and location. See Chapter 8 for seeding mixtures. Wildlife prefer a legume and grass mixture to a single species seeding. Lightly disk or rake the area to expose some bare soil for a seedbed. Broadcast the seed mixture, and then spread three bales of wheat-straw mulch for each 1,000 square feet of area.

A cutting of hay may be possible after a few years. Cut hay only once a year, leaving about 6 inches of stubble. Cut hay in alternating strips every other year to keep the plants growing vigorously. This will provide nesting sites, as well as food and cover for wildlife.

FENCEROWS

A brushy fencerow, which can provide an important link between different habitat types on your property, is an ideal place to start habitat-improvement work. The simplest way to make or improve a travel lane is to stop mowing, grazing, or cultivating the strip next to the fence. On farms with heavy grazing, install a double fence to protect a travel lane. An electric fence is effective and inexpensive for this purpose, but it must be maintained in good repair. Also, protect the fencerow from wild fire.

Brushy fencerows provide an important link between habitat types.

If you have a row of trees along your fencerow, consider edge feathering and then planting native warm-season grass (NWSG) along the buffer created. Once NWSG is established, use strip disking to produce early successional habitat and bare ground.

If you cut some of the larger trees in a fencerow for firewood, you can use the tops to make downed tree structures (DTS) (see Chapter 8 for construction tips). If the fencerow is bare or less than 20 feet wide, plant shrubs such as dogwood, wild plum, grape, cedar, and blackberries to improve the cover. Heavy disking will reduce grass competition and create a seedbed where you can plant the seeds of trees and shrubs such as persimmon, redbud, aromatic sumac, hazelnut, and ninebark, and trees such as oaks, mulberry, cherry, pin oak, and dogwood. If tall fescue is growing in this area, apply a herbicide to reduce the competition of this aggressive grass. Tree seedlings must be maintained and can be mulched with straw or composted sawdust to conserve moisture and reduce grass competition. Other native plants will be added through bird droppings.

Use fencing to limit livestock access to ponds and streams.

MANAGEMENT TIPS FOR UNIQUE AREAS

- Disk alternate strips on the contour to encourage weed-seed production.
- Disk alternate strips, but protect woody vegetation. Plant annual grain food plots.
- Plant grasses and legumes around brush piles and in brushy draws.
- Fence to protect pond areas.
- Fence to protect stream banks and woody, brushy draws.
- Develop wildlife watering holes.
- Protect springs, seeps, and fens from livestock and remove undesirable grasses.
- Plant grasses and legumes on eroding area.
- Protect fencerows for cover and travel lanes.
- Use herbicide to kill tall fescue and allow seed-producing weeds and legumes to grow.
- Burn small grassy-weedy areas at different times and intervals to create plant diversity.

Applying herbicides to fescue and brome before edge feathering and renovating fence rows will help keep these grasses from eliminating bare ground and quail-friendly plants.

Wildlife Management 7

Bobwhite quail

The habitat requirements and management techniques for several popular species of wildlife — quail, rabbit, dove, squirrel, turkey, and deer— are discussed in this chapter. Most of the management practices recommended for these species also will benefit songbirds, frogs, toads, salamanders, turtles, and other species that are essential to the balance of nature. The presence of these other species on your land further enriches your outdoor experiences, and they can provide evidence that you are on the right track with your management.

BOBWHITE QUAIL

You can successfully manage for bobwhite quail on a 20- to 40-acre basis. This area is small enough to work with and large enough for a covey of quail. But emerging science suggests that better results may come from larger grassland landscapes with scattered shrub thickets managed with the judicious use of fire and grazing.

Cover Requirements

The most obvious cover management for quail is to protect what is already there — the shrubby and woody edges, draws, and "waste areas" that usually occur around a farm. You can often improve cover simply by fencing livestock out to allow natural plant growth. Maintain scattered patches and travel lanes of dense, brushy cover throughout each 40 acres. You won't increase your quail population by manipulating the areas where quail already occur on your property; rather, you must create more places for them to live. With this in mind, make an assessment of the habitat that quail are already using, and then look for places to provide more of that same type of cover.

The following are the different types of cover that quail use throughout the year. It is important that you provide all these cover types for as much of the year as possible. See Chapter 8 for details on disking, edge feathering, and other specific practices you can use to create or improve various kinds of cover.

Escape cover — low-growing, multi-stemmed shrub thickets such as plum or gray dogwood often provide this important element. If such thickets aren't available, you can create escape cover with brush piles made from branches left over after firewood cutting, brush thinning or tree trimming, or by edge feathering, which is felling a group of adjacent trees so their branches form a tangle of limbs at ground level (see details in Chapter 8). Several loose piles located next to food production areas are best. Consider an area to be suitable escape cover if you can't walk through it. A good rule of thumb for managing escape cover is to distribute it such that a quail anywhere in the field never has to fly more than 50 yards to cover.

Nesting cover — Good nesting cover is most often located in unmowed, ungrazed, or lightly grazed areas. Bobwhites build their nests in grass clumps taller than 12 inches. Early nests are usually built in areas with residual standing vegetation from the previous year, so it's important to have suitable cover available in the spring. By mid-summer, new growth may be tall enough to provide nesting cover as well, provided it's not mowed or grazed short. Bobwhites may also nest in field borders of **native** warm-season grasses and **forbs**, as well as patches of cool-season grasses such as redtop, timothy, and orchard grass. Dense patches of grass are unnecessary, and research shows that one grass clump per 100 feet is sufficient for successful nest production. You can achieve good results by managing for patches of weedy brood cover with scattered clumps of grass throughout.

Brood-rearing cover — For quail to successfully raise their chicks, they must have abundant brood habitat in which to find plenty of high-protein food. Insects, spiders, and other invertebrates are common in weedy patches of diverse vegetation that results from practices such as burning, disking, and grazing (read more about them in chapters 2, 3, and 9). In addition, these management practices create a habitat structure with plenty of bare ground patches interspersed with plants of different heights and growth patterns to provide good overhead cover. Good brood cover is likely the most limiting habitat factor across most of Missouri, but it is the easiest to provide — just park the mower and allow diverse weed patches to grow.

Roosting cover — Quail roost in vegetation that is not too dense but still provides concealment from above. Roosting cover is usually 1–3 feet tall. The roost is usually in

open, clumpy vegetation away from thick or tangled escape cover. Fields of ragweed, croton, broom sedge, and other native grasses are good roosting areas.

Food and Water Requirements

Food is rarely the most limiting factor for quail in Missouri. Therefore, you can expect little population response if you focus solely on providing food without first assessing the cover available. Don't attempt to increase food provision until cover needs have been met.

During most of the year, bobwhite quail are primarily seedeaters, although they do eat some insects. Their diet varies over the state. In grain-producing areas, quail eat corn, soybeans, milo, and wheat when available. In other areas, quail rely heavily on weed seeds, but they will eat small-grain crop residues when available. For this reason, fall plowing, which turns under crop residues, eliminates an important food source.

A quail management plan should provide at least one of these three primary sources of food:

- Crop residues, such as waste grain and **legumes**, preferably in unplowed stubble
- Native weed and grass seeds and shrub and tree fruits
- Special plantings of grain

See Establishing Food Plots in Chapter 8 for information on what, where, and when to plant annual grain food plots.

It is essential that food be available close to escape cover. Quail should be able to walk through good cover to their feeding grounds and should have dense escape cover within 50 yards of food. Also, quail obtain the water they need primarily from the foods they eat and through the digestive process, so it is not necessary to provide water sources.

Important Food Plants for Quail

Acorns
Beggar ticks
Blackberry
Black locust
Clovers
Crabgrass
Crop residues of:
  corn, milo,
  sunflower,
  soybeans,
Crotons
Dandelion
Foxtails
Grapes
Korean lespedeza
Milk peas
Partridge pea
Pigweed
Pine seeds
Poison ivy
Ragweed
Sassafras
Sedges
Smartweed
Wild bean
Wood sorrel

Habitat Management for Quail

Soil disturbance can change the composition of plants within the bobwhite quail range. Disk to remove strips of sod-forming grasses such as bluegrass and tall fescue and make room for seed-producing plants that are important to quail. This technique can be applied to mature stands of dense native grass or old fields, where the vegetation has grown into a stagnated condition that provides less diversity of plants. However, if tall fescue is the major component of the grass composition, disking may only enhance the fescue production. In this situation, use a herbicide to kill the tall fescue before disking. See Chapter 8 for details about disking and applying herbicides.

Fallow crop fields that have produced tall weeds for a couple of years can be made more accessible for quail broods by disking from December to April. The shorter vegetation that is produced after disking will produce insects that also are important for quail

chicks. Disking strips in alternate years will add to the field's diversity and prolong its usefulness for quail and other wildlife that use this habitat component.

Timing of disking has different results. Disking in fall and winter produces heavy-seeded quail foods such as ragweed and partridge pea, while the peak production of important grass seed results from disking later in spring (April). June disking produces more of the plants that attract insects plus a number of major seed plants such as beggar ticks that are important seed producers for quail. An area managed for quail should have a mixture of these treatments to produce the variety of plants that are used for cover and food. The disked strips in an old or fallow field must be re-disked every few years to keep the food plants from being crowded out by the less-desirable vegetation. In most cases, disking will be more effective if the vegetation is burned or mowed short prior to disturbance.

Prescribed burning is one of the most effective tools for anyone wishing to raise quail in the wild (see Chapter 8 for prescribed fire instructions). The removal of litter makes quail food easier to find and improves germination of many quail-friendly plants. Important plant seeds scarified by the heat will germinate much better on the burned-over range, while the new sprouts will furnish insects in spring and summer and seeds in the fall and winter. Properly timed burns can reduce grass dominance — a common problem in Missouri — and promote the growth of more forbs. Furthermore, careful burning releases the ash and minerals tied up in vegetation, and fire is a natural disturbance to which most quail-friendly plants are adapted.

COTTONTAIL RABBIT

Under good conditions, the cottontail's home range is often less than 5 acres. Therefore, the average-size Missouri farm and many recreational properties have plenty of room for rabbit management. Like quail, rabbits need well-distributed escape cover, such as brush piles, an ample year-round food supply, and safe places for nesting and raising their young.


Cottontail rabbit

Cover Management

Good rabbit habitat is very similar to good quail habitat, and management techniques to produce the desired habitat components are similar. Rabbits thrive in early **successional** habitats comprised of mixed grasses, forbs, and young woody brush. Managing your land for a wide diversity of plants will ensure rabbits have plenty of good food and cover choices.

Cottontails choose mostly open areas with scattered grasses and other **herbaceous** vegetation for nesting. These areas provide good cover as well as abundant foods. While rabbits may nest even in short pasture or mowed areas, vegetation that is 8 inches

or taller affords better cover, so you should leave some areas unmowed and monitor grazing to ensure adequate cover.

Dense, well-distributed protective cover is the most critical element in good rabbit habitat. Downed tree structures (DTS) located in the right places bring the quickest response of all the management tools, and rabbits may begin using them within hours of construction. Place DTS close to other permanent cover, such as briers, fencerows, or woods. Don't burn DTS left from tree clearing. Instead, push them to the edges of the field to create cover. For more information, see Downed Tree Structures in Chapter 8.

Edge feathering (detailed in Chapter 8) is another effective practice for improving woody cover. By making sure to kill any dense, sod-forming grasses beneath the edge feathered trees, you will provide a variety of food and cover plants intermixed with the brushy downed tops.

In addition to man-made brushy coverts, rabbits will readily use thickets of native briers and shrubs such as blackberry, plum, and dogwood. Some nonagricultural areas — such as woodlands, gullies, and pond sites — that are allowed to grow briers, brush, and tree sprouts will provide excellent habitat for rabbits and other wildlife. Fencing these areas to control cattle access improves existing cover and allows grass and shrubs to thrive. When fencerows are protected from grazing and the larger trees along the row are topped, the resulting low, dense growth also will provide good rabbit cover.

Food and Water Requirements

As herbivores, rabbits will eat bluegrass nearly year-round, although they won't use it heavily during the summer. Sprouting wheat, corn kernels, and milo seeds are important during fall and winter.

Cheat, an annual grass, is an important food during early spring. Good summer foods are white clover, Korean lespedeza, and crabgrass. To optimize the benefits to rabbits, desirable food plants should be adjacent to good escape cover.

Although rabbits drink from surface water during hot dry spells, they obtain most of the water they need from the succulent plants they eat.

Important Food Plants for Rabbits

Alfalfa
Asters
Bluegrass
Cheat (chess)
Cinquefoil
Clovers
Crabgrass
Crop residues
Dandelion
Fall panic grass
Fleabanes
Horse nettle
Knotweed
Korean lespedeza
Nodding foxtail
Plantains
Poison ivy
Ragweeds
Sedges
Smartweeds
Strawberry
Sumacs
Tall thistle
Tick trefoils
Timothy
Wheat

SQUIRREL

You can increase the number of squirrels on most lands that have some woods. Certain practices, such as installing den boxes, give prompt results. Others require several years to take effect.


Gray squirrel

Management for Den Sites

The supply of den trees — those with cavities for shelter and nesting — is a major factor limiting squirrel populations. A mature forest usually has more cavities for squirrels than younger woodland. See Chapter 4 for details on managing your woodland for den trees.

In woodlands with fewer than four natural dens per acre, artificial dens will be of value. A pair of squirrels usually requires two to three dens — one each for the male and female, and one for raising the young. Competition for dens among squirrels, owls, bees, snakes, and other cavity users is intense. When artificial dens are supplied, some of this competition is reduced. Dens can be built from auto tires, lumber, and sawmill slabs, or hollow logs cut in sections. For details on how to build and install a squirrel den box, see *Woodworking for Wildlife* listed in Recommended References at the end of the book.

Food Requirements

Woodlands of around 40 acres or larger with at least 50–75 trees that produce nuts, seeds, or fruits — such as oak, hickory, walnut, elm, maple, and mulberry — are usually good squirrel habitat. Mature trees will increase the volume of food produced.

Timber stand improvement, or TSI, reduces competition among trees and will increase the production of acorns and other squirrel foods (see Chapter 4). Any practice that increases the diversity of plants within a woodland will usually benefit squirrels.

Important Food Plants For Squirrels

American elm
American plum
Apple
Bitternut hickory
Black oak
Black walnut
Chestnut oak
Chinquapin oak
Corn
Fungi
Grapes
Honey locust
Mockernut hickory
Osage orange
Pecan
Pin oak
Post oak
Red mulberry
Red oak
Shagbark hickory
Shellbark hickory
Shumard oak
Silver maple
Wheat
White oak

WILD TURKEY

Turkeys generally prefer open, mature woods interspersed among pastures, hayfields, old fields, and cropland. Turkeys also use stands of smaller trees if the understory is not too dense, but they generally nest in areas of dense vegetation. As with many wildlife species, turkeys usually thrive in areas with a diversity of plant species that provide an array of food and cover. In these situations, turkeys are able to meet their various needs for nesting, brood rearing, roosting, and feeding all within a relatively small area.

Eastern wild turkey

Cover Management

Nesting habitat — Turkeys nest in different land cover types, including forest openings, power line rights-of-way, old fields, and native grass stands. Sites turkeys use for nesting have one thing in common: dense vegetation within 2–4 feet of the ground. Incubation takes 28 days, so it is important for the hen to choose a nest location with good concealment. In wooded settings, nest sites sometimes have a developed canopy layer at 2–10 feet. Turkeys may choose nesting locations based on their proximity to good brood habitat as well, presumably to minimize poult loss following hatch. Early season nests are often associated with wooded sites, but as spring progresses and herbaceous cover grows, late nesting or re-nesting hens may choose nest sites in fields.

Brood habitat — Growing turkey poults have tremendous metabolic protein demands, so they need access to areas with plenty of insects, spiders, and other invertebrates. Good brood habitat consists of early successional habitats such as weed patches and fallow fields with a diverse mix of annual plants. These areas attract a wide array of invertebrates that provide poults with the energy and protein their rapidly growing bodies need.

Good brooding areas provide cover that is tall enough to conceal foraging poults but short enough to allow the hen good visibility to detect predators. You can provide good brood habitat by idling a few acres of crop ground near woods, by thinning and/or burning wooded areas to promote ground cover, or by using prescribed fire to stimulate lush new vegetation in old fields and native grass stands. See how to apply these practices in Chapter 8. Broods are seldom found far from tree cover or some other vegetation that facilitates escape from predators. Well-managed savannas — grasslands with abundant forbs and scattered mature trees (usually oaks) — are often excellent brood habitat for turkeys.

Fall and winter habitat — Two elements are key to fall and winter turkey habitat: food and roosting cover. By fall, young-of-the-year are continuing to grow, and adults and juveniles alike must put on fat to withstand the rigors of winter. Hard mast, such as acorns, pecans, and pine nuts, have relatively high fat contents and become dietary

staples throughout the winter. Turkeys also seek out waste grains such as corn and soybeans for their high carbohydrate levels.

Turkey flocks tend to increase use of forested cover during fall and winter, especially in mature hardwood stands with plenty of acorn-bearing oaks. Managing your woods to improve mast production (see Chapter 4) can provide good benefits to turkeys, as can leaving a few standing rows of corn or soybeans adjacent to woody cover.

Turkeys will roost in nearly any species of tree with an open canopy and several horizontal limbs 20–80 feet from the ground. In Missouri, turkeys usually have plenty of roosting options, so repeated use of the same tree is not as common as in other places with fewer roosts. During winter, turkeys tend to roost in areas sheltered from prevailing winds and high enough to avoid the cold air that settles in valleys at night.

Food and Water Requirements

Where they are found, the primary food of wild turkeys is acorns, but they also eat the seeds, buds, leaves, and tubers of many other plants. Their principal natural plant foods fit into a few general categories: mast (acorns and pine nuts); fruits (dogwood, grapes, cherry, hackberry); seeds (grasses and some sedges, weeds); and greens (grasses and grass-like plants, selected annual and perennial broad-leaved plants).

Turkeys also eat insects, particularly during their first month of life, and a management plan for year-round food should include clearings where they can forage for them. In areas with extensive forest coverage, at least 10 percent of the area should be in scattered openings. Although turkeys can find invertebrates in forested areas, openings generally have higher densities of these food items, making them superior brood-rearing habitats.

Seasonal fluctuations in one type of natural food will usually create few problems for wild turkeys because of their diverse diet. As supplies of one food begin to ebb, others begin to be used, and conditions that hinder production of one food often favor production of another.

Domestic crops, such as soybeans, cowpeas, buckwheat, sorghum grain, corn, oats, and millet, also are desirable foods for turkeys.

Grain food plots — Annual grain food plots for turkeys not only supplement natural foods, but they can also be important during severe winters with persistent and deep snow cover and during

Important Food Plants for Wild Turkey

Acorns
Blackberries
Bluegrass
Cherries
Clovers
Crabgrass
Crotons (such as hogwort)
Crop residues of: corn, milo, soybeans, etc.
Dandelion
Dogwoods
Grapes
Grass leaves
Hackberry
Hawthorns
Insects
Korean lespedeza
Paspalums (such as pitchfork grass)
Poison ivy
Ragweeds
Roses
Sedges
Smartweeds
Sorrels
Strawberry
Sumacs
Sunflowers
Tick trefoils
Wildbeans

drastic natural food shortages. See Recommended Food Plot Grains in Chapter 8.

Green-browse plots — Permanent 1-acre food plots can be established in forest clearings. Apply recommended amounts of limestone and fertilizer to a good, clean-tilled seedbed, then seed to wheat and clovers. See Recommended Green-Browse Mixtures in Chapter 8.

Crop residues — Corn and soybean fields attract turkeys during winter and early spring when other food is in short supply. A few rows of corn or soybeans left standing next to timber will ensure a food supply in case of deep snow.

Idle fields — Abandoned fields surrounded by timber can be an important part of wild turkeys' annual range, particularly for nesting and brood rearing. Try to keep old fields open and in a grass-legume mixture. Periodic mowing, burning, or moderate grazing helps improve these areas because turkeys tend to avoid fields grown up in dense vegetation, other than for nesting.

Although wild turkeys acquire some water through the foods they eat, the availability of surface water will improve habitat for the species. One pond, stream, or other water source per ¼ section of land is usually adequate.

WHITE-TAILED DEER

Dense vegetation is an important component of deer habitat. It provides shelter from the weather and year-round food, as well as cover for fawning, bedding, and escape. Old fields, native-grass stands, dense patches of young saplings, and logging slash can all serve well for shelter and concealment. Small cedar thickets of trees that are 8–15 feet high can offer beneficial cover, but these patches need periodic thinning or the lower limbs will die and reduce the cover value of the patch. Landscapes that consist of a variety of habitats, for example forest, old fields, and crop, can often maintain deer densities at higher levels than areas with vast expanses of forest or crops.

White-tailed deer

Cover Management

Fawning cover — Fawns are born with little scent, a dappled hide, and the ability to slow their heart rate (bradycardia). These three attributes keep predators from smelling, seeing, and hearing them, especially if they're hidden in thick cover. After giving birth, does hide their fawns in areas of dense vegetation, usually 3 feet or taller, and make only brief visits to nurse a couple times per day. In the case of twin fawns, the doe will hide her fawns separately, so that if one is found and killed, the other might survive. Diverse dense cover makes good fawning areas, so old fields and patches of native grasses and forbs are excellent fawning areas.

Bedding and escape cover — Deer will continue to use cover beyond the fawning season for escape and bedding purposes. This cover can consist of habitats similar to those used as fawning cover, but it also includes thick wooded areas, often in early successional stages. These areas can provide ample food resources as well, due to the low and dense vegetation growth. It is beneficial to provide several such cover areas interspersed throughout a property to increase deer use.

Food and Water Requirements

White-tailed deer are browsing animals. They prefer to eat the succulent tips of many different shrubs, vines, and trees, along with a variety of other foods including leaves and hard and soft mast. No one food predominates throughout the year, but instead their diet is determined by plant availability, nutritional content, and seasonal nutritional requirements. A habitat-management plan for deer should provide adequate diverse food supplies for all times of the year.

Spring and summer browse — Summer foods consist mainly of the growing tips and leaves of annual and perennial forbs, trees, and shrubs. Deer prefer summer grape, red clover, Virginia creeper, blackberry, asters, and lespedezas during this period.

Fall and winter foods — If plentiful, acorns are the primary food. Lacking acorns, deer feed on corn, lespedeza, wheat, other crops, and a variety of native plants, such as sumac and buckbrush. Twigs of sapling trees and various shrubs also are important winter foods.

Manage wooded habitats for deer by increasing the availability of food and cover by opening the canopy to allow light to reach the forest floor. Maintain a diversity of acorn-producing trees and protect the area from cattle grazing. For a good supply of acorns, maintain mature oak trees of several species, such as post, black, white, northern red, chinquapin, blackjack, and scarlet. About 20 acorn-producing oaks per acre are ideal for deer. These trees should average at least 14 inches in diameter at breast height (DBH). The number of acorns produced by each tree will depend on crown size, age, health, and weather.

Creating brush is the most commonly used technique for improving white-tailed deer habitat. The brush stage, or seedling/sapling forest, has nearly three times the amount of twig production, or browse, per acre as a saw-timber stand. Managed timber harvest is a good way to create brush, since many of the harvested trees

Important Food Plants for Deer

Acorns
Alfalfa
Asters
Blackberries
Black haw
Bluegrass
Cherries
Cinquefoil
Clovers
Coralberry (buckbrush)
Dogwoods
Elms
Goldenrods
Grain (corn, milo, soybeans)
Grapes
Greenbriers
Hazelnut
Korean lespedeza
Lettuces
Oats
Partridge pea
Pawpaw
Persimmon
Poison ivy
Pokeweed
Roses
Soybeans
Sumacs
Sunflowers
Tick trefoils
Violets
Virginia creeper
Wheat
Wildbeans
Wingstems

will re-sprout from the stump, providing plenty of easy-to-reach forage. If engaging in a timber harvest, be sure to leave enough mature oak trees for a satisfactory acorn crop.

Shrubs and vines are another type of brush. Some common shrubs and vines browsed by deer are blueberry, dogwoods, sumacs, grape, greenbrier, and viburnum. Woodlands should be fenced to exclude livestock because they compete directly with deer for food.

Food plots — Food plots have become commonplace in deer management in recent years. While good supplemental nutrition can provide benefits to deer, as with the other species in this guide, providing excellent native food and cover sources should be your primary goal. Only after that has been achieved will food plots reach their full potential.

Quality nutrition starts with quality soil, so it's important to test and amend your soils as necessary. See How to Take a Soil Sample in Chapter 8 for more information. There are dozens of food plot seeds and blends, and each has its merits and shortcomings. For best effect, you should plant a variety of foods on your land, scattered about in different parcels. Around 2 to 5 acres of food per 40 acres usually provides sufficient forage, especially if you've managed the property to promote plant diversity. Choose plants based on factors such as soil type, soil moisture, amount of shade, and other nearby foods, and considering your goals (for example, biological benefits, increased hunting opportunities).

An important aspect to consider regarding food plots is that deer do not like to feed far from cover during the day. If your food plot is more than 50 yards from cover, most use may be at night. In this case, to increase daytime use, consider planting protective screening cover such as tall native grasses, shrubs, or quick-growing tall annuals, such as forage sorghum, to provide a sense of security to deer using the plot.

Water management — Water is often not a limiting factor for white-tailed deer in Missouri. Deer meet their water needs from three sources: free water (drinking, eating snow), preformed water (from the vegetation they eat), and metabolic water (from the digestion of fats and proteins). It is ideal for deer management purposes to have at least one permanent water source per square mile.

MOURNING DOVE


Mourning dove

Many Missouri landowners enjoy hunting mourning doves and consider their habitat needs when planting and harvesting crops. To avoid inadvertently baiting these migratory birds, which is illegal, check the current federal baiting laws for doves. They sometimes change, but you can find up-to-date, plain-language dove hunting and baiting regulations at ***FWS.gov***.

Food Requirements

Most management for mourning doves consists of planting and managing crops that will mature and attract doves in time for hunting season. Agricultural crops such as sunflowers, wheat, milo, corn, millet, and popcorn are popular choices among dove field managers. As a rule, dove fields should be 3 acres or larger to attract the birds and keep them using the field throughout the season. Doves are ground feeders requiring relatively bare ground to land and feed. Open fields with lots of bare ground between crop plants receive better dove use than fields choked with dense stands of weeds. Therefore, dove field managers should commit to staying on top of weedy competition in their fields or dove use will likely diminish. Typically, crops are grown on a schedule that allows them time to mature and dry down by mid-August. They are then burned, mowed, rolled, or disked to knock down patches and scatter grain on the soil surface. Manipulation of foods to attract doves to shooting fields should be completed by the middle of August to give doves time to find and begin regular use of the field.

Sunflower management — Black oil sunflowers are among the most popular grains planted for dove fields. Maturity time for most varieties is around 120 days, so sunflowers should be planted by mid-April in order to mature and dry in time for the September 1 dove season opener. Sunflowers produce lots more seed when they're planted on wide spacing (18- to 30-foot rows) and not crowded. However, this results in good conditions for weed growth between the rows, so it is important that managers use herbicides or a row cultivator to reduce weed populations during the growing season. Many dove field managers use a pre-emergent herbicide before planting and post-

emergent herbicides after planting to control weeds in their fields. Where deer numbers are high, you may need to fence sunflower fields to ensure good growth.

Wheat management — A relatively easy but often-overlooked method for managing dove fields is to grow patches or strips of wheat and then disk or burn them to scatter the grain. Wheat should be broadcast or drilled in the fall and allowed to grow and mature the following summer. Leave it standing until mid- to late-August, and then burn with a hot, fast-moving fire. The fire consumes the stalks and chaff, but the grain kernels, though charred, are not consumed. One advantage of wheat fields is that the wheat will mature and canopy by early spring, greatly reducing weed pressure. Burning then places lots of seed on bare soil. Doves will readily use such fields to feed.

Weed fields — Fallow fields and other areas with robust stands of seed-producing field weeds can be managed to provide dove-shooting opportunity. Annual weeds typically produce large volumes of seed, many of which are choice dove foods. Fields with an abundance of croton, ragweed, pigweed, wild millet, foxtail, and wild mustards can be mowed or disked to provide bare ground and scatter mature seed. Seeds from these plants are often overlooked as important dove foods.

Cover Management

When managing cover for mourning doves, consider providing for the birds' nesting and roosting needs. Doves are known to nest in many different habitat types, including on the ground. But their preferred nesting habitat in Missouri is edge habitat formed at the junction of woodland with crop, grassland, or uncultivated areas. Hedgerows and shelterbelts are frequently used for nesting, but doves really are not very picky in their nest site selection. Doves usually roost in densely branched trees — again shelterbelts and hedgerows are important, as are brushy pastures and idle areas.

Other Management Considerations

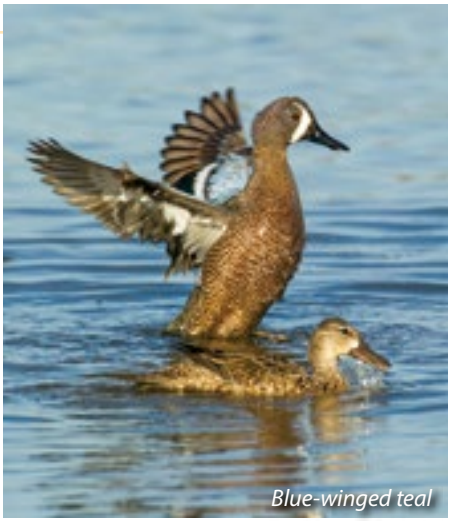
Other factors that may attract mourning doves to your hunting location include water access and snags or other perches near feeding areas.

Water access — Mourning doves require regular access to surface water to meet their daily hydration needs. Doves usually fly to water after their morning and evening feeding sessions, but they are hesitant to land and drink in areas with dense vegetation up to the water's edge. They will use sand and gravel bars on rivers and creeks if vegetation is sparse or very short. Likewise, bare shore on lakes and ponds may receive high dove use. In many years, water levels will be naturally low during dove season due to late summer dry periods or irrigation use. Managers with ponds near feeding fields can increase dove use by drawing down their water levels a week or two before hunting season, thus exposing bare shoreline where doves feel comfortable watering.

Snags and perches — Doves often land on a bare limb or other perch before entering a field to feed. With this in mind, managers may choose a dove field location based on its proximity to a utility line or tall dead tree. If these features are not available, it may be worthwhile to girdle or use a herbicide to kill one or two unwanted tall trees next to the field. The presence of such a perch can increase dove use there.

WATERFOWL

Many species of waterfowl spend at least part of their lives in the wetlands of Missouri. Most duck species nest elsewhere and migrate through Missouri in fall and winter, but several species of dabbling ducks (mallards and blue-winged teal, for example) are known to nest here in rather low numbers. The wood duck and hooded merganser, both cavity nesters, are regular nesters in Missouri. Of the geese species, only one – the Canada goose – nests with any regularity in Missouri. This section will focus on food and habitat requirements for fall-migrating waterfowl, particularly dabbling ducks and geese.



Blue-winged teal

Dabbling and Diving Duck Management

Ducks are divided into two primary groups, according to their habits and the habitats they use. Dabbling ducks include species such as mallards, gadwall, teal, and wigeon. Dabblers mostly feed in shallow water less than 18 inches deep and feed by tipping up with their tails in the air. Dabblers prefer shallow water and will use even very small pockets and pools of wetland habitat. They can spring into flight straight off the water, so water body size is of little consequence. Diving ducks on the other hand feed by diving under the water, sometimes feeding at depths greater than 50 feet. Divers, with relatively short wings and rear-positioned legs, need lots of room to get airborne, running across the water surface as they pick up the speed necessary for flight. Because of their particular feeding and flying characteristics, divers tend to use larger, deeper, more open bodies of water than dabblers. There really is little that managers can do to improve diver habitat, so this section will focus on managing food and cover for dabblers.

Herbaceous Wetlands

Missouri has several types of herbaceous wetlands. These include emergent marsh, wet prairie, fens, and moist-soil areas. Of these, emergent marsh and moist-soil areas offer the most benefit to ducks. These habitats consist of rooted vegetation that grows up out of the water. In some cases the plants tolerate flooding and grow even in standing water. In others, the manager must regulate water levels to allow the plants to germinate and/or grow in non-flooded conditions, then flood the vegetation in the fall after the plants decline.

Emergent marsh — This habitat type generally consists of flood-tolerant, perennial, rooted vegetation growing in semi-permanent water. Examples include cattail sloughs, abandoned river channels, shallow ponds, and permanently saturated, ephemeral pools with stands of bulrush or other tall plants. Emergent marsh provides important habitat for dozens of wildlife species, but long-standing water prevents annual plant seeds from germinating and growing with any regularity. Therefore, these areas tend to be more important to ducks for roosting rather than for feeding.

Moist-soil areas — An often overlooked means of attracting ducks is to manage the wetland pool for robust stands of native annual plants. These include annual smartweeds and wild millets, which produce heavy amounts of seed. Generally, managers annually disk, or otherwise disturb, roughly one-third of the wetlands. These areas are rotated on three-year cycles. The disking creates favorable conditions for seeds to germinate, thereby making these areas the most productive following the next year's spring drawdown. Following disking, manage water levels to shallowly flood or saturate the soil, then draw the water down slowly. Pools managed this way can produce tremendous volumes of seed, which can then be flooded to attract ducks during fall migration. Moist-soil seeds are often used heavily in the early half of the duck season.

Flooded crops — Another option for landowners, flooded crop management has much in common with managing moist-soil wild plants. Corn is the most commonly planted flooded crop, but it is also the most costly. Milo is another option, but large flocks of blackbirds often rob most of the seed before the ducks can use it. Japanese millet, buckwheat, and rice are other options, but not all plants will tolerate shallow flooding during the growing season. Floods of more than a few days will often kill most crops. Keep in mind that grain is a high-energy food source, but ducks may not use it very heavily until the latter half of the season. Also, be aware that any manipulation of crops, such as mowing, rolling, or disking, is considered baiting for waterfowl. Such areas may not be hunted. For up-to-date federal waterfowl-baiting regulations, visit ***FWS.gov***.

Timbered Wetlands


Mallards

At the time of European settlement, Missouri had thousands of acres of wooded wetlands. Cypress swamps, sloughs, and oxbow lakes covered most of the Bootheel region, and large rivers such as the Osage, Grand, and Missouri had vast acres of bottomland hardwoods, swamps, and sloughs. Today, most of these acres have been lost through draining and clearing to make way for row crops. But timbered wetlands still do exist, and landowners who own them can often manage their property to enhance the health and function of these habitats.

An important aspect of managing timbered wetlands is knowing when and how long to hold water. Managing for duck use of such areas typically means flooding the timber with several inches of water to make food accessible and attract birds looking for a place to rest and/or feed. But nearly all trees in Missouri can be killed or injured by flooding at the wrong time. If you have a timbered wetland pool (often called a green-tree reservoir), it is vital that you only flood during times when the trees are dormant. Furthermore, most mast-producing bottomland trees such as pin oak will be healthier and longer lived if they are not flooded every year. Acorns are an important food for several duck species, so green-tree reservoirs are usually managed for oak trees and acorn production. However, managing flooded timber for duck use and long-term forest health is complicated. For more information, visit with an MDC forester or a wildlife biologist well versed in these systems.

Wood Duck Management

Wood ducks are a unique species. While many aspects of their biology are quite similar to the dabbling ducks, there are some significant differences related to nesting. Wood ducks are cavity-nesting ducks, and they often choose a nest cavity high in a tree. They often nest near some type of water body, but they will also nest hundreds of yards from water. Landowners with sloughs, oxbows, creeks, and lakes on their property can benefit wood ducks by retaining some large den trees in their woods. In addition, wood ducks readily take to man-made nest boxes. Nest boxes made from wood are the most common type; plans for a wood duck box can be found in *Woodworking for Wildlife* listed in the Recommended References at the end of the book. To help deter nest predators, mount wood duck boxes on a pole over water. After choosing a location and mounting your wood duck box, place 4–5 inches of wood shavings in the bottom. Avoid sawdust, because it often absorbs and holds moisture. Clean out old nests and debris in the winter and have nest boxes ready to go by early March. Suitable natural cavities are often in short supply, and several well-placed nest boxes can boost wood duck production in your area.

Wood ducks

Nest box

Important Food Plants for Dabbling Ducks

Acorns
Barnyard grass
Buttonbush
Coontail
Corn
Duck potato
Japanese millet
Milo
Nutsedges
Pondweeds
Rice
Rice cutgrass
Sedges
Smartweeds
Toothcup
Waterhemp
Wheat

Goose Management

Three species of goose are regularly seen in Missouri: Canada goose, white-fronted goose (also known as specklebellies), and the lesser snow goose (blue and white color phases). Of these, only the Canada goose breeds with any regularity in the state; others are migrants.


Canada goose

Food management — All species of geese in Missouri feed primarily in agricultural fields in fall and winter. Feeding locations shift frequently as geese respond to food availability and depletion, hunting pressure, and weather conditions. Feeding fields tend to be relatively large, and all species of geese are generally reluctant to land and feed in fields smaller than 10–20 acres if the perimeter is wooded or brushy. Winter foods consist of waste grain — especially corn — and green forage such as wheat or rye. To attract geese in winter, avoid fall tillage of grain stubbles, especially corn and milo, which buries a good amount of potential food. Little else can be done to enhance winter food production and availability for geese.

To attract Canada geese during the breeding season, consider frequent mowing of lake and pond edges. Canada geese are much more likely to use a pond or lake when the shoreline vegetation is kept short. This condition facilitates their feeding on tender new plant growth and reduces predation risk by affording them good visibility. Canada geese readily feed on common turf grasses such as bluegrass and even tall fescue if the grasses are kept mowed. Plant other preferred foods such as wheat, oats, rye, clover, and alfalfa right up to the water's edge.

Important Food Plants for Geese

Alfalfa
Bluegrass
Clovers
Corn
Milo
Nutsedges
Oats
Rice
Rye
Smartweeds
Soybeans
Spike rushes
Wheat


Canada geese in corn stubble

POLLINATORS

Mention the word *pollinator*, and the average person thinks of honeybees. Most people don't know that our common honeybee is actually an import from Europe, arriving on our shores in the 1600s. Fewer still know that the vast majority of Missouri's animal pollinators are native to the state, and that they represent an incredibly important resource for both native and introduced plants, including most Missouri crops. Pollinators in Missouri include bees, butterflies, moths, wasps, flies, beetles, ants, and even hummingbirds.

Giant swallowtail on butterfly milkweed

Like other wildlife, pollinators need cover and food, and much of what you would do for ground-nesting birds and small game will also benefit pollinators. In fact, you may already have pollinator habitat and not even realize it. Patches of native grassland, wetlands, and forests that contain a diversity of flowering plants provide refuge to these species. While nectar-rich flowering plants is a positive habitat characteristic, bare soil, residual stems of last year's plants, and new plant growth also provide locations for overwintering and larval development of many beneficial pollinators.

See Establishing Pollinator Habitat in Chapter 8 for details about how to add host and food plants to your land.

Plantings rich in native wildflowers provide excellent habitat for pollinators.

Habitat Management Practices 8

Many management practices introduced in earlier chapters are detailed here. For more information about these and other practices, refer to Chapter 9 for a list of the resource management agencies and professionals that can assist you with land management.

DISKING

Dense sod or vegetation is detrimental to wildlife feeding and movement and can be improved with a practice known as strip disking. This reduces plant residue, creates bare ground, and promotes desirable broadleaf plants that produce seed and attract insects at a much lower cost than planting food plots. To be effective, strip disk in grassland habitats next to areas of usable shrubby cover such as covey headquarters, downed tree structures, edge feathering, or **native** shrub thickets.

- Disk at least 4–6 inches deep to expose at least 50 percent bare soil.
- Disk in strips 30–75 feet wide. Disk each field in thirds on the contour.
- On flat ground such as ridge tops and creek bottoms, disk areas in blocks that are 30–75 feet wide.
- Separate each disked strip by an area of undisturbed vegetation twice as wide as the disked strip. In subsequent years, disk the adjacent strip. This develops adjacent strips of vegetation of three different ages.
- Disked strips should be as long as possible and should follow the contour of the field to prevent erosion.
- Avoid disking in areas where concentrated water flow is a concern.
- As a general guideline, disk between July 16 and March 31. This may vary by species and habitat objective. Late summer/fall disking tends to favor broadleaves whereas spring disking tends to favor weedy grasses.

APPLYING HERBICIDES

Without disturbance, both warm-season and cool-season grassland fields often become dominated by dense sod or a single species of grass (monotype). This reduces habitat quality for a number of wildlife species. Herbicides can improve plant diversity by reducing the vigor and abundance of dominant plants that crowd out other desirable plants. Sprayed areas will soon produce a wide array of plants, providing a greater abundance and diversity of grasses, **forbs**, **legumes**, seeds, and insects. Used properly, chemical suppression is an excellent way to enhance grassland habitat for bobwhite quail and other wildlife. Use this practice to set back grasses and improve habitat quality on fields dominated by perennial forbs or broad-leaved plants.

Remember, for habitat-management purposes, spraying is not meant to completely eradicate vegetation but to reduce its vigor and abundance. Use herbicides at label rates to set back, or suppress, but not eliminate vegetation. To be effective, herbicides must be applied when dominant vegetation is actively growing (see following table for recommended spray dates). Weather conditions, which will influence vegetation growth, may result in narrowing these dates. Use grass-specific herbicides on fields rich with native wildflowers.

Spray Dates for Different Plant Types

Plant Type	Recommended Spray Dates (Conservation Reserve Program spraying dates may differ)
Cool-season grasses (fescue, brome, orchard grass, etc.)	March 15 to May 15 or October 1 to December 1
Warm-season grasses (Indian grass, big bluestem, etc.)	May 1 to September 1

Apply spray in blocks or strips on one-third (preferred) to one-half of the field each year. Best results occur when different areas in the field are sprayed different years. If strip spraying, strips should be 25–75 feet wide.

Separate strips from each other with an area of undisturbed vegetation twice as wide as the sprayed strip. Ideally, sprayed strips should be as long as possible and should follow the contour of the field to prevent erosion. One year later, spray a new block or strip of similar size next to the unsprayed area. Spray the final undisturbed block or strip the third year. This develops adjoining strips of vegetation of three different ages, providing three different stages of plant **succession**. Re-treat sprayed areas as needed to maintain desired plant diversity.

In areas of heavy growth, you may need to conduct a prescribed burn or mow to remove dead or tall, thick vegetation before spraying. Allow the burned or mowed vegetation to grow 6–8 inches before spraying. You can also disk or burn after the herbicide application to further enhance habitat conditions. **Note:** Always read and follow all herbicide labels.

APPLYING PRESCRIBED FIRE

Prescribed burning is applying a controlled fire to a predetermined area as a habitat management tool. When applied properly, it improves wildlife habitat by setting back the successional stage of an area, controlling undesirable vegetation, and reducing wildfire hazards. Several months before you plan to burn, contact a professional to develop a written burn plan to outline the safe and effective requirements of the prescribed burn.

Like other land management tools, fire can be used to an advantage or abused to become a negative factor in habitat management. Before fire is used, become aware of both the negative and positive aspects of fire within the habitats that are being managed. Factors that must be considered are:

- The time of the burn — early spring, late spring, summer, fall, etc.
- The type of burn — head fire, backing fire, etc.
- Conditions of the burn — wind, moisture, etc.
- Type of fuel — grassy, shrubby, etc.
- Fire-control methods — green lines, plowed lines, mowed lines, etc.

Burning should be managed with consideration for wildlife needs, such as nesting and feeding cover. Timing of a prescribed fire is one of the most important factors determining the habitat benefits obtained:

- Fall and winter burns generally favor the forb component in mixed stands and helps improve plant structure and diversity for wildlife habitat.
- Burning in spring and fall of the same year greatly reduces stands of cool-season grasses, including tall fescue.
- For greatest wildlife benefit, native warm-season grass should be burned between August 15 and March 15. Cool-season grasses should be burned between March 15 and May 1.
- Burn the area on a three-to-five-year cycle to control woody encroachment. When burning to control undesirable sprouting woody vegetation, it may be necessary to burn two or more consecutive years.

CREATING ESCAPE COVER

Nearly all animals need cover so they can escape from predators, rest in safety, nest, and raise their young. What constitutes suitable cover depends on the wildlife species. Some animals use hollow trees, while others use brushy areas and dense stands of grass. To several species of small mammals, ground-nesting birds, amphibians, and reptiles, downed woody cover represents an important type of habitat. Downed tree structures (DTS) and edge feathering bring the quickest response of all the management tools. Rabbits, quail, and many songbirds use DTS and edge feathering immediately after construction.

Downed Tree Structures

Downed tree structure

Downed tree structures (DTS) provide an immediate temporary source of woody cover in areas where shrubby cover is lacking. Achieve enduring cover benefits by incorporating shrub plantings. The location and quantity of shrubby cover can determine how much of an area will be available for use. By distributing DTS throughout large grassland fields, you can increase the amount of available habitat for quail.

Downed trees should not be pushed into dense brush piles. These structures are intended to be open to allow space for the movement of quail and other upland wildlife within the structure. Simply drag the downed trees to the desired location and place in a loose arrangement. Oak, hickory, cedar, and Osage orange make good DTS. Elm, cottonwood, and willow do not make good DTS since they tend to break down quickly and have less dense branching.

Create 0.1–1.0 acre of dense woody cover per 5–40 acres of wildlife-friendly habitat. Although wildlife will use woody escape cover as small as a tractor tire, larger patches receive great use, so you should strive to make DTS that measure 30 by 50 feet for a total of 1,500 square feet of habitat. It takes three DTS of this size to equal 0.1 acre.

- Treat existing grass in the areas where the trees will be placed with an approved contact herbicide before cutting trees. This will create bare ground and provide good growing conditions for annual food plants and shrubs.
- Choose a minimum of 8 well-branched, durable trees that are at least 20 feet tall (do not count the unbranched trunk) with a trunk approximately 10 inches wide at breast height.
- Place DTS next to early-successional vegetation such as managed wildlife-friendly grasses/legumes/forbs, field borders, food plots, or cropland.
- Do not place DTS next to a woody edge and space no more than 100 yards apart.

Edge Feathering


Edge feathering

BILL WHITE

Edge feathering creates a transitional zone of woody escape cover made of downed trees, shrubs, vines, and **herbaceous** vegetation between cropland or grassland and the wooded edge. Create 0.1–1.0 acre of dense woody cover, 3–12 feet tall with bare ground underneath for every 5–40 acres of wildlife habitat. The minimum size of an area to renovate is 30 by 50 feet. It takes three, 30-by-50-foot areas to equal 0.1 acre. Ideally, 10–25 percent of wildlife habitat should consist of dense woody cover.

- Pick at least a 30-by-50-foot area where you can cut all trees over 12 feet tall. Leave native shrubs like dogwood or plum if they are less than 12 feet tall. If the shrubs are greater than 12 feet tall, cut them off at ground level and DO NOT TREAT the stumps. Cutting down older stems will encourage new shoot growth.
- Treat existing grass, especially sod-forming grasses such as tall fescue and smooth brome, with an approved contact herbicide before cutting trees. This will create bare ground and provide good growing conditions for annual food plants and shrubs.

- Cut down trees using only chainsaws or tree shears — no bulldozers. Leave trees where they fall or windrow them along the fence or woody draw. DO NOT push the trees into a dense pile.
- Treat cut tree stumps with an appropriate herbicide to prevent re-sprouting. Do not treat Osage-orange tree stumps when renovating an old hedgerow.
- Edge feather small sections at a time. Cut 50- to 100-foot-wide sections spaced out every 150 feet. Continue this process each year until the entire fence line or woody draw has been treated.

ESTABLISHING FOOD PLOTS

Before we get into the details of creating food plots, remember, *food is seldom the limiting habitat component for wildlife in Missouri*. In particular, food plots should not be placed in natural communities such as glades, savannas, or prairies. However, using food plots can provide important food and cover plants — both planted and natural — in a particular area, resulting in an increased abundance and diversity of foods available to a wide range of local wildlife species.


No-till soybeans alongside fallow area

Food plots come in two main types: grain plots and green-browse plots. The first is designed to provide seed, brooding, and bare-ground habitat. The second yields succulent vegetation for wildlife forage. In some instances, the two can be combined. Create food plots by leaving unharvested grain strips along edges of crop fields.

For grain food plots, plant early enough for the crop to produce mature seed. Planting grain mixtures rather than monoculture crops will enhance benefits to a wider range of wildlife species. In general, grain plots or unharvested grain crop strips should be a minimum of ¼ acres in size, at least 30 feet wide, and preferably located next to or within 70 feet of good woody escape cover and diverse herbaceous cover. Create long, linear plots or strips to divide large fields, or make block plantings where strips are not desired. To limit soil loss, planting on the contour is recommended.

When possible, use no-till planting methods. The residue left by practicing no-till planting methods will harbor insects beneficial to wildlife. Food plots should be adequately fertilized and protected from livestock grazing. In most cases weed control should be limited, as the natural foods provided by annual weedy plants are important to many wildlife species. Plots adjacent to woodland edges may need to be wider than 30 feet to receive enough sun and rain to be productive.

In general, one plot per 40 acres is a minimum. Because wildlife often exhaust seeds produced on small plots by early winter, consider increasing the plot size to 1–2 acres

to provide longer-term benefits where possible. In general, you won't need plots larger than 4 acres. To maximize food diversity, establish a rotation where you leave half of the grain plots fallow each year. This allows native food plants (annual broadleaves and grasses) to establish. Replant this fallow area the next year and leave the other half of the grain plot fallow. Including a legume, such as alfalfa or annual lespedeza, in the rotation every 3–5 years will help to build and maintain soil fertility.

Make green-browse plots a minimum of ¼ acre located next to quality wildlife cover. For deer and turkey, green-browse plots should be spaced about ¼ mile apart or one per 40-acre area. To be effective for rabbits, however, these plots should be about ¼ or ½ acre in size and about 100 yards apart. Green-browse mixes also can be planted on field roads, trails, and firebreaks.

The food plot site should be open and accessible for establishment and future maintenance. The use of correct amounts of nutrients and maintaining desirable pH levels is important to ensure quality. Properly timed mowing can help promote actively growing vegetation, especially for perennial plantings, and increase its attractiveness to wildlife. Mowing between July 16 and September 30 is desired. Plots can also be mowed from March 15 to May 1. It is recommended that only one-half of the plot be mowed annually, and that mowed strips are rotated, to increase plant diversity.

Recommended Food Plot Grains

Grain sorghum (milo) seeds are rich in energy, persistent on the plant, and usually available to wildlife when other seeds are covered by snow or ice. If only one grain is to be planted, grain sorghum will give the best results. Plant grain sorghum at the rate of 4 pounds per ¼-acre plot (or 8 pounds per ½ acre and 16 pounds per acre).

Additional grain mixtures, in order of preference follow. Also see Food Plot Plantings Beneficial to Wildlife on page 75.

No. 1
Grain sorghum — 8 lbs./acre
Soybeans — 12 lbs./acre

No. 2
Grain sorghum — 8 lbs./acre
Soybeans — 8 lbs./acre
German millet — 2 lbs./acre

No. 3
Grain sorghum — 12 lbs./acre
Sunflowers — 8 lbs./acre

Caution: *Planting too much seed will result in competition between the plants and will reduce the amount of grain produced. The above seeding rates will allow the production of both grain and beneficial weeds that supply food and cover.*

Fertilization of grain food plots is strongly recommended, especially for corn, milo, and sunflowers, to develop adequate seed production. For appropriate fertilizer rates, consult either MDC or USDA biologists.

Recommended Green-Browse Mixtures

For fall planting, seed per acre

30 lbs. wheat + 1 lb. timothy + 2 lbs. ladino clover + 2 lbs. red clover	**OR**	30 lbs. wheat + 5 lbs. alfalfa + 2 lbs. red clover

For spring planting, seed per acre

30 lbs. spring oats + 1 lb. timothy + 10 lbs. of annual lespedeza (Korean, Kobe, Marion, Summit, or a mix of these)	**OR**	30 lbs. spring oats + 16 lbs. alfalfa

Other mixtures and species, such as those in the following table, may be used based on recommendations provided by an NRCS conservationist or MDC biologist. In some cases, simple disking may be sufficient to provide adequate natural foods. Note that there are specific program requirements for establishing food plots on USDA Conservation Reserve Program (CRP) acres.

Field Measurements for Quarter-Acre Wildlife Plots

Number of Feet	Number of Steps (2.5 feet/step)	Number of Yards
105 × 105	42 × 42	35 × 35
75 × 150	30 × 60	25 × 50
65 × 170	26 × 68	22 × 57
50 × 220	20 × 88	17 × 73
40 × 275	16 × 110	13 × 92
30 × 365	12 × 146	10 × 122
20 × 550	8 × 220	7 × 183

These measurements will define an area of approximately ¼ acre. For larger plots, multiply one of the numbers of a pair by the following: 2 = ½ acre; 3 = ¾ acre; and 4 = an approximate acre. For a field corner plot, measure along each fence (or axis) 150 feet from the corner post, and then connect the two points.

Acre/Square Feet Conversions:

1 acre = 208.7 × 208.7 feet = 43,560 square feet

½ acre = 104.4 × 208.7 feet = 21,788 square feet

¼ acre = 104.4 × 104.4 feet = 10,899 square feet

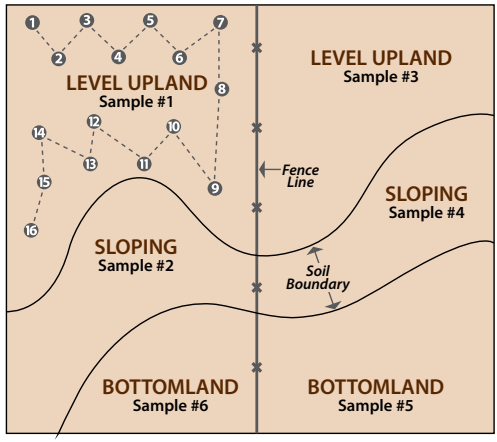
Food Plot Plantings Beneficial to Wildlife

Species	Broadcast Seeding Rate* (Pounds/Acre)	Time of Year to Sow
Alfalfa	10	Spring, early fall
Barley	48	Sept. 1 – Oct. 10
Buckwheat	48	Late spring
Canola	7	Spring, late summer
Cereal rye	90	September – October
Clover, alsike	4.8	Winter to April
Clover, berseem	16	Spring, fall
Clover, crimson	18	Spring, late summer
Clover, ladino	4.5	Spring, fall
Clover, red	9	Winter to early April
Corn (rows)	15	Spring
Kale	4	Spring, late summer
Lespedeza, annual	11	Mid-winter to early spring
Millet, German	20	April – June
Millet, Japanese	20	April – June
Millet, pearl	20	April – June
Oats	50	February – early spring; September – October
Radish	7	Spring, mid-July
Sorghum, forage	16	May to June 20
Sorghum, grain (milo)	16	June – July 1
Soybeans	45	April – June
Sunflowers	8	April – June
Turnips	4	Spring, mid-July
Wheat	90	September – early November
Winter pea	60	Late summer

**Rates can be reduced 50 percent for planting or drilling, except for soybeans, which could be reduced to 34-40#/ac.*

How to Take a Soil Sample

For routine testing of the soil to determine lime requirements, organic matter and the amounts of available nutrients in the plow layer (upper 7 inches), use the following procedure:



- A good first step is to obtain a soil survey map of your area. These maps are available from the NRCS office in your county. If a map is not available, draw a sketch of the property and the individual fields for a reference.
- On the map or sketch, divide your property into fields or soil types. Within an identified field or soil type, outline several 5- to 10-acre sampling sites. Within each site, take 15–20 soil samples, and then combine these samples into one larger sample for each site. Number these site samples and record the numbers on the map or sketch. See illustration above.
- Samples should be taken to a depth of 7 inches, using a spade, trowel, auger, or soil tube. If you use a spade, dig a V-shaped hole to the plow depth and remove a ½-inch-thick slice of soil from one side of the hole. Then trim from each side of the spade all but a thin ribbon of soil down the center of the spade face. Collect both the slice and the ribbon as the sample.
- Air dry the sample, but do not use heat. When the sample is dry, mix it thoroughly and remove about ½ pint of the soil for testing.
- Take your soil samples to an office (MU Extension) for analysis. A small fee will be charged for each sample. Be prepared to furnish information on the field's history of cropping, liming, and fertilizing. Include the soil type listed in the Soil Survey, which is available from the NRCS.
- Keep the results of soil tests with your wildlife or landowner plan for future reference. These recommendations are for crop production and considerably less fertilizer can be used on food plots. Lime is important for legume establishment and growth.

Recommended Soil pH Range for Crop Establishment

Crop	Ozark Soils	All Other Missouri Soils
Alfalfa	6.6–7.0	6.1–6.5
Clover	6.1–6.5	5.6–6.0
Cool-season grass	5.6–6.0	5.6–6.0
Lespedeza	6.1–6.5	5.6–6.0
Overseeding legumes	6.1–6.5	5.6–6.0
Warm-season grass	5.6–6.0	5.6–6.0
Sudan grass and Sudan/sorghum crosses	5.6–6.0	5.6–6.0
All row crops	6.1–6.5	6.1–6.5

Big bluestem

ESTABLISHING NATIVE WARM-SEASON GRASSES

Native warm-season grasses such as Indian grass, big bluestem, and little bluestem benefit a wide range of wildlife species and increase the profitability of a cattle operation. Because of their fluffy character, most warm-season grass seeds will not flow through a regular grain drill. Special grass drills have been developed that will accommodate this type of seed. Some of these drills may be available for loan or rent from various agricultural agencies (usually the local SWCD office) throughout the state. Smaller acreages can be successfully seeded by hand, broadcasting seed onto a rolled seedbed, followed by rolling twice with a heavy roller or cultipacker.

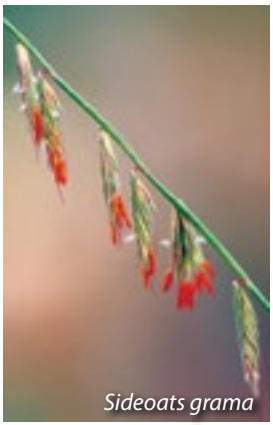
Since this seed tends to be expensive when compared to other grass seeds, you will want to use the best planting methods available. Both studies and experience have shown that planting in a clean-tilled or conventional seedbed is the best method for normal conditions. Minimum or no-till seeding methods also have produced good stands of native grass, if the correct chemicals were used to kill the existing sod and to control any annual grass competition.

Based on your soil test, you may need to apply phosphorus, potassium, and lime before seeding. For best results, spread lime at least six months before seeding. Do not apply nitrogen the year you plant. It will encourage the growth of **nonnative** cool-season plants. You should consult with local agency personnel for the current information on seeding methods, seeding dates, chemical weed control, and stand management.

Recommended Native Warm-Season Grass Mixtures

Wildlife plantings should not be dense stands, compared to pasture and hay plantings. Fields planted for wildlife use cannot be too weedy, but they can have too much grass. Include native legumes and forbs to provide more plant diversity.

Native Warm-Season Planting Mixes


Sideoats grama

No. 1 — short mix, 2–4 ft.
Little bluestem — 2.7 lbs. PLS/acre)
Sideoats grama — 1.4 lbs. PLS/acre
Alfalfa — 2.0 lbs. PLS/acre
Native forbs — 3.0 lbs. PLS/acre

No. 2 — tall mix, 3–6 ft.
Big bluestem — 0.8 lbs. PLS/acre
Little bluestem — 2.6 lbs. PLS/acre
Switch grass — 0.7 lbs. PLS/acre
Alfalfa — 2.3 lbs. PLS/acre
Native forbs — 1.0 lbs. PLS/acre

Conservation programs require pure live seed (PLS) for native grass and forb plantings. PLS is always more expensive than unrated bulk seed, but it increases the likelihood of seeding success.

ESTABLISHING POLLINATOR HABITAT

As mentioned in Chapter 7, native bees, moths, butterflies, and other invertebrates pollinate our crops and wild plants and serve as important sources of protein for wildlife.

Plant a diverse mixture of forbs using at least 5.0 PLS lbs./acre, a minimum of nine species, with a minimum of three species blooming in each season (spring, summer, and fall). Areas should be a minimum of ½ acre, but larger is better.

Locate plantings close to pollinator nesting sites such as standing dead trees, edge feathering, and downed tree structures. Plantings should be located where chemical drift into the plot will not be a concern.


Prairie blazing star, gray-headed coneflower, and Queen Anne's lace make good pollinator habitat.

Swamp milkweed prefers moist soil conditions.

DEVELOPING WETLANDS

Many areas in Missouri could be developed into productive wetlands with little expense. In fact, many wetland areas need only be identified, preserved, and protected. In such cases there is no development cost.

Before selecting the final site, consult an experienced wetland developer. MDC personnel can inform you of any restrictions or permits that might be required before construction begins. They will also be aware of any cost-share programs that might be available.

As a landowner, your first consideration should be your overall objective for the wetland and whether your property's potential site can meet your expectations. For example, if your objective is to benefit migrating waterfowl and to provide hunting opportunities, design and manage your wetland to provide seasonally available (fall and early spring) water and a sufficient quantity and quality of food to attract waterfowl. This usually requires a water-control system. However, if the wetland will be used mainly for water filtration, natural flooding will accomplish this objective.

Site Selection

Site selection is critical. The topography, soil type, water source, and overall objective for the wetland will influence the final site selection. The topography, or lay of the land, should be flat enough to allow shallow flooding of an area large enough to be functional. The soil must have the capacity to hold water.

Areas within floodplains along the base of hills, historic abandoned channels within the floodplain, back swamp areas along rivers, and areas below ponds or lakes can all provide excellent water sources. Often, extremely wet areas in fields occur in these locations and can be converted back to wildlife-beneficial wetlands. If floods ruin the crops in an area five out of 10 years, it may be better to eliminate this income risk by restoring the area to a wetland.

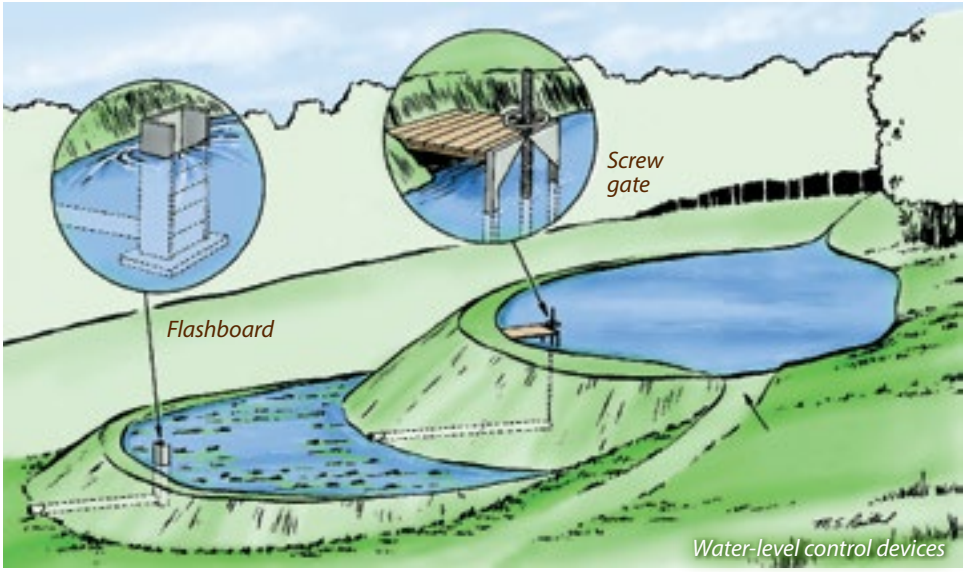
A good water source at the site is a very important consideration because a wetland cannot function without water. Your intended use of the wetland will dictate the quantity of water needed and the timing of delivery. The water can come from underground sources, such as wells or springs, or from ponds, lakes, or streams. Pumping water from underground sources can be expensive but will usually provide dependable water levels. If the water comes from natural sources or intermittent flooding, flood frequency and flooding heights of the adjacent stream must be considered.

Wetland Construction

Once you have selected an appropriate site, you can begin developing your wetland. Some wetlands may only require repair of natural levees, but others may need more extensive levee construction. Determine levee design by how you intend to use the wetland and site topography.

Levees should be built to a height of at least 12 inches above the maximum water line. This amount of "freeboard" will keep wave action and water saturation from destroying your levees. Too much freeboard may result in managed water levels that are too deep to benefit many wetland species. Usually a 6:1 slope is adequate on small levees. If the levee will be subjected to overtopping by floodwaters, an 8:1 or even 10:1 slope with a minimum 10-foot top should be used. The levee should be wide enough to allow maintenance of the top and side slopes. Flatter slopes on the levee will prevent damage from burrowing animals. Levees should be constructed away from stream banks to reduce erosion.

The type of water-level control device you install will be influenced by the intended use of the wetland and by the water source. A water-control structure typically consists of a culvert and a gate device to stop the flow of water. Various types of gates are available. Choose one to fit your specific situation. See Chapter 5 for more detailed information on wetland management.



Water-level control devices

WINDBREAKS

Windbreaks provide travel routes, shelter, and habitat for wildlife, and depending on the species planted, they can be a food source as well. The most obvious benefit of a well-planned windbreak is protection from wind. Depending on the plant species and the density or thickness of the windbreak, wind velocities can be significantly decreased on the downwind side for distances of 10–20 times the height of the trees. This amount of wind reduction can achieve the following:

- Reduce wind chill and home heating bills by 15–20 percent.
- Increase crop yields in protected fields up to 18–22 percent by buffering moisture-sapping summer winds.
- Improve livestock performance by buffering winter winds and providing shade in summer.
- Reduce pond, dam, and shoreline erosion.
- Block direct snow deposits because drifting snow is deposited within 60 feet downwind of the windbreak.

Windbreaks provide many other benefits to your property and home:

- Reduce wind velocity.
- Benefit crop production by attracting insect-eating birds.
- Reduce noise, dust, and pollution.
- Provide food and cover for many species of wildlife.
- Provide a source of nuts, berries, firewood, and Christmas trees, depending on the tree and shrub species selected.
- Add beauty to the area.

Establishing a Windbreak

Establishing a windbreak that will meet your specific needs begins with proper planning and design, which you should complete well in advance of planting your windbreak. Line up sources for tree and shrub seedlings in the fall, and plant seedlings in early spring.

You can establish windbreaks with trees, shrubs, grasses, or any combination of these. Hardwood trees, which shed their leaves in the fall, are not as effective as evergreen species for wind protection. However, even the bare limbs reduce wind velocities. Hardwood species offer some advantages: they are hardier, grow faster, and are taller at maturity than evergreens. For these reasons, both evergreens and hardwood trees are recommended in windbreaks, providing you can give each enough space to grow.

Five-Row Windbreak

Rows 1 and 5: redbud, blackberry, gray dogwood, hazelnut, aromatic sumac, false indigo bush, and American plum

Rows 2 and 4: Norway spruce, eastern red cedar, white pine

Row 3: Pin oak, northern red oak, tulip poplar, swamp white oak, sweet gum, hackberry

LYNN BETTS

Evergreens make better windbreaks than do hardwoods.

Follow these guidelines for planning and maintaining windbreaks:

- Locate windbreaks 100 feet from the area to be protected if possible.
- Locate windbreaks for winter wind protection on the north and west sides of the area to be protected, and plant evergreens in at least two of the windbreak rows.
- Locate summer windbreaks on the south and west sides of the area to be protected, and plant hardwood trees in at least two of the windbreak rows.
- Control weeds and grasses within the windbreak plantings until trees and shrubs become fully established — up to five years, depending on how fast the seedlings grow.
- Protect plantings from livestock trampling and grazing. Fencing may be necessary.
- When planting, make sure the roots of the seedlings are spread out and not curled up in the planting hole.
- Do not fertilize the seedling trees and shrubs in the first and second years of establishment. Fertilization with a 12/12/12 fertilizer beginning in the third growing season is appropriate.
- For maximum survival and growth, water new seedlings to a depth of 6 inches once per week in the absence of significant rainfall during the first, second, and third growing seasons.

More details on windbreak construction are available from MDC field offices and MU Extension.

Wildlife Management Assistance 9

Technical assistance with wildlife and fisheries habitat improvement and forest management on your land is available, usually free of charge, from government agencies and sportsman's groups. The contact information and details for specific types of assistance, including education, cost sharing, financial incentives, and grant opportunities, for the various organizations are listed on their websites, shown below. Many agencies have regional offices that can be found in the government listings of the telephone directory or online.

MISSOURI DEPARTMENT OF CONSERVATION

mdc.mo.gov

MDC is responsible for managing the fish, forest, and wildlife resources of the state. Field personnel in several divisions of MDC provide technical assistance to landowners, including private land conservationists, resource foresters, fisheries management biologists, wildlife management biologists, and conservation agents. Contact field personnel locally or through an MDC regional office (see inside back cover).

MDC field staff meet with landowners one-on-one, conduct management workshops, and give presentations to a variety of professional and social organizations as well as local schools. Staff also can provide landowners with resource management plans and connect them to sources of financial aid.

Conservation Agents Conservation agents work in every county in Missouri and enforce the rules and regulations of the *Wildlife Code of Missouri*, including Missouri's trespass laws. Conservation agents are the first point of contact with MDC for many landowners. One of the many duties of conservation agents is to assist private landowners with wildlife, fisheries, and forest management. For example, they give habitat management recommendations to landowners, and they also serve as contacts for assistance with wildlife damage. If your request for assistance is outside the agents' expertise, they will refer you to the appropriate MDC specialist.

Private Land Conservationists Private land conservationists (PLCs) help landowners meet their land management objectives in ways that enhance fish, forest, and wildlife conservation. These professionals can provide advice on a wide variety of land management objectives, including timber stand improvement, hay and grazing systems that benefit wildlife, livestock watering systems for habitat improvement, **invasive species** control, and soil erosion control. They can also make recommendations on pond, forest, wildlife, and natural community management, and they can help with wildlife that have become a nuisance or are causing property damage. Private land conservationists often call on other MDC, NRCS, and MU Extension specialists as the need arises.

Resource Foresters and Community Foresters Professional foresters have multi-county assignments, and they help landowners manage their valuable forestland. Services include tree planting and harvesting information, woodland wildlife management, timber stand improvement, timber sale advice, information on tree insect and disease control, and other related assistance.

Fisheries Management Biologists These professionals provide technical help with managing private impoundments and streams. They give advice to landowners with regard to pond stocking, aquatic weed control, water-quality improvement, fish-population management, stream bank stabilization and re-vegetation, and other aspects of fisheries management.

Habitat Management Specialists Wildlife management biologists, urban wildlife biologists, and natural history biologists can make recommendations for improving wildlife habitat and natural communities to meet a landowner's conservation goals. They can also provide guidance on an owner's wildlife specific interests, whether game (deer, turkey, rabbits, and others) or nongame species (songbirds, bats, reptiles, and other rare wildlife). They can also advise on ways to incorporate farming systems or smaller food plots into wildlife management. If there is a natural history component to your management plan, a natural history biologist can consult on that aspect.

Wildlife Damage Biologists These professionals can help you deal with conflicts between wildlife and people. Due to multi-county assignments, they can provide assistance over the phone or are available for onsite visits by appointment only. They teach wildlife-control techniques to landowners who are experiencing significant wildlife damage. Contact your MDC regional office to make arrangements for this service.

UNIVERSITY OF MISSOURI EXTENSION

extension.missouri.edu

MU Extension provides technical assistance on a broad range of land management projects. These offices have a wide selection of printed and online material available on various aspects of agriculture, forestry, pasture management, horticulture, home economics, wildlife conservation, and wildlife damage to property and crops. MU Extension regional offices will do soil testing and help interpret the results. MU Extension employs a variety of professional staff, including agricultural advisors stationed at many locations throughout the state, who work individually with farmers or give presentations to groups on agricultural topics. They also provide services and information on several wildlife management topics.

MISSOURI DEPARTMENT OF NATURAL RESOURCES SOIL AND WATER CONSERVATION DISTRICTS

dnr.mo.gov/env/swcp

DNR oversees state programs related to energy, mineral resources, soil and water conservation, and the state's historic heritage. It also administers the Parks and Soils Sales Tax that funds soil and water conservation in Missouri. The majority of the soil-and-water portion of this tax has been used to assist agricultural landowners through voluntary programs developed by the Soil and Water Districts Commission. The Soil and Water Conservation Program administers them through district boards in each of the 114 counties. The cost-share program provides financial incentives to landowners for installation of soil and water conservation practices that prevent or control excessive erosion and improve water quality. Soil and water conservation districts provide technical support with the design, implementation, and maintenance of practices.

UNITED STATES DEPARTMENT OF AGRICULTURE

Farm Service Agency *fsa.usda.gov*

USDA/FSA oversees a number of voluntary conservation-related programs. These programs work to address a large number of farming and ranching related conservation issues that include drinking water protection, reducing soil erosion, wildlife habitat preservation, preservation and restoration of forests and wetlands, and aiding farmers whose farms are damaged by natural disasters. FSA accomplishes these goals through the many conservation programs it administers. On the local level, FSA is assisted by a committee of landowners to ensure programs meet both federal policy and local needs, and it offers cost share and incentives to assist landowners wanting to establish conservation practices on their land.

Natural Resources Conservation Service *nrcs.usda.gov*

NRCS is a unit of the U.S. Department of Agriculture delivering conservation programs to landowners to reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. NRCS works closely with the Farm Service Agency in the administration of these programs. They also make forage and crop management recommendations, help with the design of terraces, waterways, and ponds, and suggest plant species that best meet your land management objectives.

Note: Cost-share and incentive programs vary from year to year, depending upon available federal revenues. Landowners should contact their county USDA service center concerning programs available from various agencies and their sign-up dates.

U.S. FISH AND WILDLIFE SERVICE

fws.gov/partners

The U.S. Fish and Wildlife Service administers The Partners for Fish and Wildlife Program established in 1987 for on-the-ground wetland restoration projects on private lands. This program has grown into a larger and more diversified habitat restoration program assisting thousands of private landowners across the nation.

The Partners Program provides technical and financial assistance to private landowners willing to work with multiple partners on a voluntary basis to help meet the habitat needs of federal trust species. These include threatened and endangered species as well as migratory birds (for example, waterfowl, wading birds, shorebirds, and Neotropical migratory songbirds). The Partners Program can assist with projects in all habitat types that conserve or restore **native** vegetation, hydrology, and soils associated with imperiled ecosystems such as bottomland hardwoods, glades, native prairies, marshes, rivers, and streams. It also provides an important habitat requisite for a rare, declining, or protected species. Locally based field biologists work

one-on-one with private landowners and other partners to plan, implement, and monitor their projects. Partners Program field staff help landowners find other sources of funding.

NONGOVERNMENT CONSERVATION ORGANIZATIONS

There are many NGOs that work hand-in-hand with federal and state conservation agencies to improve wildlife habitat on private land. Examples of NGOs that provide assistance to private land conservation in Missouri, whether as partners with a government agency or with more direct financial assistance, are shown below. There are many other NGOs with missions in conservation, so consider this a representative list.

Pheasants Forever and Quail Forever *pheasantsforever.org • quailforever.org*

PF/QF is a national organization dedicated to the conservation of quail, pheasants, and other wildlife through habitat improvements, public awareness, education, and land management policies and programs.

Through a unique partnership between PF/QF and the Missouri Department of Conservation and the Natural Resources Conservation Service, QF farm bill wildlife biologists are located in some local USDA service centers. QF farm bill wildlife biologists are specialized professionals in conservation programs and habitat planning. The purpose of the Farm Bill Wildlife Biologist Program is to assist landowners in designing, developing, and funding habitat improvements on private lands. QF farm bill wildlife biologists possess knowledge of federal, state, and local programs and assist landowners in finding the right program to meet their personal habitat and land-use goals.

Quality Deer Management Association *QDMA.com*

QDMA is a nonprofit white-tailed deer conservation organization that helps hunters improve local deer populations and deer habitat to create the most exciting and rewarding deer-hunting opportunities possible. QDMA achieves its mission through a wide range of educational channels, including its membership magazine, *Quality Whitetails*, the only deer-hunting magazine focused on the Quality Deer Management philosophy. QDMA's Deer Steward program provides advanced training in habitat and deer population management for hunters who want to take their knowledge to the next level. Both in-person and online Deer Steward courses are available.

In Missouri, QDMA works in partnership with the Missouri Department of Conservation to fund full-time wildlife management cooperative specialists to assist landowners and hunters to form cooperatives across property lines to enhance wildlife management through teamwork with neighbors. A number of volunteer QDMA branches are located throughout Missouri working at the grassroots level to improve deer hunting.

National Wild Turkey Federation *nwtf.org*

NWTF is a nongovernmental conservation organization dedicated to conservation of the wild turkey and preservation of the hunting heritage. The NWTF's "Save the Habitat. Save the Hunt." initiative is a 10-year strategic plan to enhance and conserve 4 million acres of habitat, create 1.5 million additional hunters, and gain access to an additional 500,000 acres of hunting land. The Missouri portion of the habitat goals is to enhance and conserve 131,200 acres.

Because the vast majority of Missouri is privately owned, a portion of NWTF efforts targets private land management. NWTF does not work directly with private landowners, nor does it have its own cost-share program, but it provides assistance to landowners by augmenting existing state and federal programs. Matching cost-share dollars are available through the MDC Habitat Challenge Grant program or the Missouri Bird Conservation Initiative from the NWTF Super Fund Grant program. NWTF also works closely with the U.S. Fish and Wildlife Service to administer the Partners for Wildlife Program in a user-friendly manner for private landowners and local technical service providers.

Quail and Upland Wildlife Federation *QUWF.net*

QUWF is a multispecies-based habitat conservation organization that works very closely with many of the federal, state, and local conservation partners listed in this handbook. QUWF works directly with private landowners through a network of chapters across the state and nation. QUWF focuses on a variety of upland species and their habitats, including turkey, quail, grouse, pheasant, doves, rabbits, songbirds, and others. QUWF assists landowners by providing matching funds through the MDC Habitat Challenge Grant program to implement approved habitat practices. These practices include timber stand improvement, edge feathering, native warm-season grass management, early succession management, food plots, and much more. QUWF has field staff to provide technical assistance to private landowners to develop habitat management objectives for their land.

Ducks Unlimited *ducks.org*

DU conserves, restores, and manages wetlands and associated habitats for North America's waterfowl. These habitats also benefit other wildlife and people. Nearly three-fourths of America's remaining wetlands are on private lands. All over North America, DU works with farmers, ranchers, and other landowners to improve the agricultural and recreational value of their land, making it more wildlife friendly. No single group could perform the work necessary to meet the goals of the North American Waterfowl Management Plan and DU's International Conservation Plan. Virtually all of DU's projects are done in cooperation with a number of partners, including state and federal agencies, private corporations and foundations, and individuals.

Glossary of Terms

Forb. Wildflowers or any soft-stemmed flowering plant that is not a grass.

Herbaceous. A soft-stemmed (nonwoody) plant.

Legume. Plants in the bean family, such as clover, alfalfa, partridge pea, and Illinois bundle flower.

Native, **nonnative**, **invasive**, and **noxious species**. A **native** species is any plant or animal that historically occurred and evolved in a given ecosystem and is in balance with other species in that ecosystem. **Nonnative** species are intentionally or accidentally introduced into an ecosystem where they did not evolve, but they do not necessarily interrupt natural ecosystem processes. Species, either native or nonnative, become **invasive** when they disrupt local ecosystem functions, outcompeting other community members. For example, invasive nonnative sericea lespedeza has no natural controls in the United States, and it outcompetes local native grasses and forbs. Similarly, native eastern red cedar, which was historically controlled by fire, also overruns local natural communities such as glades unless they are burned periodically. **Noxious** plants and animals are native or nonnative species that occur where they are not desired and as a result cause harm to public health, crops, livestock, wildlife, and the environment. Examples include musk thistle and sericea lespedeza in livestock pastures, zebra mussels in our lakes and streams, Callery pears (Bradford pear, for example) that take over open grasslands, and bush honeysuckles that take over woodlands.

Succession. The natural process by which an area passes from bare ground to the most complex or climax stage of vegetation.

Recommended References

ONLINE RESOURCES

mdc.mo.gov. Browse our website for technical sheets and videos on a number of wildlife and habitat management topics. Just key your topic of interest into the search bar and go.

Don't forget to check the websites of our government and nongovernment partners listed in Chapter 9. They offer many excellent wildlife and habitat management resources.

FREE PUBLICATIONS FROM MISSOURI DEPARTMENT OF CONSERVATION

For free publications about managing your land for wildlife and other topics, visit ***short.mdc.mo.gov/4Y6***. Browse and read digital versions online, or download the order form. Choose up to 20 items, and we'll be happy to send Missouri residents one copy of each selection.

FROM THE NATURE SHOP

Browse MDC's Nature Shop online at ***mdcnatureshop.com***, or stop at any MDC office with a visitor center for books and other products that can help you discover outdoor Missouri and conserve it, too.

Need More Information?

To request copies of this booklet, call Missouri Department of Conservation at 573-522-4115, ext. 3237, or email *pubstaff@mdc.mo.gov*.

For a free list of nurseries that carry native seed adapted to Missouri, call Private Land Services at the above phone number.

To purchase Missouri Department of Conservation books and other gift shop items, visit ***mdcnatureshop.com***, or call the Nature Shop at 877-521-8632 from 8 a.m. to 5 p.m. CST, Monday through Friday except holidays. The Nature Shop number is for purchases only. If you have a question about conservation issues, call a number on Page 89.

MDC Regional Contacts

Serving nature and you

The Department's staff is available to help you develop and manage wildlife habitat on your property. They can provide technical support and supply information about cost-share and training opportunities. To find help, call your regional MDC office, which is listed in the sidebar to the right. If you're online, visit ***mdc.mo.gov*** and choose Contact & Engage to search for local contacts by county.

Central Region
3500 East Gans Road
Columbia, MO 65201
573-815-7901

Kansas City Region
12405 SE Ranson Road
Lee's Summit, MO 64082
816-622-0900

Northeast Region
3500 S. Baltimore
Kirksville, MO 63501
660-785-2420

Northwest Region
701 James McCarthy Drive
St. Joseph, MO 64507
816-271-3100

Ozark Region
551 Joe Jones Blvd.
West Plains, MO 65775
417-256-7161

Southeast Region
2302 County Park Drive
Cape Girardeau, MO 63701
573-290-5730

Southwest Region
2630 N. Mayfair
Springfield, MO 65803
417-895-6880

St. Louis Region
2360 Highway D
St. Charles, MO 63304
636-441-4554

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Monarch butterflies on New England aster

PLS182 4/2024