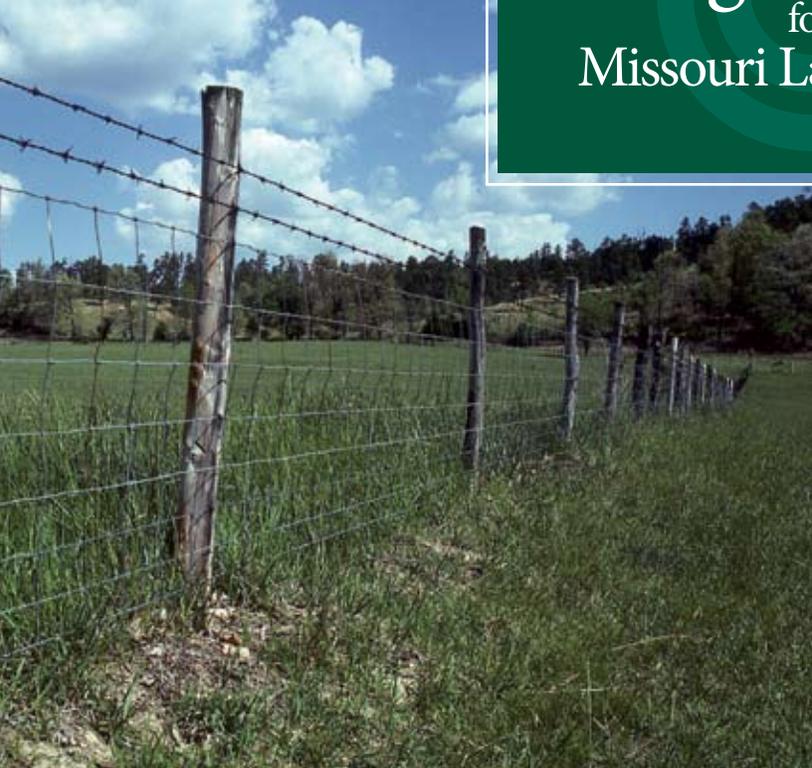


Land & Water
Management Tips
for
Missouri Landowners





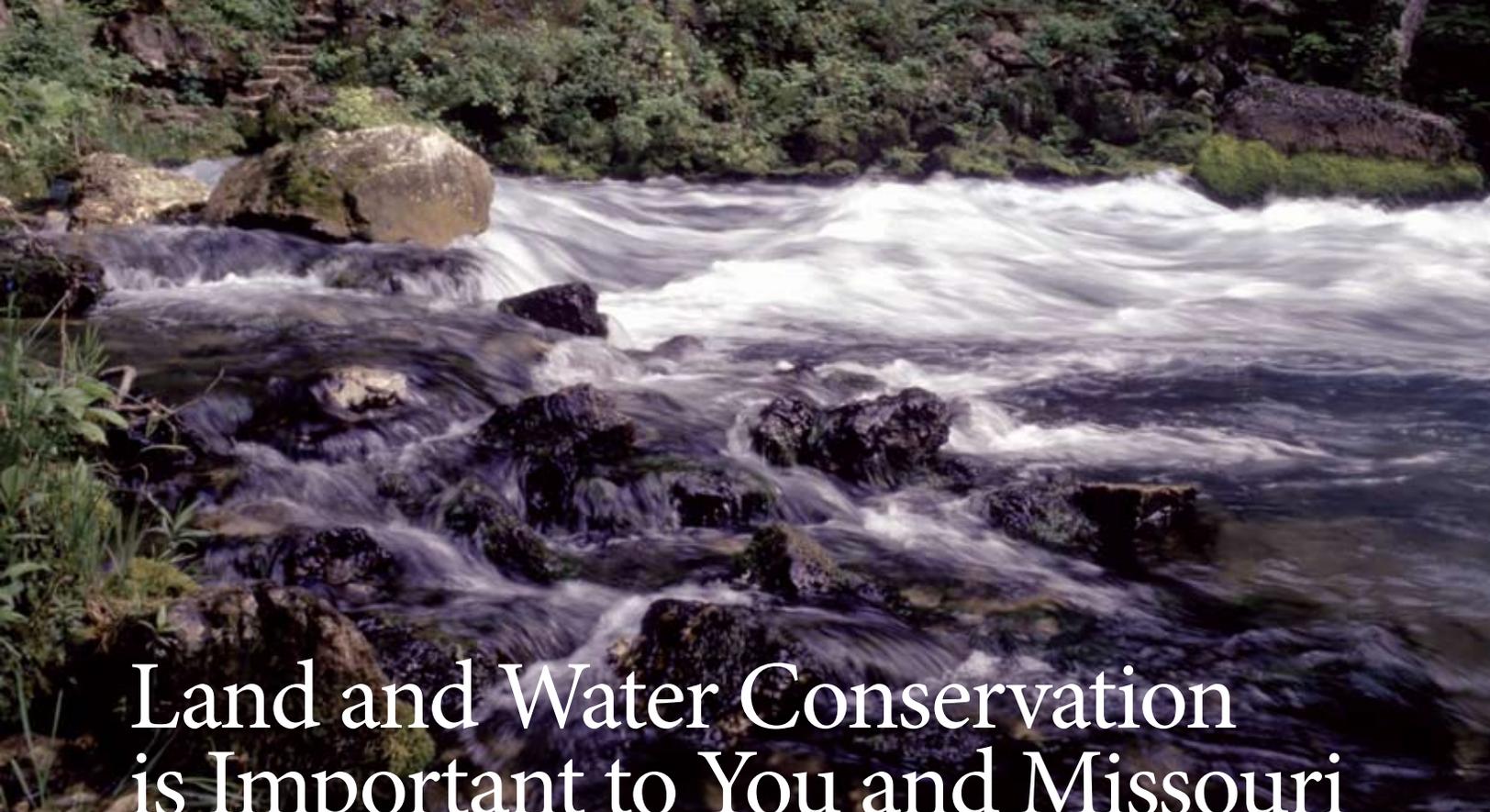
*Helping People Help the Land
in Missouri*

Land & Water Management Tips for Missouri Landowners

Planning.....	4
All About Soils	6
Preventing Water Pollution	8
Riparian Areas	9
Grazing Management Planning.....	11
Grazing Schedules and Systems.....	14
Watering Livestock.....	16
Choosing the Right Fence	17
All About Ponds	18
Attracting Wildlife.....	19
Healthy Trees.....	23
Insects and Disease	24
Yard Tips.....	26
Pests and Weeds.....	27
Watering and Irrigation	29
Composting.....	31
Where to Get Help	32



Natural Resources Conservation Service



Land and Water Conservation is Important to You and Missouri

Are you raising horses and wondering why you are having to buy more feed each year as your land's productivity declines, leaving bare ground and weeds?

Have you had the good fortune to buy a place on a creek and are now frustrated that you aren't permitted to remove the brush so you can see the water?

Did you just find out that those pretty purple flowers along your fence are noxious weeds that threaten the productivity of your land and your neighbor's land?

As you can see, there's a lot to know about owning and managing land, and you need to know even more if you're raising livestock as well. This booklet will get you started and give you lots of information and ideas for your place. With a little time, a little knowledge and not a whole lot of money, you can protect Missouri's land and water and have a "picture perfect" place of which you can be proud.

Remember, we're all part of a neighborhood and our actions can affect others. The things that you and your neighbors do can greatly improve the health of the Missouri resources we all appreciate.

Look Around

Any landowner needs a management plan. Before developing your plan, look around, make a sketch, and take a few notes about your property. In your sketch show or note:

- Property boundaries
- Fences and corrals
- Wells (human or stock)
- Septic system
- Streams, wetlands, ponds
- Bare ground
- Weeds
- Lay of the land (flat, sloped, etc.)
- Lawns, pastures or croplands
- Soil type (refer to your county soil survey available online at websoilsurvey.nrcs.usda.gov, or check at your local NRCS field office)
- Depth to groundwater (check with well driller)
- Neighboring land uses



Before

Identify Your Goals

If you don't already know what your goals are for your property, ask yourself the following questions:

- What do I want from my property?
- What can my land support?
 - Livestock grazing? How many animals?
- Do I want to encourage wildlife habitats?

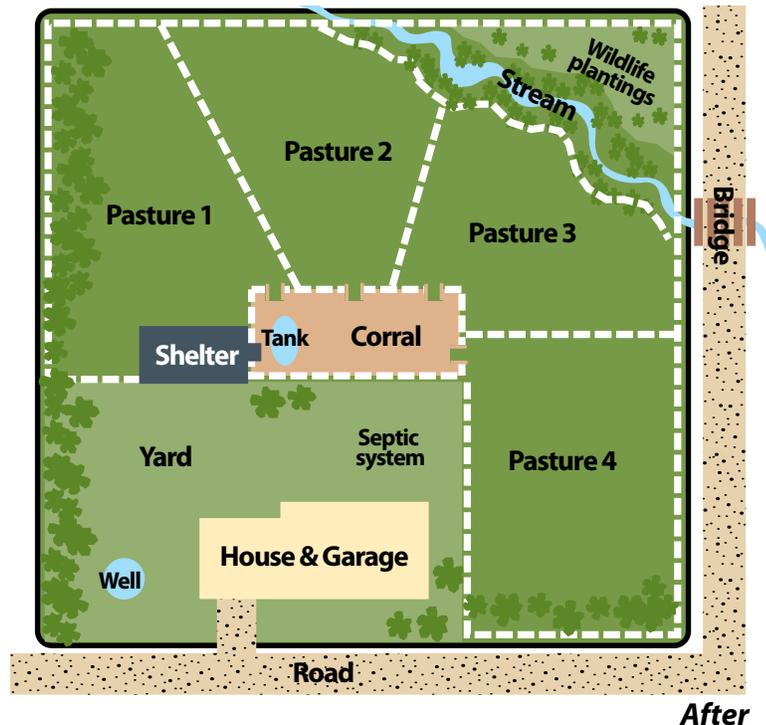
- How is the water quality? What about fish?
- Is my forest healthy?
- Should I think about using native plants?

You may find that you have to modify some of your goals because they are not realistic. Identify the most important goals that fit your property.

Make a Plan for Your Land

The four pastures in this drawing allow better management of livestock grazing and increased forage production. A stockwater tank located in the corral is accessible from all pastures and reduces streambank trampling. Shrub and tree plantings along the streambank prevent erosion, replace weeds and bare areas, and provide wildlife habitat.

Once you've looked at your property and identified your goals, you need to develop a management plan for reaching your goals. Remember, even if you like things just the way they are, there are things you can do to prevent weeds and keep the water clean. This booklet provides useful information on developing the many different parts of your management plan.



After



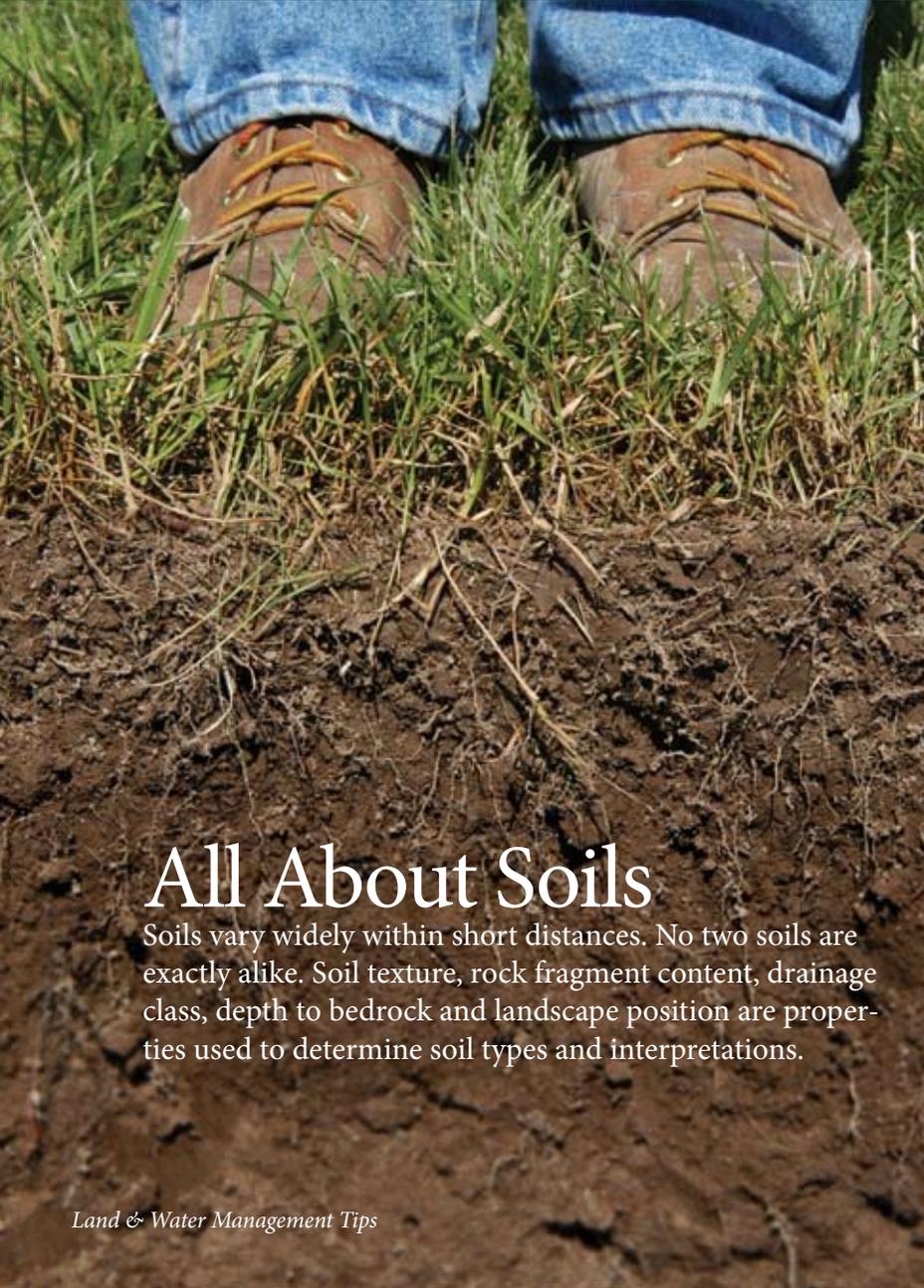
The Value of Conservation

Simple conservation practices can:

- **save you money.** Your land is more productive over the long term.
- **ensure better water quality** for you, your animals, and your neighbors.
- **provide wildlife habitat.**
- **produce more, better quality grass** which promotes healthier livestock.
- **make your property more attractive** and improve your property value.
- **help the health** of your neighbors' land and encourage them to do the same.
- **satisfy your responsibility** to care for the land.

Don't Know Where to Start?

Try From the Ground Down



All About Soils

Soils vary widely within short distances. No two soils are exactly alike. Soil texture, rock fragment content, drainage class, depth to bedrock and landscape position are properties used to determine soil types and interpretations.

The soil types you have will influence:

- What crops, trees or grasses your land will produce and what yields you could expect.
- How quickly water moves through the soil (permeability).
- How much water the soil will hold and make available to plants (available water capacity).
- Depths to high-water tables.
- How well human and animal wastes will be treated and if there is a potential for these materials to reach the groundwater or streams and lakes.
- Natural fertility
- Building site development. Will sidewalks and streets crack, and will dwellings with basements have moisture problems?
- If the area is a wetland or if the site floods.

For specific information about the soils on your land, look up your property online at websoilsurvey.nrcs.usda.gov. Or check with your local NRCS field office for your county soil survey report.

Not Just a Bunch of Dirt

Soil consists of minerals, organic matter, water, and air. The portions vary, but the major components remain the same. The percentages of sand, silt, and clay (the three soil particle sizes) determine the texture of the soil. Terms used to describe soil texture include silt loam, loam, sandy loam, and clay loam, to list a few.

The flow and storage of water, the movement of air, and the ability of the soil to supply nutrients to plants are examples of properties that are influenced by the size and arrangement of these soil particles (soil texture). Knowledge of soil texture can also help you evaluate many other properties of your soil, such as: natural fertility, soil structure, tilth, how water and nutrients are retained, and how they move through the soil.*

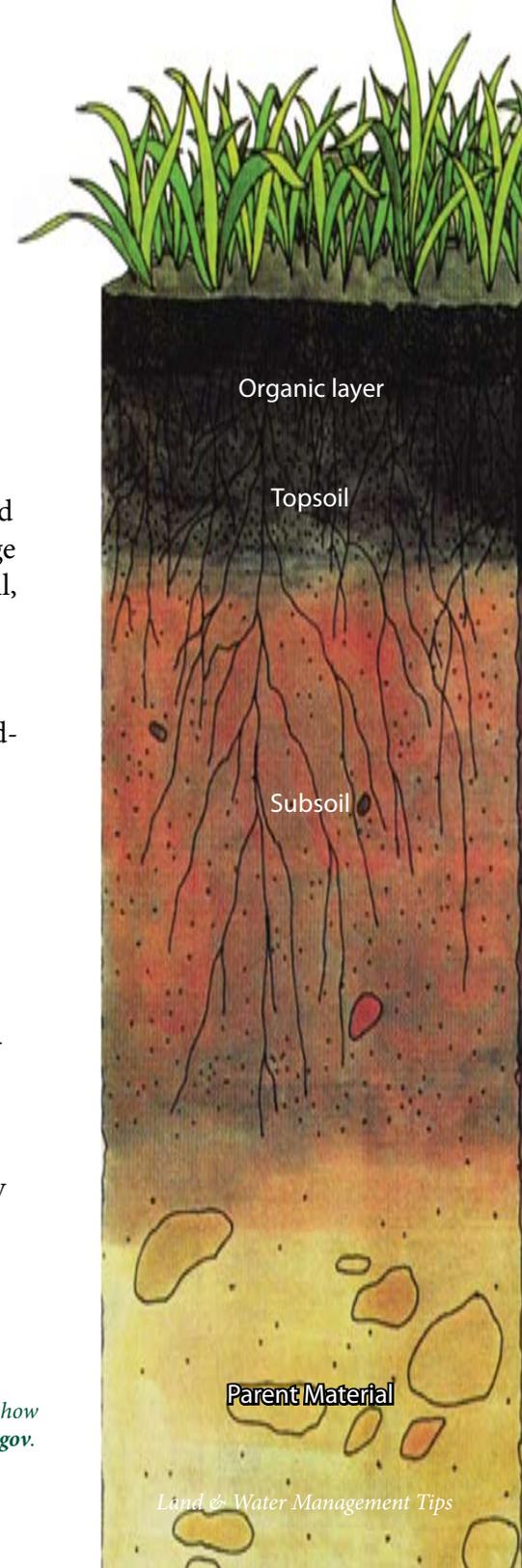
Soil health is defined as how well a specific soil functions within its surroundings, supports plant and animal productivity, maintains or enhances water and air quality, and supports human health and habitation. Knowing the health of your soil will help you determine what conservation goals are achievable and necessary.

Vegetation Prevents Erosion

Vegetation protects the soil from erosion by rain, runoff and wind. Vegetation increases water uptake by soil, and holds soil in place on slopes and along streams.

Soil erosion claims 75.5 million tons of Missouri's topsoil each year, mostly from the state's 10.5 million acres of cultivated cropland. It takes about 500 years for nature to create one inch of topsoil. But with an erosion rate of 5.6 tons per acre, an inch of topsoil (about 160 tons) erodes in less than 30 years. So you can see, soil conservation is important for everyone.

* NRCS has a free publication "Estimating Soil Moisture by Feel and Appearance," further describing how to determine soil texture. Check with your local NRCS field office or online at landcare.sc.egov.usda.gov.



How Safe is Your Drinking Water?

The Farm**A**Syst program allows you to assess the potential effects of various farmstead practices on your drinking water supplies. In addition to 12 do-it-yourself worksheets, the program provides suggestions for how you can modify your practices and where to go for help. The quality of your drinking water can affect farm values, as lenders consider the cost of corrective actions or cleanup in sale prices. Contact your local University Extension office for help.



Tips for Preventing Water Pollution

- Establish and maintain shrubs and grasses along streams and around animal confinement areas to trap and absorb pollution-laden runoff before it reaches streams or groundwater.
- Locate corrals and other livestock confinement areas away from streams. Use water gaps or off-stream stockwater tanks to prevent livestock from trampling streambanks.
- Locate corral and septic systems downslope of your drinking-water well.
- Avoid over-irrigation that can cause runoff of valuable topsoil, fertilizer, and pesticides.
- Properly dispose of manure, feed, and bedding wastes by spreading it on unused pastures or cropland. Be sure the soil will absorb wastes, and is not too wet or frozen. This can reduce your need for commercial fertilizer.
- Use farming practices that reduce soil erosion and increase water infiltration, such as minimum tillage, contour farming, filter strips, and grassed waterways.
- Do not mix, apply, or dispose of weed-control chemicals, used motor oil, or other toxic substances near streams, wells, or where they can leak into groundwater. Contact your county health department for the best method of disposal in your area.

Use Riparian Areas

Riparian areas are found along streams, lakes, and wetlands. They are comprised of water-adapted plants such as sycamore, willow, cottonwood, and sedges. These areas make up a small portion of the landscape, yet contain high levels of plant and animal diversity. Species associated with riparian areas include turtles, beavers, muskrats, wood ducks, songbirds, frogs, insects, orchids, lilies, and more. Just about everything you like about riparian areas depend on leaving them in their natural state. A minimum width of 50-100 feet is necessary to maintain a healthy riparian area.

Continuous, season-long grazing often removes important riparian vegetation, and may cause streambank erosion and water quality degradation.

A healthy riparian area is key to a healthy stream system. Lush riparian and wetland vegetation along the water's edge will:



Bad riparian area

- **slow** flood flows and reduce erosion and property damage.
- **secure** food and cover for fish, birds, and other wildlife.
- **keep** water cooler in the summer and prevent ice damage in winter.
- **reduce** water pollution by filtering out sediment, chemicals, and nutrients from runoff and groundwater.
- **provide** important breeding habitat for birds and animals.
- **hold** more water in the soil, slowly releasing it for longer-season streamflows and groundwater recharge.



Good riparian area

For Help

The Natural Resources Conservation Service (NRCS) in cooperation with the Missouri Department of Conservation (MDC), and the U.S. Fish and Wildlife Service provides technical and financial assistance to create, enhance, and restore wetlands.

MDC's **Streams for the Future** provides technical and financial assistance for stream corridor improvement including streambank enhancement, tree planting, alternative watering sources, fencing and ponds. For more information, check out MDC's website at mdc.mo.gov/programs/stream.

The **Stream Team Program** is a citizen volunteer program involving litter pick-up, water quality monitoring and general stream corridor management. Call 1-800-781-1989 or look for more information online at mostreamteam.org.

NRCS provides technical assistance through the **Buffer Initiative**, the **Conservation Reserve Program** and **Wetlands Reserve Program**. Look under U.S. Government in your phonebook to find your local NRCS office. You can also find more information online at www.mo.nrcs.usda.gov.





Develop a Grazing Management Plan

Do you have so little grass in your pastures that your animals consume soil while trying to graze? Are your animals chewing on trees, shrubs, fences, or barns? Are your animals losing weight, or are they overweight? Do your animals have scruffy coats? Are your animals prone to colic or respiratory problems?

If you answered “yes” to any of these questions, you need a new grazing program that will provide more grass and healthier animals. It will also save you money with lower feed costs and veterinary expenses.

Grazing Management Produces More Grass

Continuous grazing allows weeds to grow where grass roots have been weakened. A less dense leaf canopy allows sunlight to reach invading weeds. Pasture rotation and good grazing management produce more grass, fewer weeds, and no bare ground.

Forage and Feed

Forage is what your animals consume when grazing pasture. Forage production is measured in animal unit months (AUMs). One AUM is equal to the amount of forage consumed by a 1,000-pound animal in one month.

Feed is the hay and grain you provide the animal when forage is not available, usually December through March. Hay production is measured in tons per acre.

Average Forage and Feeds Requirements*

	Forage AUMs of grazing per month	Feed (hay) Tons per month
Cow	1.2	.4
Horse	1.25	.5
Sheep	.2	.1
Llama	.3	.15
Goat	.2	.1

* Requirements may vary with season, level of use, and the age and size of the animal.

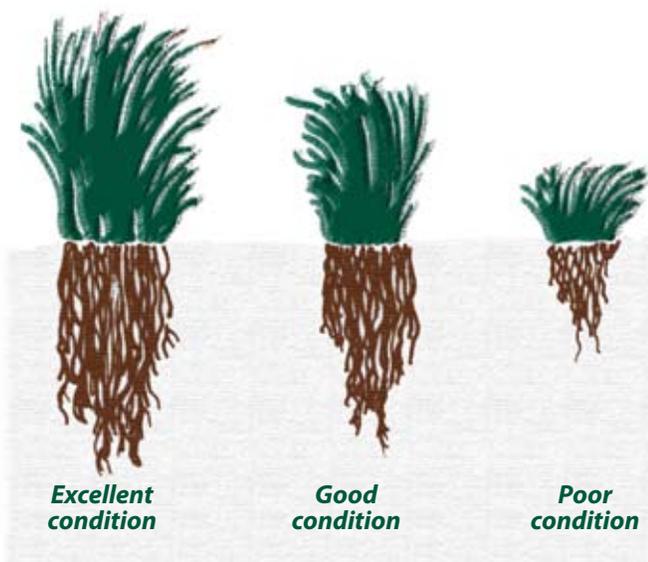
How Grazing Affects Root Growth

Overgrazing occurs when more than 50 percent of the grass plant is removed all at once. Overgrazing stops root growth and reduces grass production.

Look what happens (chart at right) when you try to sneak in another 10 percent harvest — 50 percent of the roots stop growing!

Notice the root mass of the grasses below. The root mass decreases as the condition of the pasture decreases.

Percent of Grass Plant Removed	Percent of Root Growth Stopped
10%	0%
20%	0%
30%	0%
40%	0%
50%	2-4%
60%	50%
70%	78%
80%	100%
90%	100%



Tips for Successful Gra

- Eliminate continuous season-long grazing.
- Subdivide large pastures into smaller pastures (see sample grazing designs, page 15) and develop a pasture-rotation grazing system.
- Normally grazing should begin when plants are 6" to 8" tall. Move livestock after 50 percent (3"-4") of the plant has been removed. At least 20 days is needed between grazing periods in the spring, and between 45 and 60 days in the drier summer periods. If sufficient regrowth has not occurred, remove animals from the pasture, and feed hay to livestock.
- During winter months, continue your rotation to distribute manure and feed wastes evenly across your pastures or hold animals off pasture during non-growing periods.
- Allow long rest periods (45-60 days) or use a high-intensity, short-duration grazing system to rejuvenate poor pasture.
- Provide a water source for each pasture.
- Irrigating pastures after grazing will get plants growing again. To avoid soil compaction, do not graze when soils are wet.
- Horses do not need 24-hour access to feed or forage. Their nutrition needs can be met with only

zing

a few hours of grazing on good pasture each day. Take animals from the pasture for the remainder of the day to prevent trampling of plants and to extend the forage available in your pastures.

- On a limited acreage, you may have only enough pasture to exercise your animals, and you will need to feed them year-round.
- If animals are confined to a corral or lot for a long period of time, these lots should be located so that runoff does not degrade streams.

To avoid overgrazing your pastures each year:

- Buy additional feed or rent pasture.
- Increase your pasture production.
- Improve your grazing management.
- Reduce your number of animals.
- Seek assistance.

For more information, contact your local NRCS or University Extension office.





Grazing Schedules and Systems Guide

Schedules

In Missouri, livestock are normally grazed April through November. The grazing period can be extended by using a variety of cool-season, annual grasses and stockpiled forage.

Some examples of cool-season grasses are:

Annual ryegrass	Smooth bromegrass
Orchardgrass	Reed canarygrass
Perennial ryegrass	Tall fescue
Timothy	

Two-Pasture, One-Herd Switchback System

	Pasture A	Pasture B
March - June	Graze	Rest
July - October	Rest	Graze
November - February	Graze	Rest
March - June	Rest	Graze
July - October	Graze	Rest
November - February	Rest	Graze

Systems

A planned grazing system is a method of utilizing the forage resource to maximize return, while maintaining productivity of the total resource for the long term. Good grazing management aims at managing the soil, water, plants and animals together, so that:

- In the growing period the pasture can produce the maximum amount of high quality forage.
- The forage grown in the growing period is sensibly budgeted and rationed through the non-growing period.
- The nutritional requirements of the animals are adequately met.
- The same pastures are not grazed at the same time year after year.
- There is a minimum of physical handling stress on the animals.

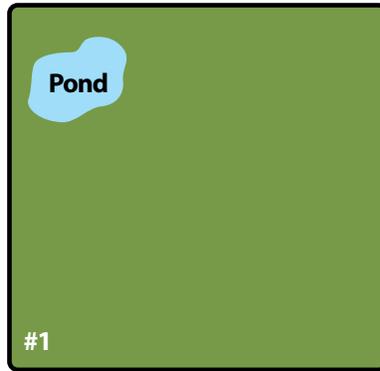
Continuous Grazing

Advantages:

- Less time
- Low initial cost for set-up
- Animals eat choice of plants if not overstocked
- Less management needed

Disadvantages:

- Fewer pounds of beef per acre
- Poor grass utilization
- Less desirable species begin to dominate
- Difficult to maintain legumes
- Difficult to re-establish weakened areas
- Livestock not seen frequently



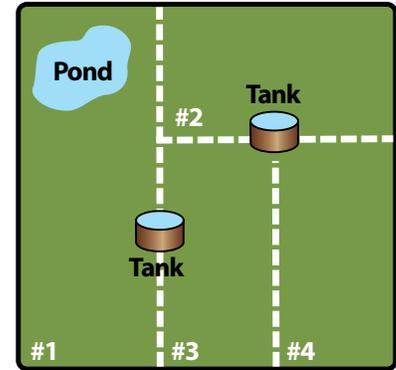
Rotation Grazing (2-5 fields or paddocks)

Advantages:

- Matches grazing to plant growth
- Allows for rest and regrowth
- Increases forage production
- Opportunity for hay production
- Can stockpile forage
- Can begin to maintain legumes

Disadvantages:

- Initial set-up cost is increased
- Requires more labor
- Water sources needed
- Difficult to re-establish weakened areas



Intensive Rotation Grazing (6 or more fields or paddocks)

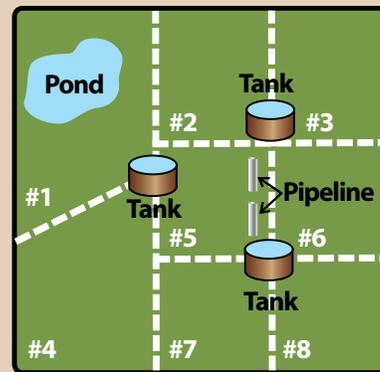
Advantages:

Cross-fencing is based on forage production, not equal-sized fields.

- Optimize forage production
- Optimize pounds of beef per acre
- Livestock are controlled
- Controlled forage utilization
- More uniform grazing

Disadvantages:

- Higher initial set-up cost
- Requires more labor
- Additional water sources



Watering Livestock

An adequate quantity of good quality water is an essential part of your grazing and animal health program. As you divide your acreage into several pastures, you should try to provide water in each pasture. If this is not possible you may need to provide a single water source that is accessible from several pastures. Water should be within 800 feet of grazing livestock. There are several possible livestock water options, and you will need to consider many factors in choosing an alternative. These include:

Spring - The depth to a solid foundation for the spring box; the length, depth and size of the pipe going to the tank; the amount of gravel or concrete around the tank; and the length of drain pipe going from the tank.

Pipeline - Size of pipe needed; location; climate; trench depth; plastic or metal pipe.

Tank - Size; type (open top, covered with concrete and soil).

Ponds - Soil available at site; size of drainage area, and experience of contractor.

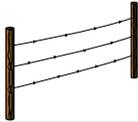
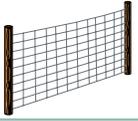
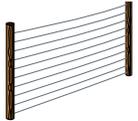
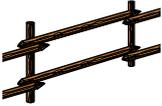
Wells - Depth; size of hole; depth of casing, availability of electricity; size and type of pump.

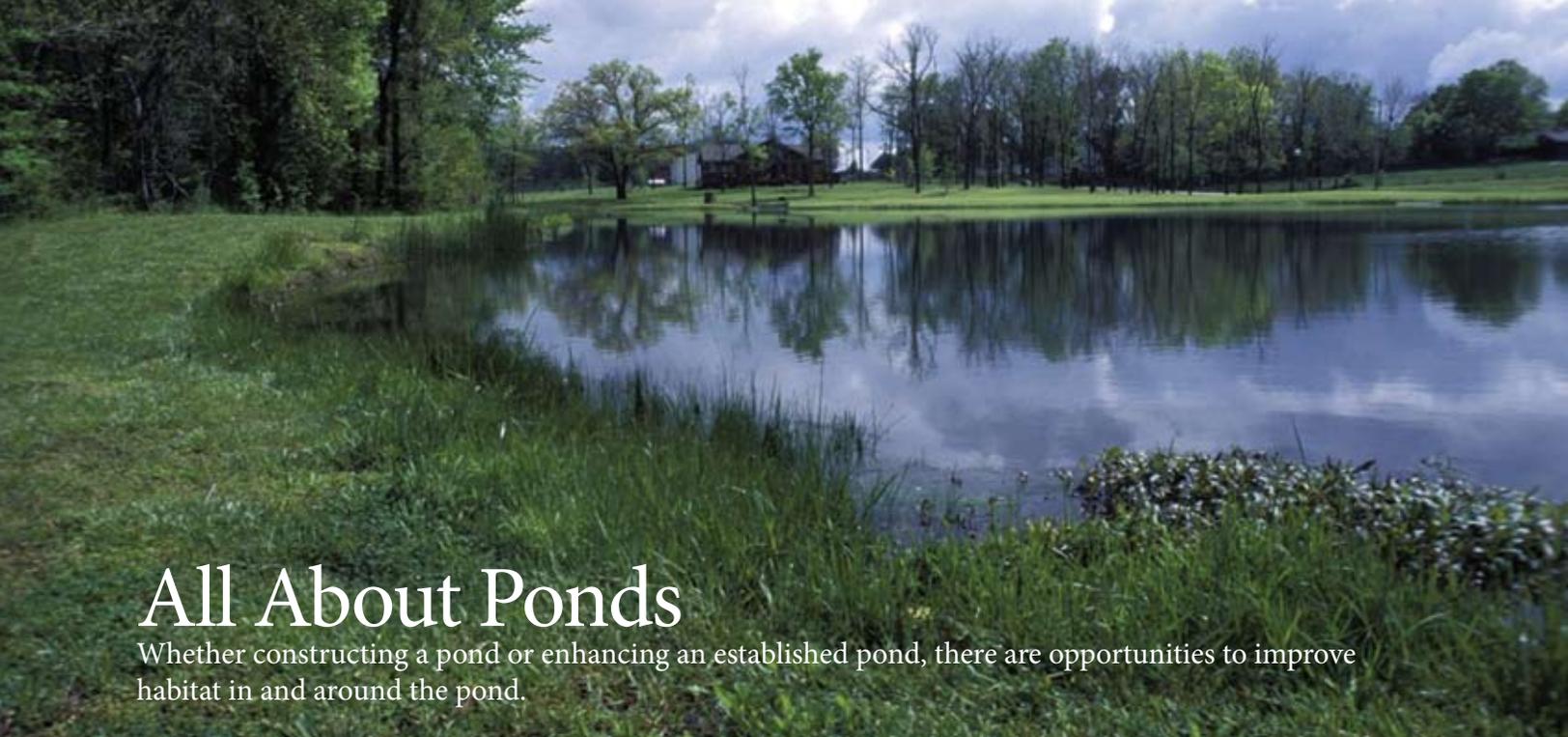
Streams - Water quantity and quality; affect on water quality for downstream users; accessibility; permanency.

Choosing The Right Fence

There are many types of fences. Each has advantages and disadvantages. No single factor determines the best type of fence to use. When selecting a fence, consider:

- Purpose (type of animal you're keeping in or out)
- Soil type (clay, rocky, etc.)
- Terrain (hilly, floodplain, etc.)
- Material and labor costs
- Availability of power
- Maintenance requirements
- Weather
- Visual impact

Type of Fence	Advantages	Disadvantages
 <p>3-Strand Barbed Wire</p>	Good control of cattle. Materials readily available. Construction skill and designs easily attained.	Barbed wire could injure livestock. Labor and material costs high. High maintenance.
 <p>Woven Wire</p>	Good control of most livestock. Materials, skill and design readily available.	Labor and material cost high. Requires maintenance.
 <p>High-Tensile Non-Electric</p>	4-5 strands for cattle and horses. 8-10 strands for large or exotic animals or game. Very durable.	Labor and material cost high. Requires some maintenance.
 <p>High-Tensile Electric</p>	Good livestock control. 1-2 wires for cattle. 2-3 wires for sheep or goats. Cost-effective construction.	Needs solar, battery or electric power source. Quality materials and construction are a must for effective control.
 <p>Temporary Electric</p>	Good for starting intensive grazing, small acreage, or in combination with high-tensile electric to further subdivide pastures. Least expensive.	Some weather poorly. Needs solar, battery or electric power source. High maintenance. May require more labor.
 <p>Post and Rail or Plank and Board</p>	Durable. Attractive. Low maintenance. Can effectively control several classes of livestock if designed properly.	High labor and material costs.



All About Ponds

Whether constructing a pond or enhancing an established pond, there are opportunities to improve habitat in and around the pond.

Building Your Pond

A pond should be at least eight feet deep over an area of approximately 1,000 square feet to ensure a permanent water supply and to support fish.

Consider leaving the bottom irregular, instead of bowl-shaped. Fish prosper when they have places to hide, feed, and reproduce. For ponds built on flatter sloping sites, fill material can be taken so shallow water areas are left in the upper ends of the ponds in order to create shallow water wetlands. Twelve to eighteen inches is ideal. Aquatic plants in the shallow water areas benefit fish by providing cover for smaller fish and living areas for other fish and animals.

Construct islands to provide safe nesting habitat for waterfowl. Leaving trees in the coves, particularly trees with a diameter of 12 inches or greater, provides habitat for fish and wildlife.

Enhancing the Wildlife Habitat In and Around Your Pond

The quality of the water in the pond is very important to supporting a healthy fishery. Grassy or forested watersheds provide good water quality by preventing sediment and nutrients from reaching the pond.

Ungrazed forestland generally provides the best water quality and prolongs the life of the pond.

Trees shading the pond's edge cool the water, providing more dissolved oxygen and healthier fish. Filter strips, trees, and shrubs benefit wildlife in the watershed above the pond.

If the pond will be used to water livestock, a water pipe can be installed through the dam. Then, the pond can be fenced, preventing livestock from entering the pond and contaminating the water.

You can enhance the fishery and wildlife habitat in and around your pond by keeping livestock out, and leaving a 50-foot-wide area of vegetation around the pond.

There are many ways to enhance the fish and wildlife habitat in or around an existing or new pond.



Build brush piles in the pool area to provide shelter and protection for fish. Areas adjacent to the pond should be developed with natural cover and left undisturbed to provide habitat for wildlife. Consider wood duck boxes, Canada goose nesting tubs, bat houses and artificial improvements for birds and other wildlife.

Making Your Property Attractive to Wildlife

As you walk around your property, ask yourself a few questions:

- Are there a variety of vegetation types, such as small grains, tall grasses, shrubs, and trees for food? For cover?
- Is there a pond, stream, or stockwater tank available to wildlife? Do you have a wetland?
- Can wildlife avoid predation from domestic animals, such as cats and dogs?

Wildlife habitat is being lost as more land is subdivided, bringing houses, people, livestock, dogs, cats, and other intrusions. Landowners can help offset this loss of wildlife habitat by growing a diversity of vegetation that provides food and cover for wildlife.

Food requirements will naturally vary by wildlife species, from the seeds and berries required by birds, to the forbs, and shrubs preferred by deer.

Cover is needed to provide wildlife with places to hide from predators, and to provide travel corridors, nesting areas and shelter.

A green lizard with a long tail is resting on a rock. The lizard has a brownish head and neck, and a green body with small white spots. Its tail is long and thin, extending towards the top left of the frame. The rock it is on is dark and textured.

Water on or near your property in the form of a pond, stream, or wetland will increase the variety of wildlife you can attract. Wetlands are protected by law from land management activities that would destroy them or change their function. Wetlands are determined by specific soil, vegetation, and hydrologic characteristics. Contact the NRCS office in your area (www.mo.nrcs.usda.gov) to determine if your wet area is a wetland.

Tips for Creating Wildlife Habitat

- Plant a diversity of vegetation types and heights.
- Plant shelterbelts and fence rows with evergreens and fruit-bearing shrubs.
- Leave snags and downed woody material for perching, hiding, and nesting.
- Plant small grains or large-seeded grasses for wildlife food.
- Develop ponds.

If you have too much wildlife or the wrong kind, contact the Missouri Department of Conservation (www.mdc.mo.gov) or the U.S. Fish and Wildlife Service (www.fws.gov) for help.



Deer

Provide food. Deer browse on trees and shrubs. Leaving openings in the forest will increase small woody shrub growth. In fall and winter, deer utilize crop harvest remains and acorns or other nut production. After feeding, deer look for thickets of shrubs or stands of trees to rest and stay warm.

Provide cover. When deer feed in the open, they typically stay within 600 feet of trees and brush. Consider maintaining large areas of dense shrubs or trees on your property for escaping and shelter, especially near crop areas. Areas of dense timber are cooler in the summer and warmer in the winter than open areas.

Remember, attracting large wildlife may also mean damage to gardens and ornamental plants.

Upland Game Birds

Provide food. Areas of native tall grass, thickets of native shrubs, a variety of grain crops, and a mix of natural forbs provide food and habitat diversity for quail and other upland birds. When harvesting crops, begin cutting from the center of the field outward to flush birds away. Don't worry about water. Birds get moisture from dew and the food they eat.

Provide nesting areas and cover. Plant native tall grass along roadsides and ditch banks, and native shrubs along fencelines or as part of a windbreak to provide nesting and cover. Since game birds nest on the ground in the spring, avoid mowing, burning, or using weed control chemicals on your grass areas until birds are out of the nest in late June. (If mowing is needed, mowing between July 15-August 15 will help protect ground-nesting birds.)



Songbirds

Provide food and water. Trees and shrubs can provide seeds, fruits, and berries that birds like. Streams, ponds, or wetlands can provide water.

Provide nesting areas and cover. Songbirds require a diversity of vegetation heights (tall grass, shrubs, trees) and a variety of foliage densities (evergreen and deciduous trees) for nesting and safety from predators. Perches of different heights, such as old snags, fences, and telephone poles, are used by many birds (from bluebirds to hawks) for resting and searching for food.



Waterfowl

Provide food. Waterfowl like aquatic plants, small insects, snails, and crustaceans. They also feed on grains and forage.

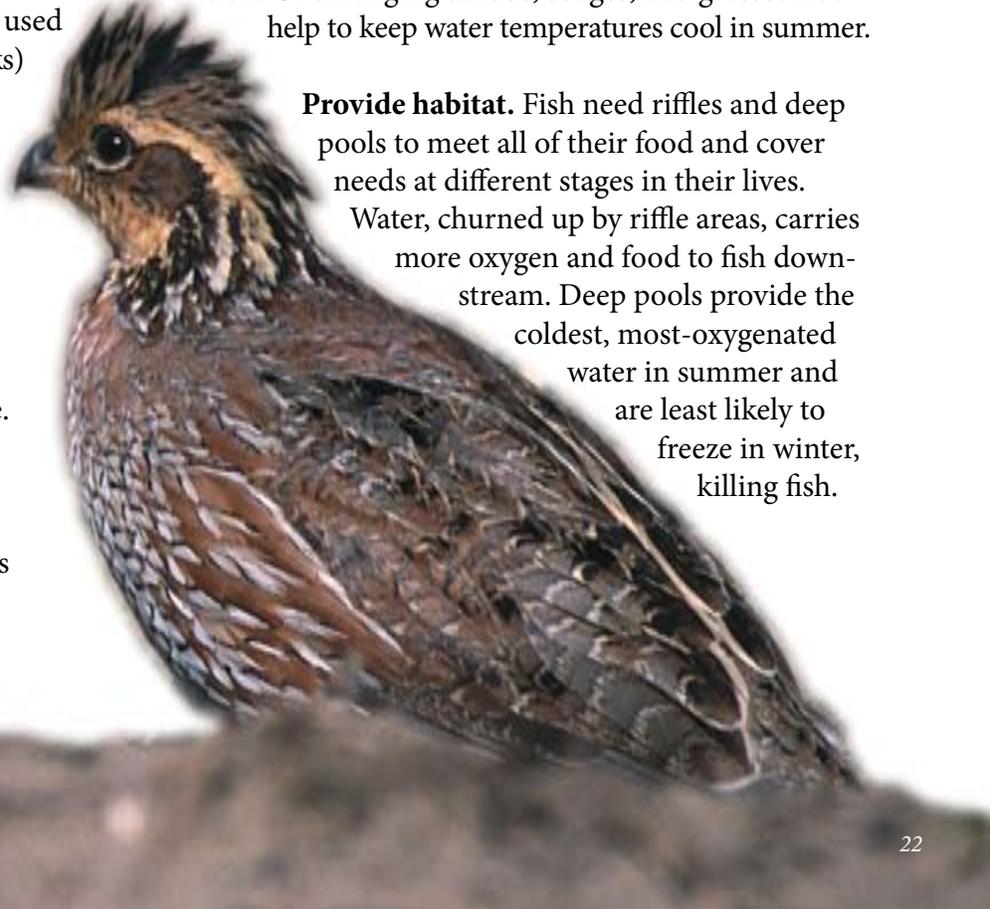
Provide water. Ponds and wetlands are a natural for attracting ducks, geese, and other waterfowl. These areas should have shallow and deeper areas and well-vegetated banks. Vegetated islands are the safest and preferred spots for nesting.

Water 4-18” deep will provide the greatest diversity of vegetation and attract the greatest variety of waterfowl. Areas with control of water levels greatly increases management opportunities.

Stream Fish Habitat

Provide food and cover. In streams, the majority of “fish food” comes from the insects that live in the stream or that fall into the stream from overhanging vegetation. Overhanging shrubs, sedges, and grasses also help to keep water temperatures cool in summer.

Provide habitat. Fish need riffles and deep pools to meet all of their food and cover needs at different stages in their lives. Water, churned up by riffle areas, carries more oxygen and food to fish downstream. Deep pools provide the coldest, most-oxygenated water in summer and are least likely to freeze in winter, killing fish.





Are Your Trees Healthy?

Take a look at the trees around your property. Ask yourself a few questions:

- Are your trees showing signs of insect problems, disease, or animal damage?
- Are your trees spaced too closely together, not allowing sunlight to reach the plants growing on the ground?
- Do you have trees that are all the same age?
- Do you only have one species of tree on your property?

If you answered “yes” to any of these questions, your forest may not be as healthy as it could be. You might need help.

NRCS and local soil and water conservation districts can provide assistance on basic forestry planning.

The Missouri Department of Conservation, Division of Forestry, assists Missouri landowners on detailed forestry management and provides information about the best management practices for forestry.

Private forestry consultants can conduct forest inventories, set up and monitor timber sales, and assist with long-term forest management objectives.

Early Symptoms of Insect and Disease Problems

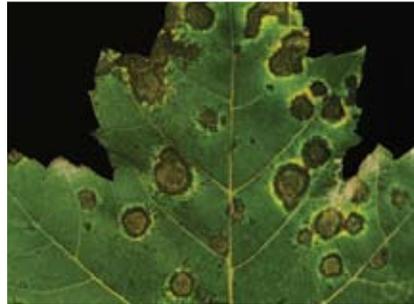
Insects and diseases can pose serious threats to a tree's health. Periodic scouting for problems is essential for early treatment and control. Begin careful analysis as soon as abnormalities are noticed in a tree's appearance or growth. Some or all of the following symptoms may be apparent in trees experiencing insect or disease problems:

Leaves:

- Wilted leaves
- Light greenish-yellow leaves
- Brown leaf margins
- Premature autumn coloration
- Smaller than normal leaves
- Early leaf drop
- Curled or twisted leaves
- Uneven or broken leaf margins

Woody parts:

- Dripping sap or dark stains
- Small circular holes in woody parts
- Little new growth on stems
- Branch dieback
- Conspicuous trunk sprouts
- Black roots



Brown leaf margins



Premature coloration



Feeding aphids



Beetle damage



Stunted twig growth



Caterpillar damage

Tips for a Healthy Forest

- Maintain diverse species and ages of trees.
- Remove insect-damaged and disease-damaged trees as soon as possible.
- Thin trees to improve growth, health, and vigor. Leave healthy, well-formed trees. Favor species with wildlife value.
- When planting trees, select species adapted to your soil, climate, and particular site.
- Prevent browsing by livestock and wildlife.
- Exclude livestock that compact soils and damage trees by browsing or rubbing.



- Leave snags (standing dead trees) and larger downed logs for wildlife and forest nutrient cycling.
- Locate access roads away from streams; avoid soils that rut easily. Seed bare slopes and logging trails promptly to reduce erosion and water pollution.
- When using chemicals, follow label instructions.
- Seek professional consulting forestry help when planning a timber sale to get top dollar, handle the various permits needed, and see that the remaining stand is in good shape when the harvest is over.

Tips for Protecting Your Home From Wildfire

- Maintain at least 30 feet of green lawn or fire-resistant plants around your home.
- Prune the lower branches of trees below 12 feet to remove “ladder fuels” that can cause a ground fire to become a more destructive and harder-to-control crown fire.
- Keep water and fire-fighting tools easy to reach.
- Avoid using wood shakes for roofing.
- Store firewood away from your house.

Tips for Your Yard

Creating a Home for the Birds

You don't need a huge yard or a degree in biology to create a haven for feathered creatures. Follow these tips, and you'll have birds flocking to your yard.

- Include some trees and shrubs, such as evergreens and thorny bushes, that protect birds from natural enemies and provide safe nesting sites.
- Mix annuals and perennials for continuous bloom from April into October. Old varieties may offer more nectar than new hybrids.
- Vary the heights of plant masses. Keep shorter plants in the front so that birds that feed on them can be seen.
- Choose plants that change with the seasons. For instance, an ornamental crabapple tree has crimson buds that open into white blossoms in spring. Berries, just the right size for birds cover the tree in summer, and foliage is orange-red in fall.
- Leave areas open, both to attract wildlife and to provide a better view.
- Help prevent disease by scrubbing birdbaths and feeders at least once a month with a cloth or scouring pad. Do not use detergents or chemicals.
- Give birds a choice of food. For instance, fill one feeder with a mix of millet, corn, and black sunflower seeds; another with crushed sunflower seeds; and another with cracked corn.
- Plant an assortment of trees, shrubs, and flowers that produce fruit, berries, seeds, and nectar.
- Remember hardy native plants and shrubs that can supply shelter and food.



Pests & Weeds

A Basic Concept for Better Gardening

Integrated Pest Management (IPM) was originally developed as a management program for agricultural and horticultural crops, but today it is used successfully on a variety of plants in almost every setting. IPM is a method of managing pests in the garden and landscape by using the least disruptive methods possible.

Components of IPM

Identification - Knowing your plants and identi-

fying potential pests will help you determine the most appropriate management methods.

Monitoring - Monitoring your plants on a regular basis will allow you to keep on top of pest problems before they become serious.

Control Strategies - After you identify a problem, there are many different control measures you can use. Always select the methods that are the least disruptive to the environment.

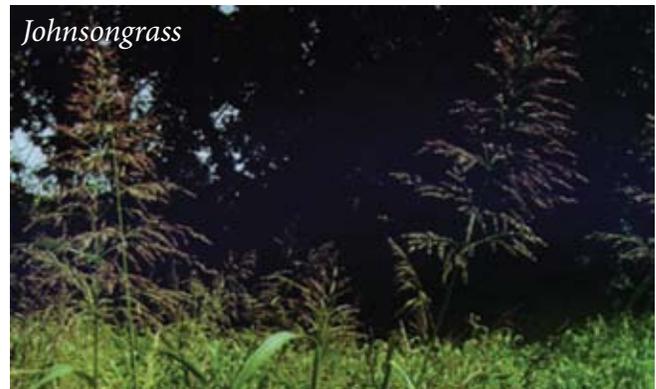


Know Your Weeds

As most of us know, weeds can be difficult to identify. It is important to become familiar with the various types of weeds before they:

- choke out desirable forage for livestock and wildlife.
- reduce the productivity of your pasture or other land.
- cause water pollution and soil erosion. (Weeds are less effective at holding the soil.)
- spread rapidly.

Some common weed types are pictured here, but there are many more. For more information, contact the Missouri Department of Agriculture at (573) 751-2462, or online at www.mda.mo.gov.



A close-up photograph of a green watering can pouring water over a variety of flowers. The water is captured in mid-air, creating a fine mist that glistens in the sunlight. The flowers include purple and yellow blooms in the foreground, and orange and red flowers in the lower right. The background is a soft, out-of-focus green, suggesting a garden setting.

Tips on Watering & Irrigation

How Much Water Do You Need?

If you plan on using a well for your irrigation water, be sure you have enough capacity to adequately water your yard, crops or garden. A rule of thumb is to have seven gallons per minute for every acre to be irrigated. This will vary with system and crop.

If you plan on using pond water, the pond should store enough water to supply at least five inches of water to the irrigated acres. This will vary with system, crop, and your production goals.

If you plan on using a stream for a source of water, be sure the stream has enough flow when irrigation is needed, generally during the middle of summer. Permits may be needed to withdraw irrigation water from certain streams.



Irrigation - When and How Long

Irrigate when the soil moisture drops to about 50 percent of its water-holding capacity in the top foot of soil.

Check your soil moisture by squeezing several handfuls of soil taken at 6" and 12" depths. Irrigate before the soil at 6" begins to crumble in your hand, since most of the plant roots are above 12". Practice irrigation water management. Under-irrigating will limit quantity and quality of your crop; over-irrigating wastes energy, water, and your time. It can also hurt your crop and carry chemicals or fertilizer to surface streams or the groundwater.

In general, irrigate sandy soils for short periods (2-3 hours) on a frequent basis (every 2-3 days) and clay soils for longer periods (9-12 hours) less frequently (every 3-4 days). When it rains, see if the rain has gone deeper than the soil surface before considering it a source of water for your crop.

For more information, request a copy of "Estimating Soil Moisture by Feel and Appearance," from your local NRCS field office, or online at landcare.sc.egov.usda.gov.

Composting

Good gardeners have known for centuries how the end result of composting a brown fluffy material called humus can benefit the soil. It is also a process that can help solve the environmental dilemma of overflowing landfills.

All organic materials, over time, will break down when exposed to microorganisms. In nature, humus is generated at the rate of about an inch a century. You can achieve this much faster.

You can make compost in one or two years by piling weeds, grass clippings, leaves and some kitchen scraps in a corner of the garden. However, you can get humus in as few as three to eight weeks if you help things along.

First, slightly till the ground in a 4'x4' space. This exposes the soil to essential microorganisms. If you wish to enclose the area, use wood, concrete blocks or wire, making sure you leave air spaces on the sides. The gaps will help the oxygen-loving microorganisms survive and multiply. There are also several commercial composting bins available that work just as well.

As layers of organic debris are added to the compost pile (shredded materials break down faster) it is a good idea to add soil occasionally to add more microorganisms. You can also buy products containing them to speed up the process.

Keep the pile moist, but not soggy. It won't break down if it is allowed to dry out. Use a pitchfork or other tool to turn the pile occasionally, but not more than once a week. This mixes and moistens the debris and supplies more oxygen to the microorganisms.

The compost heats up and it breaks down, and the pile will shrink to a fraction of its original size. The heat can become so intense it will kill bacteria and weed seeds. You'll know it's ready when the nutrient-rich humus is dark and has an earthy smell. Add this to the soil in your garden, landscaping, or any place you need an organic-rich mixture.

Tips On Where to Go for Help

It can be confusing when you begin to look for help with questions about your land and its management. A good place to start is with your local soil and water conservation district office where the U.S. Department of Agriculture has Natural Resources Conservation Service employees. You can find these offices in the phone book under U.S. Government, Department of Agriculture, or on the web at www.mo.nrcs.usda.gov.

The University of Missouri has staff located throughout the state under their University Extension efforts. You can find these offices in the phone book under University of Missouri Extension Office or online at www.extension.missouri.edu.

The Missouri Department of Conservation (MDC) also has a variety of offices and specialists scattered throughout the state. You can find these offices in the phone book under Missouri Department of Conservation or online at www.conserva.state.mo.us.



Common Conservation Issues and Contact Information

Protection of streambed and banks

You must have a permit before doing any activity that modifies a stream channel or streambanks.

Contact:

- Your county Soil and Water Conservation District listed in the phone book under county government or online at www.nacdnet.org.
- U.S. Army Corps of Engineers, online at www.usace.army.mil

Floodplain protection

In many areas of Missouri, you must obtain a permit before doing any construction work in an area that would be inundated in a 100-year flood. Find out if you are in a floodplain.

Contact:

- Your County Engineer listed in the phone book under county government.

Control of certain weeds

All Missouri counties have laws requiring you to control certain weeds. Find out which weeds are noxious in your county and how best to control them.

Contact:

- Missouri Department of Agriculture, (573) 751-2462, or online at **www.mda.mo.gov**.

Septic system installation

County health departments regulate septic system installation, including the minimum acceptable distance between your septic system and drinking wells, streams, and groundwater. Counties also approve the septic system design, capacity, and type of soil used to treat your wastes.

Contact:

- Your County Health Department or Planning Office listed in the phone book under county government.

City/county zoning questions

Before building anything on your property, contact your city (if you are within city limits) or your county planning office to obtain a zoning compliance permit.

Contact:

- Your City or County Planning Office listed in the phone book under city or county government.

Water quality protection

You are responsible for preventing livestock manure, pesticides, sediment and other pollutants from reaching waterways.

Contact:

- Missouri Department of Natural Resources, (573)-751-4932, or online at **www.dnr.state.mo.us**

Wetlands protection

You must have a permit to fill, drain, or dredge any waters of the United States, including wetlands. Find out if you have a wetland on your property.

Contact:

- USDA Natural Resources Conservation Service field office, in the phone book under U.S. Government, Department of Agriculture, or on the web at **www.mo.nrcs.usda.gov**.
- U.S. Army Corps of Engineers, online at **www.usace.army.mil**

Other land and water protection measures

Find out if your city or county has special ordinances, such as a sediment and erosion control ordinance, that limit erosion resulting from construction, timber harvest, farming, etc., or an aquifer protection ordinance that protects drinking water wells from contamination, or any type of ordinance that may affect your proposed activity.

Contact:

- Your City or County Planning Office listed in the phone book under city or county government.
- Your county Soil and Water Conservation District listed in the phone book under county government or online at www.nacdnet.org.

Air quality protection

Counties determine the best time of year for open burning to minimize deterioration of local air quality, and may restrict the use of wood stoves and fireplaces.

Contact:

- Missouri Department of Natural Resources, (573)-751-4932, or online at www.dnr.state.mo.us

Grazing

Adjacent landowners are equally responsible to maintain the fences between them. As a general rule, fence your property to keep range livestock out and your animals in. It is unlawful for dogs

and other predators to harass, kill, or wound cattle, horses, sheep and other livestock.

Contact:

- Your County Commission listed in the phone book under city or county government.

Backyard wildlife habitat and controlling unwanted wildlife

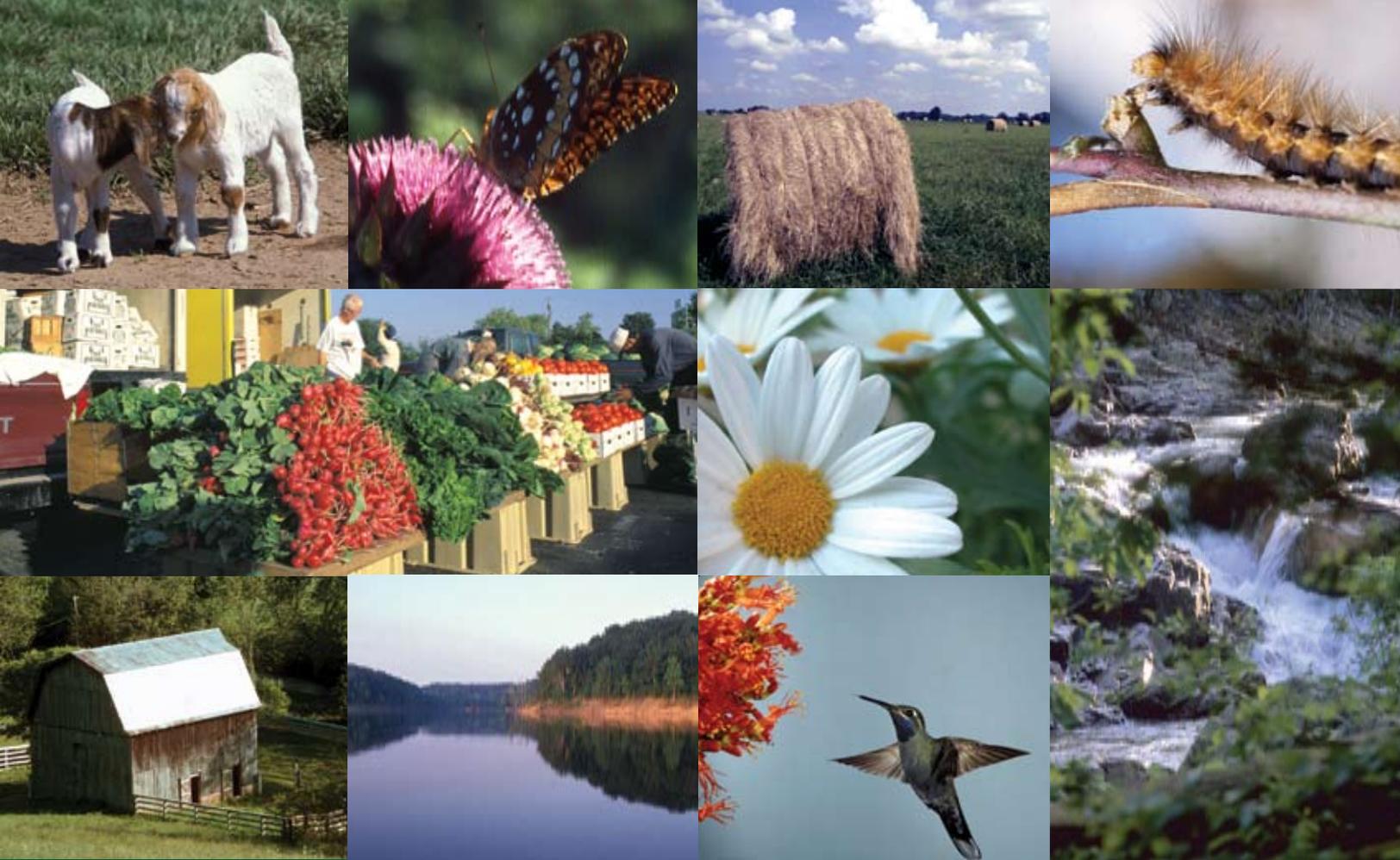
Contact:

- Missouri Department of Conservation, listed in the phone book under state government or online at www.conservation.state.mo.us.
- U.S. Fish and Wildlife Service, listed in the phone book under U.S. Government, Department of the Interior, or online at www.fws.gov.

Trees, urban forestry and horticulture issues

Contact:

- The University of Missouri Extension office, in the phone book under University of Missouri or online at www.extension.missouri.edu.
- USDA Forest Service, in the phone book under U.S. Government, Department of Agriculture, or online at www.fs.fed.us
- Missouri State Forester, Missouri Department of Conservation, listed in the phone book under state government or online at www.conservation.state.mo.us.



This publication was produced and printed by:
 USDA Natural Resources Conservation Service
 601 Business Loop 70 West, Suite 250
 Columbia, MO 65203
<http://www.mo.nrcs.usda.gov>



The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



***Helping People Help the Land
in Missouri***

