

WILDLIFE HABITAT MANAGEMENT FOR ARKANSAS LANDOWNERS

MP483



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■ Introduction

Whether you own five or five thousand acres, implementing a few habitat improvements on your property can help wildlife. This handbook introduces ideas for improving your land for wildlife and provides sources for additional information. Some habitat practices are fairly simple while others require contacting a private lands biologist, forester, Extension agent, district conservationist or other professional for assistance (Figure 1). Contact information for assistance and additional resources are listed at the end of this handbook.



Figure 1. Your local county Extension agent can suggest soil amendments based on a soil test, herbicide recommendations to control invasive plants and other methods to improve wildlife habitat on your property. *Photo by Kevin Quinn, University of Arkansas Division of Agriculture.*

For many landowners, the most difficult part of improving wildlife habitat on your property is getting started. The key is to begin with a few habitat improvements and add a few more each year. Improving habitat is just one component of a wildlife management plan. A wildlife management plan also includes population management and harvest strategies if managing game species. Having a plan will help make the best use of your land for wildlife while avoiding mistakes.

Wildlife management is both an art and science. The “science” in this booklet is based on years of research about species and habitats. The “art” is figuring out what works best on your particular piece of land, which may take months, years or even a lifetime to determine.

■ Preparing a Wildlife Management Plan

A wildlife management plan will improve your chances of increasing wildlife on your property. A management plan outlines a course of action so that good habitat is created and not inadvertently destroyed. A plan will also identify a sequence for implementing habitat practices to maximize efficiency and produce the best outcomes for wildlife. Management plans are not static – they are working documents that can change depending on plant responses to your practices, wildlife usage, economic costs, seed availability, weather conditions and other factors.

A management plan will help match habitat to the needs of wildlife species you want to encourage. Often it is useful to target your plan toward specific species or feature species. Those habitat practices which benefit a feature species will also benefit a variety of other wildlife requiring similar habitat. Conversely, some habitat practices may reduce or harm habitat for other wildlife. It is important to recognize what you are “giving up.” A simple example is creating small openings of < 5 acres in a mature oak forest. Openings may benefit turkey and foxes but reduce habitat for woodpeckers and gray squirrels. These tradeoffs need to be considered carefully before implementing any management plan.

A map (Figure 2) aides in identifying where habitat improvements are needed on your property. The size and arrangement of newly created habitat affects species responses. Cottontails do well in habitat consisting of clovers and native forbs, native warm-season grasses, blackberry thickets and brushpiles in areas of one to five acres. Bobwhites also use this habitat, but additionally they need shrubby areas, woodlands and old fields located within 40 to 80 acres. As such, the landowner needs to visualize the location of current and future habitat on a map. Some habitats require periodic maintenance such as burning or mowing every one to three years



Figure 2. Mapping your habitat will help identify areas needing improvement.

to keep grasslands in an early successional stage. The sequence of when these disturbances occur should be written in the plan and labeled on the map.

In summary, a good management plan contains the following:

- A clear set of *objectives* identifying the feature species with measurements of success. For example, a good objective would be: “Increase the number of nesting eastern bluebirds on the property.”
- A *description of the area* including its location, number of acres, soil type(s), land use, vegetative cover and current wildlife populations.
- A description of *habitat requirements* for the feature species. For example, eastern bluebirds are cavity nesters, so they require snags or artificial nesting structures. Bluebirds thrive on the edge of open areas including old fields, pastures, yards and utility right-of-ways. These open areas should harbor plenty of insects (their food source) with limited pesticide use and be located near scattered areas of hardwoods.
- A *plan of action* for implementing the habitat practices. Use a sketch map or mark on an aerial photograph to illustrate where your

habitat practices will be implemented. Aerial photographs of your property are available at no charge from the Natural Resources Conservation Service (<http://offices.sc.egov.usda.gov/locator/app>). Aerial photos are also available on the internet through the Spatial Analysis Laboratory at the University of Arkansas at Monticello (<http://sal.uamont.edu/>) or Geostor (<http://www.geostor.arkansas.gov>) or private companies such as TerraServer (<http://terraserver-usa.com/>) and Google Earth (<http://earth.google.com/>).

- A way to *assess* your success and know when your objectives have been achieved. For example, “Records will be kept of the number of bluebirds nesting in nest boxes, the number of eggs laid and the number of fledglings.”
- A *budget*. Determine how much you are willing to spend. Include costs for supplies such as tree saplings or lumber for building bird houses, equipment, fuel, labor or professional services.

Think strategically about habitat needs for species with home ranges larger than your property size, such as white-tailed deer or migratory songbirds. Use aerial maps to determine what habitat is lacking in your area. Develop a plan to provide the limiting habitat and attract wildlife onto your property.

■ Habitat Practices

Whether you own cropland, grassland, woodland, idle areas, wetlands or a combination of these, implementing the practices outlined in this handbook can dramatically improve wildlife habitat and ultimately the number of wildlife species on your land. Selecting the correct habitat practices for your property is a big decision. The suitability of a particular habitat practice depends on your current land use and soil capabilities. It also depends on how much time and financial resources you are willing to invest. Again, start with a few practices and plan to expand or add a few practices each year. Learn what works and doesn’t work on your property by keeping good records.

Cropland Management

Minor changes in an area's crops can have a major effect on wildlife numbers. This section discusses management practices for crop fields and adjacent areas that are practical, profitable and beneficial to wildlife.

Conservation Tillage

Many land managers consider conservation tillage to be the most promising single practice for reducing soil erosion. It is also very beneficial for wildlife, especially bobwhites and upland songbirds. Conservation tillage is a broad term that refers to several tillage methods that maintain crop residue – stubble, grain and other plant seeds – on the field surface. These tillage methods control erosion, conserve soil moisture and increase organic matter, resulting in better field soil conditions. Studies have shown that conservation tillage fields can have yields that equal or exceed conventional tillage fields. In addition, production costs are less for conservation tillage systems.

Residues from conservation tillage provide both food and cover for wildlife (Figure 3). In particular, waste grain and weed seeds left after harvesting are staple foods for wildlife in winter.



Figure 3. Residue from this corn crop will reduce soil erosion and benefit wildlife. Photo by Jeff Vanuga, USDA Natural Resources Conservation Service.

Rather than burning rice stubble, roll the stubble and catch rainfall to control red rice and other weed seeds. This practice causes red rice to germinate and then be killed by frost before the seed is mature. Catching rainwater and/or flooding fields can encourage use by ducks, which eat large quantities of red rice seed. Studies show heavy duck feeding during winter reduces the number of red and white rice grains on and in the soil by 97 percent. Rice fields can be managed to attract waterbirds to red rice-infested fields immediately after rice harvest in the late summer or fall until late February.

Currently, conservation tillage methods dictate an increase in pesticide use. Proper application of these pesticides will reduce both production costs and hazards to the environment. However, many wildlife species rely on insects as a food source. For example, insects are an important food source during the critical early-life stages for bobwhite chicks and turkey poults in the spring. Set aside bugging areas (areas where no pesticides are applied) for these species in locations which won't impact crop production.

Crop Rotation

Crop rotation is simply planting different crops in the same field from year to year. Long-term rotation means planting three or four different crops before returning to the original crop. These practices increase the health of the cropping system and add plant diversity to the land.

Continuous cropping means that the crops in a field do not change each year. Crop disease experts report that the highest risk for crop diseases results from continuous cropping. Insect problems are also more prevalent under this system, so more pesticides are needed. Most corn and soybean diseases and associated pests can be controlled by a simple crop rotation.

Legumes are always a good choice – and often a necessity – for rotation because they add nitrogen to the soil and reduce fertilizer requirements for next season's crop. Legumes also make ideal wildlife nesting cover and food if mowing is delayed until after July 15. Clovers and vetch can be seeded into row crops after the last

cultivation to reduce erosion, add nitrogen and provide wildlife cover during the winter. Or consider planting a week or few days before crop harvest so that clover and vetch can germinate and grow without the risk of being shaded out by the crop.

Small grain crops, such as wheat and oats, provide food and nesting cover for a variety of wildlife species. The stubble of these crops, cut high and left undisturbed, makes excellent brood-rearing habitat for bobwhites. The seeds of annual plants associated with small grain stubble provide food for wildlife.

Contour Strip Cropping

Contour strip cropping is when row crops are planted in strips along the natural contour of the slope and next to a grass strip. Contour strip cropping provides erosion control and plant diversity. These strips of grass, legumes or small grains act as filters that trap sediment and slow water runoff. The strip width is dictated by the severity of the erosion problem and the slope of the field. Where erosion is severe, permanent grass strips can be maintained. A native grass/legume mixture can be planted that is beneficial to wildlife. In some years, the seed and hay harvested from these strips can produce more income per acre than the adjacent row crops. Avoid using fescue, bermudagrass or bahiagrass as these have minimal wildlife value.

Strips seeded to grass/legume mixtures serve as travel lanes and cover for wildlife and hunting lanes for rodent-consuming barn owls. These strips also provide nesting and roosting cover and, if possible, should not be mowed until mid-July or later.

Field Borders and Turn-Rows

Field borders can be seeded to grass/legume mixtures that are attractive to wildlife. When planted around crop fields, native warm-season grasses such as big bluestem and switchgrass serve as valuable nesting, brood-rearing and concealment cover for wildlife. These warm-season grasses may be hayed after mid-July when adjacent crops provide cover.

Turn-rows planted to a grass/legume mixture will help control soil erosion, provide space to turn equipment and serve as a roadway along the edge of the field. Native grass/legume borders also provide cover for ground-nesting birds such as meadowlarks and bobwhites. These areas should be mowed at two-year intervals to prevent woody sprout invasion. Mowing should be done in mid-July or later after the peak of the nesting season. If noxious weeds are not a problem, you may consider allowing turn-rows to grow native vegetation. These can be mowed or disked on a two- or three-year rotation to control woody plants and provide a diverse food source for wildlife.

Fallow Fields

Fallow fields are crop fields which lie idle during part or all of the growing season. Every year thousands of acres of idled cropland in Arkansas are available for wildlife habitat. These fallow fields can provide wildlife with the old-field weeds and grasses they need for food and cover.

Buffer Strips/Grassed Waterways

Buffer strips or grassed waterways may be used as outlets for water collected from croplands or terrace systems built on farmlands to control erosion. These waterways vary in size according to the size of the drainage area and are seeded to perennial grasses, legumes or both.

A grassed waterway is helpful in all applications where active cropping is disturbing the soil regularly. In many cases a wooded draw may function as an excellent water outlet for terraces or cropland if it is not actively eroding. In addition, wooded draws can provide critical cover for wildlife.

Most native warm-season grasses can be planted on grassed waterways to help control erosion, provide wildlife cover and produce high-quality hay. Mow after the peak of bobwhite and upland songbird nesting and brooding season which ends about mid-July or later. This delay in mowing will ensure ground-nesting birds and mammals are spared.

Field Shelterbelts, Windbreaks and Fencerows

Trees planted as windbreaks can reduce wind velocities on their downwind side for distances up to 10 to 20 times the height of the trees, depending upon the species and density. Hardwood or deciduous trees, which shed their leaves in the fall, are not as effective as evergreens for winter protection. Their bare limbs will reduce wind velocities and offer some amount of protection, however. Field windbreaks reduce soil erosion, conserve soil moisture and provide food and cover for wildlife.

Woody fencerows next to crop fields or pastures (Figure 4) provide many of the same benefits as windbreaks. Natural woody fencerows can be encouraged by not spraying or mowing next to the fence. When protected from clipping, fencerows can develop into natural travel lanes for wildlife. Plant clumps of trees and shrubs or spread seeds of vines and shrubs along fencerows to encourage plant growth.



Figure 4. A brushy fencerow provides travel and escape cover for cottontails, songbirds and bobwhites. Photo by Tom Jacobs.

Wildlife-Friendly Tips for Cropland Management

- Implement conservation tillage systems whenever feasible and practical.
- Leave unplowed borders or strips during spring plowing, or plant a cover to wheat or oats on the plowed land in the fall.
- Minimize chemical applications.
- Rotate crops to include forage and small grains.
- Use winter cover crops for green browse, erosion control and wildlife cover.
- Plant native grass/legume border strips around all or a portion of crop fields.
- Disk strips at two- to three-year intervals (or up to five years if growth is slow) to control woody vegetation. (Figure 5)

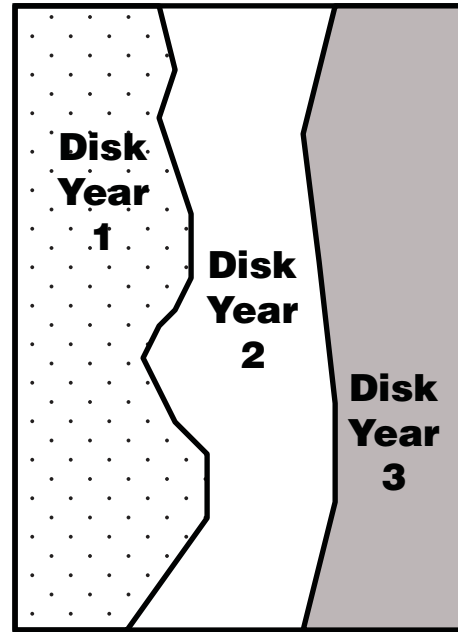


Figure 5. Rotational strip disking provides wildlife a diversity of plants for food and cover.

- Allow shallow draws to re-vegetate naturally, or plant warm-season grasses or a grass/legume mixture. Delay mowing until after July 15 to avoid nesting losses and reduce newborn fawn mortality.
- Seed waterways to native grass/legume mixtures that are beneficial to wildlife. Delay mowing until after the peak of the nesting and brooding season (July 15 or later) to protect nesting wildlife and reduce fawn mortality.
- Establish filter strips of native grasses and shrubs around ponds in crop fields to reduce sedimentation and add wildlife cover.
- Establish or protect woody draws and fencerows.
- Leave at least one-quarter acre of grain crops unharvested for each 40 acres of crop field. Leave crops in patches or strips near cover.

- Plant no-till beans in wheat stubble, and don't burn the stubble.
- Roll rice stubble and catch rainfall or flood starting immediately after rice harvest and hold water until the end of February each year.

Cropland Review

The following questions will help evaluate your current management and its benefits for wildlife. Ideally, you should answer "yes" to every question.

- 1 Do you currently use conservation tillage methods such as crop rotation, no-till and contour cropping? *Conservation tillage residues provide both food and cover for wildlife.*
- 2 Do you perform land improvements for wildlife on fallow fields? *These areas can easily be enhanced for wildlife habitat.*
- 3 During harvest, do you leave a row or two of grain at the field edge? *This standing grain provides food and cover for wildlife during winter months.*
- 4 Do you avoid heavy pesticide or herbicide applications? *When applied in excess of label directions, pesticides and herbicides may eliminate important wildlife food sources by destroying weed seeds and insects in noncrop areas.*
- 5 Are your farm's field draws and waterways vegetated with native plants to prevent erosion and sedimentation? *These areas can be planted in vegetation favorable to bird and nongame wildlife nesting and foraging.*

Grassland Management

Grasslands provide many kinds of wildlife with food and cover. The grasshopper sparrow and meadowlark are open grassland nesters. Cottontails, bobwhites and turkeys also nest in grasslands but prefer areas near woods or brush (Figure 6). Grasslands also control soil erosion.



Figure 6. Warm-season grasses provide cover for many wildlife species including songbirds and deer.
Photo by John J. Mosesso, courtesy of life.nbii.gov.

Few native grasslands exist in Arkansas except for a small number of unplowed prairie remnants scattered over the state. Assistance for maintaining or establishing prairies is available from the Arkansas Natural Heritage Commission, Arkansas Game and Fish Commission and The Nature Conservancy.

A pasture is a type of grassland which is used to graze livestock. Pastures can be divided into cool-season and warm-season pastures. Cool-season pastures contain grasses such as orchard-grass, fescue and legumes such as white clover. Warm-season pastures contain grasses such as Indiangrass, bluestem, switchgrass, bermudagrass and bahiagrass.

Cool-Season Grasses. Cool-season grasses begin growth early in the spring when the soil temperature rises above 40 degrees. Their growth slows during the warmest part of summer when the soil temperature reaches 78 degrees and resumes as the soil cools in the fall. Cool-season grasses are popular with farmers because they are easy to establish and respond to heavy fertilization. Most continue to be productive, but endophyte-infested tall fescue can be detrimental to certain animals. Studies have shown that fungus-infected fescue can cause sickness and low conception rates in livestock, cottontails and other small animals. Endophyte-free varieties of grasses have been developed, but a better alternative from a wildlife standpoint is to replace fescue with native warm- and cool-season grasses. An Extension agent or private lands biologist can provide recommendations on converting fescue to native grasses which will benefit both wildlife and cattle.

Cool-season grasses are usually grazed to 2 to 4 inches. Grazing below this height will result in lower production, increased soil erosion and less wildlife use. These grasses are normally at peak quality and ready for cutting during the nesting season. If possible, leave grasses near the edge of the field. Raise the cutting height to around 6 to 12 inches to reduce disturbance to ground-nesting wildlife.

Warm-Season Grasses. Many landowners are rediscovering native warm-season grasses and their value to forage systems. Grasses such as switchgrass, native bluestem and Indian-grass provide cover for wildlife. Tall fescue, bermudagrass and bahiagrass are non-native, sod-forming grasses with limited value to wildlife. Native clump grasses are better suited for small bobwhite and turkey chicks which require travel lanes for feeding and retreating to escape cover. When the soil reaches about 60 degrees in the spring, the warm-season grasses begin growing. They grow best during the warmest months of the year when the soil is about 90 degrees. Although warm-season grasses have a shorter growing season, they make more efficient use of water and soil nutrients – nitrogen, phosphorus and potassium – than do other grasses. Native warm-season grasses are not as productive as cool-season grasses, but they also require less fertilizer. In new warm-season grass plantings, legumes may be overseeded during the second year or after the grasses have become established.

The earliest that native warm-season grasses should be grazed is mid-summer after most ground-nesting wildlife have hatched their broods. A pasture should be grazed no closer than 8 inches. Warm-season grasses should be cut for hay in mid-July or later after most broods have hatched. Grasses should not be cut closer than 6 inches to allow for rapid re-growth. The re-growth should not be grazed, nor should a second cutting be taken. A second cutting will reduce plant vigor, weaken the stand and eliminate important winter cover and spring-nesting cover.

Management is usually necessary to keep grasslands productive. When grasslands are left idle, forage production is reduced as ground litter builds up. Unmanaged grasslands can produce an abundance of rodents which provide

food for many mammal and bird predators, including screech owls, barn owls, red-tailed hawks, bobcats and coyotes.

Six methods commonly used in grassland management are grazing, haying, fertilizing, overseeding with legumes, prescribed burning and converting to native forbs and grasses.

Grazing

Grazing affects the plants and soil in pastures and consequently affects wildlife. Livestock are selective about the plants they eat. They tend to graze some plants repeatedly and ignore others. This may weaken the more desirable plants and allow unwanted plants to thrive and multiply. Proper grazing management involves keeping desirable plants healthy so stands are adequate to support livestock and benefit wildlife (Figure 7). Stocking rates are adjusted to avoid overgrazing and damaging grasslands.



Figure 7. Arkansas cattle grazing on the left side of the fence will be moved to the other side in a rotational grazing schedule. Photo by Jeff Vanuga, USDA Natural Resources Conservation Service.

Grazing can be continuous or rotational. Continuous grazing occurs when all animals are placed in one pasture and allowed to selectively graze. Rotational grazing may be as simple as switching livestock between two pastures or moving livestock frequently among several pastures.

Continuous grazing reduces forage production and eliminates wildlife cover and food. Nearly all pastures have areas where livestock concentrate, such as around water, bedding grounds and feeding areas, resulting in

pasture deterioration. Trampling destroys wildlife nests. Years of continuous overgrazing can change a grassland into a brushy area where undesirable plants predominate. Continually overgrazed grasslands will produce less forage each year. When land is rested – left idle between grazing periods – plant vigor increases, giving desirable plants a chance to grow and multiply. This gradually increases the number of high-quality plants per acre. Improved grass increases livestock production, enhances wildlife food and cover, reduces soil erosion and conserves water. More livestock can be pastured together when using rotational grazing. With advance planning, grazing occurs when forages are at peak production, maximum protein content and palatability. It also encourages growth of legumes (such as clovers) and allows wildlife nests to survive. If you are unfamiliar with rotational grazing operations, ask your local county Extension agent or district conservationist for advice on developing a rotational grazing plan for your pastures.

Hay-Cutting

Haying has a dramatic impact on both the landscape and wildlife. With the ground left barren, wildlife are vulnerable to predation and must move to adjacent areas for cover. Haying should be timed so that yields and quality are optimum with wildlife in mind. Cutting too early may reduce production, but cutting too late will not allow grasses to replenish their root reserves before winter and weakens a stand of grass. Wildlife cover is also reduced from lack of re-growth. Cutting height affects the speed of re-growth. Clipping too low will remove the point on the grass stem where new growth occurs, and re-growth will be slowed. For optimum wildlife production, haying and mowing should be delayed until after July 15. However, this practice will likely reduce hay quality on the first cutting. An alternative is to cut only hay that is needed for livestock or to sell and leave the rest around the edges of the field. This will save fuel and labor costs spent for harvesting hay while providing benefits for wildlife.

Fertilizing and Liming

Wildlife are attracted to healthy plants that contain ample nutrients from fertilizers, whether these plants are native or agricultural plantings. Adding fertilizer and lime to the soil can also

increase forage production. Fertilizer and agricultural limestone should be added to soils only if needed as determined by a soil test. If you are unfamiliar with soil tests, ask your local Extension agent or district conservationist for advice about collecting samples and interpreting reports. Take precautions to prevent fertilizer from entering streams and ponds. This includes planting buffers of grass, shrubs and /or trees along banks.

Overseeding With Legumes

Plant a mixture of warm-season grasses, cool-season grasses and forbs to provide habitat components for wildlife species throughout the year. Avoid establishing hayfields and pastures with only a single species of grass. Establish legumes in cool-season pastures for added benefits to livestock and wildlife. Legumes such as clovers produce nitrogen, an element which improves plant growth. Therefore, growing legumes with grasses can be more profitable than growing grasses alone.

The success of overseeding an established pasture with legumes will vary. Consult your county Extension agent or district conservationist for current recommendations on legume varieties, seeding dates and methods.

Prescribed Burning

Prescribed burning (Figure 8) is one of the most beneficial practices for improving wildlife habitat; however, its application is often limited where soil erosion, safety and legal aspects are of



Figure 8. A newly burned field provides bugging areas for bobwhites, turkey and songbirds and stimulates new plant growth. Photo by Jeff Vanuga, USDA Natural Resources Conservation Service.

consideration. Prescribed burning is an important practice for establishing and maintaining native grasses and remnant prairies when used under the right conditions at the correct time. It can also be useful for regenerating hardwoods and improving pine plantations. Fire releases nutrients, controls ground litter and some unwanted plants, stimulates seed production and helps improve plant diversity within grasslands. For further information about prescribed burning, contact a county forester or private lands biologist.

Converting to Native Grasses and Forbs

Sometimes planting is an option for re-establishing native prairie grasses along with prescribed burning. A soils map will guide you to the best locations for plantings. A detailed soils map of your area is available from the Natural Resources Conservation Service, or a web soil survey is available on the internet at <http://websoilsurvey.nrcs.usda.gov/app/>. Soil that is less suitable for agriculture crops can grow valuable wildlife plants. Taking a soil test can help determine the types of plants most suitable for your area. Note that soil amendments are not recommended for establishing native grasses, as other non-native grasses may outcompete them. Soil amendments may be added later after native grasses are established and non-natives are no longer present. Contact your county Extension agent or private lands biologist for methods to convert fescue, bermudagrass and bahiagrass to native warm-season grasses.

Brushy Fencerows and Thickets

Fencerows next to grasslands or pastures provide food and cover for wildlife. Natural woody fencerows can be encouraged by not spraying or mowing next to the fence. When protected from grazing and clipping, fencerows can develop into natural travel lanes for wildlife. Songbirds which perch on fences will deposit consumed seeds that have passed through their digestive systems. Planting clumps of trees and shrubs or spreading seeds of vines and shrubs along fencerows can help establish plantings more quickly.

In large fields or along right-of-ways, thickets of shrubs (Figure 9) such as blackberries or wild plum afford cover for cottontails, songbirds and



Figure 9. Thickets of brushy cover such as along this railroad track (after an ice storm) improve habitat availability and offer bobwhites and cottontails protection from predators. *Photo by Kevin Quinn, University of Arkansas Division of Agriculture.*

bobwhites. In open fields, these clumps of shrubby thickets should be placed within “softball-throwing” distance from each other. In other words, you should be able to stand near one thicket and throw a softball to the next thicket (Dale Rollins, Extension wildlife specialist, Texas A & M). Placing this type of cover in large fields greatly improves habitat availability and protection from predators. Shrubs may need to be mowed in strips periodically to prevent trees from becoming established and changing the pasture into a woodland.

Wildlife-Friendly Tips for Grassland Management

- Use a mixture of warm-season grasses, cool-season grasses, legumes and other forbs. Avoid having hayfields and pastures with only a single species of grass.
- Use rotational grazing.
- Leave un-mown strips 30-50 feet wide around the edge of hayfields.
- Protect shrubby vegetation in drainages and along field edges with permanent fences.
- Establish legumes in cool-season pastures and hayfields.
- Allow warm-season grasses to re-grow to 12-15 inches before fall dormancy.
- Convert fescue, bermudagrass or bahiagrass pastures into native warm-season or cool-season grasses.

- Avoid thick, dense vegetation and sod-forming grasses as quail and turkey chicks require travel lanes for feeding and retreating to escape cover.

Grassland Review

The following questions will help evaluate your current management and its benefits for wildlife. Ideally, you should answer “yes” to every question.

- 1 Do you practice rotational grazing of livestock among several pastures? *Rotating cattle through different pastures can improve both beef production and wildlife habitat.*
- 2 Do you follow soil test recommendations and apply fertilizer and lime to pastures when needed? *Improved soil fertility will contribute to both wildlife and domestic livestock productivity.*
- 3 Are native warm-season grasses included in your grazing system? *Grasses that grow during the hot summer months provide summer livestock grazing and wildlife food and cover.*
- 4 Are legumes present in your pastures? *Legumes add nitrogen to the soil, provide forage for cattle, attract insects on which wildlife feed and are a very important source of protein for deer, turkey and other wildlife.*
- 5 Do you delay mowing or haying until after nesting season? *Delay until after July 15 or later to protect ground-nesting wildlife.*
- 6 Do you mow or disk from the middle of the field outward to allow wildlife to escape? *Mowing or disking from the edge of a field inward drives wildlife toward the middle where they are trapped and become susceptible to predators and mortality from machinery.*
- 7 Are your thickets within softball-throwing distance of each other? *Wildlife such as cottontails and bobwhites are unable to find protection in large open fields. They need cover provided by thick brushy vegetation which predators cannot effectively penetrate, such as blackberry thickets, brushpiles, travel corridors and brushy fencerows.*

Forest and Woodland Management

Forest and woodland habitats reflect the natural forces which impact them – wind, ice, fire, floods, insects and disease. Many wildlife species depend on these natural disturbances to create habitat. Forest openings from disturbances increase the availability of sunlight to the lower reaches of the forest, generating a dramatic increase of understory plants.

From a wildlife perspective, a forest can be divided into layers: canopy, mid-story and understory. Some forest-dwelling species use all layers while others access only one or two. Although tree canopies serve as food and nesting sites for a variety of wildlife, many forest dwellers depend on food and cover at ground level. Without disturbances, the tree canopy shades out wildlife food and cover and impedes growth of tree seedlings on the forest floor.

Periodic natural disturbances can be imitated through forest management. Thinning is a valuable forest management practice when conducted with wildlife in mind. The decision to remove a tree should be based on harvesting the lower-quality and less-desirable tree species. Taking the best trees decreases the overall quality of the forest for wildlife and timber production. Remove tree and shrub species that have less wildlife and economic value to reduce competition around the valuable “crop trees.” Removing the competition increases growth rates of the valuable trees and allows their crowns to expand. Increased sunlight to the understory will encourage seedlings from desirable overstory trees and increase browse and cover for wildlife underneath.

In your wildlife management plan consider how the forest will replace itself. As the forest canopy and mid-story are opened, plan for regenerating desirable tree species that do not grow in shaded conditions. Older trees will eventually die and be replaced. Build tree regeneration into your plan to increase the value of the current forest to the next generation of forest.

Managing large forest tracts for both wildlife and a sustained yield of forest products can be complicated and requires professional advice.

A landowner in this situation should give serious consideration to hiring a consultant forester. Avoid the services of an unsolicited one-time timber buyer who will often remove high-quality trees and leave those with low economic and wildlife value.

Hardwood Forest Stands

Hardwood forests, in both uplands and bottomlands, fill a variety of wildlife needs. They provide food and nesting sites for many cavity-dwelling species, such as raccoons, squirrels and wood ducks, and temporary nest sites for migrating and resident songbirds. Young hardwood forests are home for diverse plants that benefit wildlife including vines, grasses and forbs, most like acorns (Figure 10), hickory nuts and berries, and a variety of shrubs. Left undisturbed, mature forests slowly lose their species richness as sunlight becomes less available for shade-intolerant plants. Although most plants have some wildlife benefit, wildlife thrive where plants are diverse and abundant. Sometimes one or two plant species dominate the forest understory in lieu of those having more wildlife value. Disturbance is necessary to ensure continuous benefits to wildlife.

Hardwood forests should be thinned periodically by choosing individual trees for harvesting. Thinnings should favor the maintenance and improvement of oak, hickory, blackgum, cherry, dogwood and persimmon. As the forest floor is



Figure 10. Acorns are one of the best all-around food sources for over 100 wildlife species including deer, turkey, squirrels, blue jays and black bears. *Water oak photo by Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database.*

opened, sunlight will generate a plant response serving as browse and cover for a variety of wildlife. Always leave an ample number (3-6 per acre minimum) of den or cavity trees (Figure 11). These standing dead or dying trees harbor insects which provide food for woodpeckers, songbirds, flying squirrels and a number of wildlife species. If your wildlife objective is directed at species depending on tree cavities, protect even more of these trees.



Figure 11. This nine-year-old natural pine stand has little understory with limited food and cover for wildlife. *Photo by David Stephens, Bugwood.org.*

Thinnings can be conducted commercially or by the landowner where timber markets are unavailable. Most commercial loggers use heavy machinery and equipment to remove trees. However, a few commercial loggers use horse- or mule-drawn skids resulting in less environmental impacts to the landscape, particularly when soil erosion or aesthetics are of consideration. When thinning is implemented by the landowner, selected trees and shrubs can be removed by chainsaw or by injection with labeled herbicides (Figure 12). Thinning can also be conducted after a commercial timber harvest to treat undesirable trees that couldn't be sold. Low-quality hardwoods can be used or sold as firewood.

Hardwoods have the ability to sprout from an existing root system. Conifer species (i.e., pine, spruce, cedars) do not sprout. Unless its root system is destroyed or an herbicide treatment is used, a hardwood will sprout many stems off a single root or stump. These new sprouts provide a great source of browse for deer



Figure 12. "Hack and squirt" is an herbicide method for removing undesirable trees and shrubs.
 Photos by Steve Dewey, Utah State University, Bugwood.org.

and other wildlife and are the next generation of the forest. However, trees growing from sprouts often do not produce merchantable timber.

Pine Forest Stands

Pine forests occur both naturally and commercially as plantations in Arkansas. Historical records from surveyors in the early 1800s show that much of the coastal plain and southern slopes of mountains were expansive forests of loblolly and shortleaf pine. Deer and turkey populations respond favorably to well-managed disturbances of cutting and prescribed burning in these forests. Pine seed can be a major food supply at times of the year for turkey and other wildlife. On good soils, natural, mature pine forests normally have a mid-story and understory of hardwoods and vines which should not be removed. Most natural pine stands have a mix of hardwoods that should be maintained because of their food values. Pine forests offer opportunities to receive profitable income while benefiting wildlife

Pine plantations can be adapted to provide wildlife habitat. The first five to ten years of these forests provide extremely important food, cover and nesting to a variety of wildlife like deer, turkey, bear, fox and many migrating song-birds. However, as the pine canopy closes, the value of these forests decreases because fruit and seed-bearing plants no longer thrive in the understory. Pine tree production techniques often reduce understory and mid-story plant

competition to increase pine tree growth and yield. In a wildlife-friendly pine forest, plantations need to be thinned as soon as economically feasible to open the forest floor to sunlight and encourage understory plant growth (Figure 13). Pine production that is lost through understory and mid-story plant growth will need to be balanced with the gain in wildlife habitat.



Figure 13. A gradual edge offers more plant diversity and escape cover for wildlife than an abrupt edge.
 Photo by Dot Paul, USDA Natural Resources Conservation Service.

Prescribed Burning

One of the most economical tools for managing forests is prescribed burning. Periodic, controlled fires encourage succulent plant growth on the forest floor and remove excess pine straw or leaf litter that could be a potential fire hazard. Pine trees have a very thick bark which protects the tree from fire. More care is

needed in mixed forests with both pine and hardwoods or pure hardwood forests where a “cool” fire is recommended to avoid killing hardwoods. Landowners can increase the wildlife use of forests by developing permanent firebreaks (15+ feet wide) around stands that are to be burned. These disked strips also function as openings for wildlife. If planting fire lanes, a combination of winter wheat and clover are excellent choices.

Prescribed burning should be conducted only by trained professionals such as those from the Arkansas Forestry Commission. Landowners should complete appropriate training before utilizing this management practice on their own. In addition to legal and safety concerns, an improperly conducted burn (i.e., one that is too hot) will destroy your entire forest and timber investment as well as endanger your neighbors’ property. Conducting a safe and beneficial prescribed burn requires expert knowledge and specialized training. For more information about prescribed burning, contact the Arkansas Forestry Commission.

Soil Erosion

No matter if you are raising crops, trees or wildlife, the basic building block is the soil. If topsoil is disturbed, seed with a cover crop to prevent wind and water erosion. All woodland roads with the potential for soil erosion should be seeded with clovers or grasses. Road construction should be kept to a minimum and roads opened only as long as necessary.

Wildlife Openings

Openings improve forest diversity by providing growing conditions for a variety of plants and increasing brooding habitat for ground- and shrub-nesting wildlife. For example, wild turkey and bobwhites use openings for “bugging” and nesting. Many non-game species such as songbirds depend on openings within forests for year-round habitat needs. However, it is important to recognize that openings can also be detrimental to wildlife species requiring large expanses of forest.

Openings should be well-distributed across the forest for wildlife to gain easy access. Ideally, openings should be less than 10 acres (usually 2-5 acres) and maintained in grasses, forbs or shrubs. These areas can also serve as food plots which are limed, fertilized and planted in annual grains and legumes. Planting perennial plantings can save time and money over annual plantings. Openings can be maintained periodically by burning, disking or bushhogging. Without disturbance, shrubs and young trees will overtake these openings and eventually become a forest again. You may be successful controlling some young trees and shrubs with the use of appropriate herbicides.

Openings can be created most economically during a timber harvest. As the forest is accessed by logging equipment, the landowner can design the best locations for openings and allow loggers to create them. Commercial loggers tend to prefer clearcutting > 10 acres, so be prepared to negotiate. When the operations are complete, loggers can plant their loading areas in grasses and legumes. Sometimes soil compaction is a factor in loading areas, and it may be difficult to establish plants for a number of years.

Openings should be designed to maximize edge and structured to reduce predation. Edge is the transition area between two different habitat types. An edge can be abrupt, such as where forest and field meet. Wildlife tend to prefer a gradual edge which mixes the two neighboring habitat types and contains qualities of each (Figure 14). Increased sunlight at a forest edge generates a thicker and brushier understory and mid-story compared to a few yards inside the forest interior. This transition zone provides more diverse food and nesting habitat which attracts more wildlife.

You can nearly double the amount of edge by simply meandering the wood’s edge in a wavy fashion. Mixing fields and forests along elevation contours or terraces will provide a natural curve that contains a greater proportion of edge than a squared-off, rectangular opening.



Figure 14. Snags provide feeding and nesting areas for woodpeckers, squirrels, bluebirds and black bears. *Photo by Becky McPeake, University of Arkansas Division of Agriculture.*

Snags and Downed Wood

Retain at least three to six snags (i.e., standing dead trees) per acre, plus a number of den and downed trees in your forest for wildlife (Table 1). The presence of a variety of cavity sizes will attract a broader diversity of wildlife species. This is contrary to forest management plans having the objective of maximizing timber production. Removal of diseased or dead trees is recommended to increase the health, vigor and economic value of the forest. However, many forest species use den trees, standing dead trees and downed trees for roosting, nesting, resting and food reservoirs of insects infesting the dead wood. If no snags or downed logs are available, create them by deadening large trees by girdling, topping or the use of herbicides. The retention of den trees and snags will greatly enhance a property's ability to hold a more diverse wildlife community.

Fence Out Livestock

Grazing livestock in forests damages the understory vegetation needed for many wildlife

species (Figure 15). Fences will safeguard the woodlands from soil compaction and depletion of wildlife foods by domestic livestock. Additionally, soil erosion increases as grazing pressure increases in forests (Table 2). Typical forests provide only marginal forage value for cattle. If forests must be grazed, consider using rotational grazing or seek information about agroforestry practices from the USDA National Agroforestry Center or the University of Missouri Center for Agroforestry.



Figure 15. Vegetation on the ungrazed side of the fence (right) is thicker and provides more wildlife habitat than on the left where cattle grazing has removed understory vegetation. *Photo from the Minnesota Department of Natural Resources Achieves, www.forestryimages.org.*

Streamside Management Zones

Watercourses should be protected by leaving a substantial amount of trees along the banks and by fencing out livestock. These low-impact areas will reduce soil erosion and help maintain good water quality for you and your neighbors. An added benefit is that streamside management zones provide travel lanes between habitats. Shade trees along streambanks keep water temperatures cooler in the summer, which benefits fish and other aquatic organisms. Changes in water quality, such as increases in temperature or turbidity, generally favor less desirable fish species over stream fish such as smallmouth bass, rock bass, sunfish and other sport fish. This is also true of forage fish that are food for predatory fish. Stream crossings should be as few as possible and placed only where absolutely necessary. Gravel removal from the streambed will damage your aquatic habitat and should be avoided.

Table 1. Types of snags and den trees used by primary and secondary cavity nesters.

Species	Snag Type	Snag Size	
		Minimum nesting/denning height (feet)	Minimum tree diameter at breast height (dbh) (inches)
Primary Cavity Nesters			
Downy woodpecker	Hardwood	15	6
Hairy woodpecker	Hardwood	15	10
Yellow-bellied sapsucker	Hardwood	15	10
Pileated woodpecker	Hardwood	31	20
Red-headed woodpecker	Hardwood	24	20
Northern flicker	Hardwood	6	12
Red-breasted nuthatch	Softwood	15	12
Secondary Cavity Nesters			
Tree swallow	-	15	10
Brown creeper	-	15	10
Red-breasted nuthatch	-	15	10
Northern flicker	-	6	12
American kestrel	-	15	10
Barred owl	-	30	20
Big brown bat	-	15	12
Wood duck	-	6	20
Black bear	-	28	32
Gray squirrel	-	25	10
Fox squirrel	-	30	15
Southern flying squirrel	-	5	10
Eastern bluebird	-	3	6
Raccoon	-	-	20
Tufted titmouse	-	<20	6
House wren	-	<10	6

Adapted from: Allen 1982, Dolan and Carter 1977, Missouri Department of Conservation 1994, Scott et al. 1977, Sherry 1986 and Thomas 1979.

According to the Arkansas Forestry Commission, best management practices for streamside management are:

- For slopes less than 7 percent, the minimum buffer width should be 35 feet on each side.
- For slopes 7 to 20 percent, the minimum buffer width should be 50 feet on each side.
- For slopes greater than 20 percent, the minimum buffer width should be 80 feet on each side.
- Select individual trees for harvest. Retain a minimum of 50 square feet of basal area per

Table 2. Influence of grazing on erosion potential in forestland.

(Missouri Department of Conservation)

Grazing Pressure	Percent Ground Cover	Erosion Potential
Non-grazed	95+	minimal
Lightly grazed	85-95	8 times
Moderately grazed	50-85	30 times
Heavily grazed	0-50	110 times

acre. Leave all trees if less than 50 square feet of basal area per acre exists. Trees should be evenly spaced along streams to maintain bank stability and protect water quality.

- Fell trees away from the stream except where safety is a concern.
- Remove trees in a manner that minimizes disturbance to the forest floor, exposure of mineral soil or reduction of streambank stability.
- Plant seedlings or direct seed by hand.
- Remove significant timber debris dropped into stream channels.
- Do not handle or store toxic and hazardous materials such as fuels, lubricants and solvents near streams.

Activities which are discouraged in stream-side management zones are:

- Harvesting trees growing directly on the bank or overhanging a waterbody.
- Prescribed fires that burn to mineral soil. Light, cool burns are permitted.
- Creating excessive rutting, especially where ruts run perpendicular to a stream.
- Leaving downed trees or other debris in front of cave entrances and in sinkholes if the effect is to change the natural flow of water.

Converting existing hardwood forests to pine stands can be detrimental to stream fishery populations. Trees are a watershed's energy source, which helps determine the composition of the fisheries community. Predominant hardwood or mixed hardwood forests should not be converted to pine since their input into streams requires different biological processes for conversion into a useful energy form for the resident fish population. Studies show a net energy loss to a stream system from these conversions, which impacts the fish community.

Wildlife-Friendly Tips for Forests and Woodlands

- Create browse and cover by thinning the overstory.
- Always "low grade" when harvesting forest products. Remove those trees which are lower quality and less desirable for wildlife and economic value.
- Encourage fruit-producing tree and shrub species.
- Use a chainsaw or herbicides to remove "undesirable" tree species. Use herbicides to prevent undesirable trees from resprouting.
- Seed and fertilize disturbed soils in openings, logging trails and roads.
- Create small openings within large forests or woodlands.
- Retain an ample number of den and cavity trees on your property.
- Protect trees along streams and ponds.
- Protect forests and woodlands from grazing.
- Leave brushpiles from firewood cutting.
- Install squirrel den boxes where natural cavities are missing.
- Fence a 150-foot-wide zone along all wooded streambanks to exclude livestock. Stop all cutting and mechanical activities inside this area.
- Use prescribed burning to stimulate growth of legumes and other wildlife food plants.
- Leave "key" areas of large-diameter, mast-producing hardwoods scattered through the area. These should be at least ¼ acre or larger.

Forests and Woodlands Review

The following questions will help evaluate your current management and its benefits for wildlife. Ideally, you should answer “yes” to every question.

- 1** Do you prevent cattle from grazing your forest? *Forests and forest edges are prime wildlife habitat in Arkansas. Woodland habitat is improved if protected from competing livestock.*
- 2** When you harvest timber or cut firewood, do you build brushpiles from the trimmings rather than burning them? *Place brushpiles around the edge of a forest or woodland to provide cover for wildlife.*
- 3** Do you have a gradual edge between the forest 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.*
- 4** Do you avoid cutting timber from November to July? *Avoid cutting timber at nesting and denning times to allow for safe and successful nesting and winter survival of woodland songbirds, squirrels, raccoons and birds of prey.*
- 5** Have you considered creating wildlife openings within your woodlands? *Such openings can provide a diversity of cover and food for many wildlife species. If you are managing for a mature forest-dependent species, however, openings may not be ideal.*
- 6** Does your forest contain at least 3 to 6 snags per acre? *Retaining snag trees enhances forest habitat for roosting, nesting, resting and feeding.*
- 7** Do you leave trees along streambanks? *Tree roots stabilize streambanks and prevent soil erosion. Their shade keeps stream water cool and improves habitat for desirable fish and aquatic organisms.*

Wetlands Management

Wetlands are characterized as having moist soils that support specific types of water-tolerant vegetation. Wetlands can be permanently flooded sloughs or areas that are wet only part of the year. Wetlands function as biological filters that remove sediments and pollutants from surface waters. They also act as natural sponges which reduce flood severity by slowly discharging excess water back into the stream or groundwater.

Wetlands are biologically rich with a greater diversity of plants and animals compared to drier habitats. Wetlands are home for waterfowl, shorebirds and songbirds (Figure 16). Natural wetlands along streams and rivers are important fish spawning and rearing areas. Many wetlands in Arkansas are constructed wetlands; that is, they were developed on previously dry or



Figure 16. Many waterbird species such as this Great Egret inhabit wetlands. *Photo by Gary Kramer, USDA Natural Resources Conservation Service.*

seasonally flooded land and are maintained by levees and water-control devices. Wetland practices are designed to encourage growth of native moist-soil plants through manipulating water levels using water-control structures. Different plant responses are achieved depending on when and at what rate water is removed. Moist soils also provide excellent growing conditions for invertebrates such as small snails, clams and insects which waterfowl and shorebirds consume.

Wetlands are federally protected resources which require federal permits before being altered. If the wetland is less than five acres and was farmed, wooded or converted to cropland prior to 1986, contact the Natural Resources Conservation Service. For information on construction, development, removal or mitigation of other wetlands, contact the U.S. Army Corps of Engineers. Wetland permits need to be issued from the U.S. Army Corps of Engineers before these areas can be developed. Contact them before making any changes to your wetland.

Managed wetlands can produce ideal habitat for migratory waterfowl or shorebirds. Seed-producing aquatic vegetation grows naturally on moist or wet soil. Dabbling ducks are attracted to easily assessable seeds which contain essential nutrients. Interspersion of native vegetation with other habitats is ideal for attracting ducks. Habitat complexes should include readily available agricultural grains such as corn, grain sorghum and rice along with native sources, because grains do not fulfill all of a duck's nutritional requirements. However, feeding activity for grains requires less energy than searching for native foods. A large biomass of native seeds can be produced in an impoundment, but if the water is too deep, there is too much downed wood or other debris covering seeds on the bottom, or the water is too muddy or iced over, ducks may be unable to feed on these seeds. Grassy wetlands, flooded croplands and flooded timber provide alternative habitats for ducks.

Grassy, Weedy Areas

On constructed or reclaimed wetlands, moist-soil plants will germinate when water is drawn during the plant's growing season. Valuable waterfowl plants include smartweed, barnyardgrass, sticktight, chufa tubers, rushes and other native plants present in the seedbed. Timing (e.g., season, soil temperature) and rate of draw-down are critical for managing plant response. Removing water too early or late results in infestations of plants that have limited value and outcompete beneficial plants. Generally water

should be held on the wetland until early spring (March to April). A slow two- to three-week drawdown prevents rapid drying of soil and discourages undesirable species while stimulating desirable moist-soil plants. The wetland is then re-flooded prior to and during winter migration to make these foods available for waterfowl and shorebirds. A slow re-flooding can be started as early as August to attract migratory shorebirds and early-arrivals like teal, or October 1 for other wetland species. Keep in mind that seeds deteriorate with flooding. Some seeds if submerged a month before waterfowl arrive will lose their food value. Soybeans lose 90 percent of their energy content during the first three months of flooding, whereas other seeds such as barnyardgrass deteriorate 57 percent after three months.

Relying on rainwater to fill wetlands is risky and unpredictable, though it can be done. Having water-control structures for manipulating water levels is an important tool for effective wetland management (Figure 17). Water levels can be manipulated to improve the predictability of plant responses and control undesirable, invasive weeds. Moist soil areas may need to be disked and/or burned at two- to three-year intervals to control invasion by undesirable plants. Disk and/or burn as early in the spring as possible to allow time for rainfall and seed germination.



Figure 17. A water-control structure is an essential tool for creating habitat for amphibians, reptiles, shorebirds and waterfowl. *Photo by Becky McPeake, University of Arkansas Division of Agriculture.*

Flooded Cropland

Flooded grain crops can be very beneficial to waterfowl, especially in late winter when the weather is extremely cold. Rice, corn or grain sorghum can be flooded from October 15 to March 30. These small grains decompose at different rates when flooded and persist well when flooded for extended periods. Soybeans are not recommended as a waterfowl planting because they deteriorate rapidly when flooded for extended periods.

Crops planted specifically for waterfowl should limit weed control because these weeds typically provide more food choices for water-birds. Japanese millet can be sown to supplement cultivated crops. The majority of cropland should be flooded 1 to 8 inches so that dabbling ducks and other birds have access to seeds, grains and macro-invertebrates (i.e., aquatic insect larvae) on the bottom. Flooded croplands are also valuable in spring, late summer and early fall to migratory shorebirds which feed on the macro-invertebrates found in shallow-flooded fields.

If you plan to hunt ducks or other water-birds, carefully read hunting regulations before manipulating unharvested crops or native vegetation to avoid violating state and federal migratory bird hunting laws. See Extension fact sheet FSA9082, *Hunting Waterfowl and Doves on Agricultural Lands in Arkansas*, and contact your local wildlife officer for details regarding anti-baiting laws.

Bottomland Hardwood Management

Bottomland hardwood forests consist of water-tolerant trees and other plants which grow naturally under moist soil conditions. Arguably the largest expanse of bottomland hardwood forest remaining in the world is The Big Woods found along the Cache and White Rivers in eastern Arkansas. Bottomland hardwood forests are different from green-tree reservoirs. Green-tree reservoirs are impoundments comprised of water-*intolerant* trees and plants that are temporarily flooded while trees are dormant

during fall and winter to attract ducks. Flooding while dormant prevents permanent tree damage and possible death, hence the name “green-tree” reservoir.

Oftentimes the best management strategy for an existing bottomland hardwood forest is to do nothing and let nature take its course. A floodplain ecosystem provides habitat for a number of wildlife species as well as storage for floodwaters and water quality improvements. Site variations within a floodplain are based on elevation, drainage and soil moisture. The length of time that water is held on a site affects survivability of tree species. Relatively small changes in elevation can result in different tree communities inhabiting different locations vertically along streambanks. Hydrology, or the movement of water, is the most important factor affecting the distribution of tree species within their natural range. In areas where a bottomland hardwood forest is being restored, matching the site characteristics with tree species is critical. The natural hydrology of the site, soils, plant competition, domestic animals and wildlife such as beaver, insects and disease can affect the successful restoration of a bottomland forest.

Green-tree reservoirs normally have levees and water-control structures for manipulating water levels. Levees should be low and wide to reduce erosion damage with approximately two feet of free board above the desired flood pool level. After construction, levees should be planted with native grasses to control erosion. A water-control structure is needed to retain captured water, control water depth and release water before trees leave dormancy around March. The structure(s) needs to accommodate complete drainage of the reservoir within one week. A high degree of management is required to prevent severe damage to trees within green-tree reservoirs. Water left standing more than one week during the late spring and summer will cause excessive mortality to trees (Figure 18). Generally forested areas should be flooded after November 1 and completely drained by March 31. Flooding dates, depths and duration can vary from year to year to maintain the productivity of the forest.



Figure 18. The swollen trunk of this water-intolerant tree indicates extended flooding and could result in tree mortality. Photo by Jody Pagan, 5 Oaks Wildlife Services.

Tree composition and density should be considered when flooding forests for waterfowl. Different species of oak trees should be encouraged and cavity trees made available for wood ducks, woodpeckers and other cavity-nesting wildlife. Low-valued trees can be removed to make room for better mast producers. All den trees should be retained. A few standing dead trees may provide desirable nest sites for wood ducks and other cavity-nesting wildlife.

Water impounded by beaver is a constant threat to water-intolerant tree species, though flooded areas created by beaver can benefit bottomland hardwoods and wetlands. In green-tree reservoirs, if prolonged inundation occurs during the growing season, timber will be killed. Control of beaver activity and expedient dewatering of beaver-impounded forested acreages may be necessary. Contact your local wildlife officer with the Arkansas Game and Fish Commission or county Extension office for information on nuisance beaver control.

Ponds and Small Lakes

Ponds and small lakes are used at times by wildlife. If water-level control of a pond or lake is possible, it should be drawn down 1 to 2 feet in early March or April to encourage beneficial plants, then allowed to refill with rainfall and runoff. Mud-flats around ponds can be seeded to Japanese millet through August. Drawdowns can also help with fish management when fish populations become unbalanced.

According to the Arkansas Forestry Commission, best management practices include having a protected area of trees, shrubs and/or grasses surrounding ponds. The minimum width of this buffer should be 35 feet beginning at the break in slope at the top of the shoreline. Follow guidelines discussed under *Streamside Management Zones* in the previous section about Forest and Woodland Management.

Natural Sloughs

If water control is possible, sloughs can be managed as described above for ponds and small lakes. If not, the following techniques can be used where feasible:

- Plant food and cover strips and encourage native plants along edges of slough.
- Plant pin oaks or other beneficial trees along the water's edge.
- Install water-control structures which will allow proper summer drawdowns and winter flooding.

Wildlife-Friendly Tips for Wetlands

- Native plant and seed production for waterfowl can be encouraged by germination of favorable seeds through spring draw-downs in moist-soil units (March-April).
- In the fall, flood areas 4 to 8 inches deep for migrating and wintering waterfowl, shorebirds and other wetland species.
- Rice, sorghum and stubble from other crops can be rolled after harvest or left standing, then flooded 4 to 8 inches to produce ideal habitat for invertebrates which attracts waterfowl and shorebirds.
- Nesting structures for wood ducks, Canada geese, prothonotary warblers and other birds can be erected in wetlands.
- Be careful when flooding trees which are not water tolerant. Flooding creates stress and causes trees to die.
- In naturally wet areas and bottomland hardwood forests, the best strategy may be to leave it alone and let flooding occur normally.

Wetlands Review

The following questions will help evaluate your current management and its benefits for wildlife. Ideally, you should answer “yes” to every question.

- 1 Do you winter-flood fields of rice, corn or grain sorghum? *Flooded grain crops provide food for waterfowl and shorebirds, especially during late winter when the weather is coldest.*
- 2 Do you maintain any wet, marginal crop production lands as wetlands? *Wildlife can benefit from allowing wet areas to hold water and revert to weedy seed-producing plants.*
- 3 Do you seasonally manipulate water levels on existing wetlands? *Water-control structures are an important tool for improving seed production and food availability to migratory waterbirds.*
- 4 Do you know which trees are water tolerant and allow water to flood those trees? *Water-tolerant trees include bald cypress and water tupelo.*

Idle Area Management

Nearly every property has some land that is unsuitable for cultivation, grazing or haying due to its steepness of slope, soil type, wetness or small size. These idle areas – old fields, abandoned house sites, pond edges, streambanks, brushy draws, ditch banks and erosive areas – can be very useful to wildlife. With a little management, they can provide wildlife food and protection and sites for nesting and brood rearing.

Old Fields

Abandoned pastures and crop fields provide good wildlife habitat. When left undisturbed, these areas naturally produce plants which provide food and cover for deer, turkey, foxes, bobwhites, cottontails, many species of songbirds and small mammals. Old fields can be maintained for wildlife using the following techniques:

- Disk 30- to 50-foot strips through open fields on the contour to disturb the topsoil. No seeding is necessary – let the seedbank take root (Figure 19).



Figure 19. This disked field yielded new plant growth which provides habitat for butterflies, songbirds and mammals. Photo by Lynn Betts, USDA Natural Resources Conservation Service.

- Disk or control-burn fields on a two- to three-year rotation to promote grasses and forbs.
- Mowing is less preferable than other habitat practices but can prevent encroachment from invading woody shrubs and trees into old fields. Mow 30-foot strips and leave 30-foot strips in late fall to stimulate new growth. Mow uncut strips every two or three years in a rotation (e.g., Figure 5).
- Leave unmowed clumps of woody growth about 30 to 50 feet in diameter (average 1,500 square feet) to provide covey headquarters for bobwhites and food and cover for other wildlife.
- Hinge-cut large cedars or small trees by cutting two-thirds of the way through the trunk and bending the tree parallel to the

ground. Many trees will continue to live in this position, creating a living brush pile.

- Where emergency winter food is needed, plant a grain food plot.

Some fields erode more than others depending on soil type, steepness of slope and land use. Erosion-prone land can be seeded to various plants which will benefit wildlife and help conserve soil. Wildlife biologists recommend native plants because wildlife are familiar with them, they typically require less maintenance and are less expensive to establish. Oftentimes, planting seeds is not required to encourage native plant growth. Establishing native plants can be as simple as lightly disking strips to expose the seedbed if the slope is not too steep. Disk in strips to limit erosion.

Highly erodible areas may also be planted in pine or hardwood trees. Preferably, rows should be planted along contours or terraces. A sufficient number of seedlings should be planted to retain soil. This will vary depending on soil type, slope, tree species and other factors.

Fencerows

Wide, brushy, weedy fencerows provide woody cover and travel lanes for wildlife. An overgrown fencerow which connects habitats is an ideal location for habitat improvement. Larger trees in a fencerow can be cut for firewood with tops used for brushpiles. Bare fencerows require seeding or planting native shrubs to improve cover. Shrubs can grow naturally or be planted

deliberately in rows along the fence. Protect fencerows from livestock. Electric fencing is effective and inexpensive for this purpose. A good travel lane will develop naturally.

Brushpiles

Design brushpiles with wildlife in mind (Table 3). Leave travel lanes and an open space in the middle of the brushpile. Crisscross logs to form a base, then add increasingly smaller diameter wood to the brushpile, topping it off with a layer of twigs and branches until the interior cannot be seen. Another option is to cut halfway through the trunk of a small cedar or other bushy tree and push it over. This living brushpile provides cover for a number of wildlife species.

Avoid placing a single brushpile in the middle of a large (e.g., 10-acre) open field with no nearby cover or travel lanes to escape from predators. With careful planning, the proper design and placement of brushpiles can help improve wildlife populations on your land.

Abandoned House Sites

Shrubs, weeds, fruit trees and shade trees found around old home sites are beneficial to wildlife. Place tree limbs and old lumber on old foundations for wildlife cover. Retain or plant fruit-bearing shrubs and trees such as wild plum, cherry, mulberry and dogwood. Mow strips around and through the lot to stimulate new growth of grasses and legumes. The best time for

Table 3. Brushpile construction for cottontails and other small mammals, songbirds and insects.

Structure	Materials	Placement	Dimensions
Overall	Logs and tree branches; artificial structures optional (see below)	Near hedgerows, briar thickets, wind-breaks, and within dense grasslands when additional brushy cover is nearby	Ideally 12 to 18 feet diameter, 6 feet high
Base frame	Large logs or tree trunks	Perpendicular to and on top of one another in crisscross	12 to 20 inches high
	Drainage tile	Place under the base to give access	4-foot long, 6-inch diameter maximum
	Cinder blocks	Elevate base off ground to slow down rot and provide access to cottontails and other small mammals	8 inches maximum
Crown	Loose branches	Place on top of base	Decreasing size as near top of pile

Source: *Cottontail Rabbit*, Fish and Wildlife Habitat Management leaflet.

mowing is early spring before the start of the nesting period or early fall after nesting is complete. If fescue, bermudagrass or bahiagrass is present, increase the wildlife value of these sites by treating with appropriate herbicide and converting to more wildlife-friendly plants. Contact your local county Extension agent or private lands biologist for detailed information.

Pond Banks

Pond banks can be developed into prime areas for reptiles, amphibians, birds and mammals. Plant trees and shrubs around the pond for protection, shade and cover. Avoid planting trees and shrubs on dams, levees, dikes or any water-control structure because roots may degrade the structure's integrity. Dams, levees or dikes should be mowed no earlier than mid-July (after brooding season for most ground-nesting wildlife) to maintain grassy cover and protect water-control structures from invading trees. Ponds with gentle slopes and shallow water areas provide foraging sites for migratory shorebirds during late summer and early fall and again in spring. Plant windbreaks on the bank to reduce wave erosion and provide food and nesting areas for wildlife. Aquatic vegetation will grow in the shallows, providing nursery habitat for young fish.

Fence pond banks from livestock, as soil erosion will cause the pond to fill up with sediment. Livestock also trample and consume plants providing wildlife habitat and add nutrients to the pond which may lead to excessive aquatic plant growth. If the watershed is grazed, fence an area around the pond that is 1 to 1½ times the water acreage to develop ideal wildlife cover. Cost-share programs from the Farm Service Agency through the Natural Resources Conservation Service provide financial support for installing alternative water sources and fencing to keep livestock from ponds (Figure 20).

Streambanks and Drainage Ditches

Many wildlife species depend on wooded areas along streams for part or all of their habitat needs. Trees stabilize and protect streambanks and drainage ditches from erosion and sedimentation. A lack of trees can raise water



Figure 20. Farm Bill programs provide cost-share support for alternative water sources to keep livestock from ponds and streambanks. *Photo by Jeff Vanuga, USDA Natural Resources Conservation Service.*

temperatures and negatively affect the aquatic food chain in streams.

Stands of trees growing along streams and ditches are called riparian woodlands. In the Delta, a strip of riparian woodland may be the only woody cover found in landscapes dominated by fields and pastures. The variety of trees, shrubs and other plants found in riparian woodlands are important wildlife habitat. Forested portions of Arkansas often have trees down hill-sides and in stream bottoms. Tree species growing along streambanks likely are different from those on the adjoining slopes, making riparian woodlands biologically unique.

Ideally, a riparian woodland is minimally 100 to 200 feet wide on each side of the stream. Where the riparian strip is very narrow or nonexistent, it can be widened or re-established by allowing natural tree invasion or planting seedlings.

Riparian woodlands are managed differently from other forest woodlands. Indiscriminate timber cutting in riparian woodlands can damage streams and eliminate critical wildlife habitat. Avoid removing trees that have fallen into the stream or appear ready to do so. The tree roots are keeping the bank from eroding. When a tree eventually falls, it creates important in-stream habitat for fish and other aquatic life. Trees that cause problems in the stream can be removed, but never use heavy equipment to dredge the stream channel. Using such

equipment damages the streambed and affects the aquatic habitat where fish, frogs and turtles live.

All roads and trails close to waterways should be kept in suitable vegetative cover to reduce or prevent erosion. Livestock that graze along streambanks destroy vegetation, and streambank erosion increases. Cost-share programs from the Farm Service Agency through the Natural Resources Conservation Service provide financial support for installing alternative water sources and fencing to keep livestock from streams. The next-best alternative is fencing the streambank and installing a fence chute to minimize cattle's impact to a limited portion of the streambank.

Sediment is a primary water pollutant in Arkansas. The most effective method of reducing sedimentation is establishing vegetative buffer strips and riparian corridors year-round. Legumes and perennial grasses can be planted in buffer strips to reduce runoff and capture sediments before reaching stream channels. For example, phosphates and ammonium-nitrogen found in fertilizers adhere to soil particles and enter streams when heavy rains occur. Toxic levels of ammonia kill stream organisms by depleting them of oxygen. Pesticides deposited in the stream may become suspended solids, be deposited on the sediments or absorbed by aquatic organisms. Pesticides can kill, impair reproduction and decrease growth rates of aquatic organisms which breaks links in the food

chain. The overall response is a drastically altered stream system with greatly reduced wildlife benefits. Pesticide applications need to be monitored closely and every effort made to control chemical drift. Planting vegetative buffers can reduce or eliminate the introduction of chemicals into streams and drainage ditches.

Steeply banked streambanks and drainage ditches carry runoff and deposit sediments in streams. Reduce the slope and allow vegetation to grow at the edge of the bank (Figure 21) or bottom of the drainage ditch. Vegetation will slow the flow and trap sediments before reaching the stream. Vigilance is required such that drainage ditches don't fill in with vegetation and lose their functional abilities. Control woody vegetation while allowing herbaceous vegetation to grow.

Brushy Draws

Brushy draws extending into crop or hay fields provide habitat and help control soil erosion. Ideally, a brushy draw contains a mix of vines, shrubs, grasses and trees. Brushy draws are enhanced when 30-foot-wide borders are planted in a mix of wildlife-beneficial grasses and legumes. Exclude livestock since they can quickly destroy low-growing shrubs which are sources of food and cover for wildlife. Brushpiles may be constructed along field edges near draws, but avoid placing brushpiles in the bottom of the draw which could impede water flow and prevent drainage.



Figure 21. Restoring vegetative buffers, as shown before and during restoration, will reduce stream sedimentation and improve wildlife habitat. This private lands project was partially funded by the Arkansas Game and Fish Commission. Photos by Steve Filapek, Arkansas Game and Fish Commission.

Springs and Seeps

Springs and seeps are water sources for wildlife. Many springs are still used as water sources for homes and livestock. For seeps, consider constructing a small basin to collect water and improve availability for wildlife. Fence springs and seeps to prevent livestock damage to soils and vegetation in the immediate area.

Shallow Water Areas

Shallow water areas occur where soils have low permeability or a high water table that inhibits surface drainage. Typically these areas are of any size from 1 to 18 inches deep over the majority of the area. Shallow water areas attract shorebirds, waterfowl, wading birds, mammals, fish, reptiles, amphibians and other species that require shallow water for at least a part of their life cycle. Naturally-occurring shallow water areas may dry up in the hot summer months after amphibians have progressed through their early life stages. They may appear intermittently every few years whenever adequate rainfall is available. Amphibians and reptiles thrive in these temporary shallow pools which lack fish. Protect temporary pools from livestock, and avoid pesticide use in the vicinity.

Landowners can retain or construct shallow water areas to attract waterbirds and other wildlife. An adequate method for dewatering will promote food plants and invertebrates for waterbirds. Slow drawdowns of two to three weeks usually are more desirable for plant establishment and wildlife use. Typically early drawdowns during the first 45 days of the growing season and 90 days before the end of the growing season result in the greatest quantities of seeds produced. Fall flooding which coincides with migration attracts a number of waterfowl. Slowly flooding a site to a depth of 4 to 6 inches allows new areas of food to become available each day as the water is rising.

Glades, Cliffs and Rocky Outcrops

Glades (Figure 22) are rocky, open areas with exposed rock and little or no soil. These areas have no tree canopy and very few shrubs. Glades vary by soil depth, type of bedrock, moisture and



Figure 22. A unique nepheline syenite glade in Pulaski County, Arkansas. *Photo by Mary Smith, Audubon Arkansas.*

topography. Typically, glades are found on southerly or westerly facing slopes. Although the soil is mostly dry, particularly in summer months, pockets of water may be present.

These seemingly barren areas are of considerable ecological interest. A variety of plants thrive in such environments, some of which are rare. Examples are insectivorous plants such as sundews and bladderworts. The Missouri bladderpod is found only in Arkansas and Missouri and is considered a threatened species. Reptiles typically associated with the arid southwestern U.S. can be found in these rocky areas.

Glade habitats are not as common as they once were. Arkansas glades have been subjected to mining, overgrazing and development. Fire suppression has led to glades being invaded by woody plants, in particular the eastern red cedar. To protect rare plants, fence out livestock and implement a prescribed fire sometime in the late summer or fall up until February at three- to five-year intervals. Chainsaws can be used to remove woody vegetation. If invasive plants are a problem such as fescue or multiflora rose, spot treatments of an appropriate herbicide may be necessary. Avoid using herbicides after seed germination (e.g., December) to protect rare plants which may be present in the glade.

Cliffs and rocky outcrops serve as nesting and denning sites for hawks, bats, birds and black bears. Protect these habitats from erosion and degradation by establishing native plants and limiting human disturbance.

Wildlife-Friendly Tips for Idle Areas

- Disk 30- to 50-foot strips on the contour to encourage native vegetation.
- Use tree trunks and branches from thinning operations to construct brushpiles. Hinge-fall cedars and cull trees for quick cover.
- Plant native grasses and legumes around brushpiles and along brushy draws.
- Fence to protect pond areas, streambanks, woodlands and brushy draws from livestock.
- Protect springs, seeps and shallow water areas as watering holes for wildlife and habitat for amphibians.
- Plant native grasses and legumes or trees on eroding area.
- Protect brushy, weedy fencerows for wildlife cover and travel lanes; expand where they are less than 30 feet in width.



Figure 23. Idle areas are inhabited by a number of wildlife species. Photo by Kevin Quinn, University of Arkansas Division of Agriculture.

Idle Areas Review

The following questions will help evaluate your current management and its benefits for wildlife. Ideally, you should answer “yes” to every question.

- 1 Are you using idle areas to improve wildlife habitat? *Idle areas such as old fields, abandoned home sites, pond and stream banks, brushy draws, fencerows, glades, cliffs, rocky outcrops and erosive areas are opportunities to improve unused land for wildlife. Remove woody invasives from glades and limit human disturbance to cliffs and rocky outcrops to protect nesting and denning sites.*
- 2 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.*
- 3 Do you avoid applying herbicides to fencerows? *Destroying fencerow vegetation reduces both the food supply and the cover that these areas provide.*
- 4 Are brushy or grassy strips present between crops, pastures and woodlands? *These buffer strips provide cover, nesting and feeding areas for wildlife as well as erosion control.*
- 5 Do you have a spring, seep or shallow water area? *Fence out livestock or take other actions to protect fishless water areas which provide habitat for waterbirds, frogs, toads and salamanders.*
- 6 Do you leave riparian buffers along streams which cross your property? *Any stream running through the property should be protected by a buffer (150-foot minimum) of trees and other vegetation specifically designed for both wildlife habitat and water quality maintenance.*
- 7 Are roads or trails located near streams kept in vegetative cover? *This practice will greatly reduce stream sedimentation.*
- 8 Are ponds, streambanks, shallow water areas, springs and seeps on your property fenced off from livestock usage? *Livestock use will cause soil erosion/sedimentation, destroy vegetation and muddy water. When water access is needed, an alternative water source can be cost-shared from a Farm Bill program or a fence chute can be used to restrict cattle to one area of the bank.*

Wildlife Food Plots

One of the more popular management practices is preparing wildlife food plots. Many experts offer advice and books have been written about food plots. Commercial products tout great results using exotic-sounding plants or plant mixes with pictures of trophy deer on the bag. In reality, food plots have several advantages and disadvantages:

Advantages

- Wildlife food plots may be the only habitat practice available for hunting clubs on leased timberland where prescribed fire, thinning timber and other habitat practices may not be an option.
- Food plots can attract game species to a particular area to improve chances of harvest and facilitate wildlife population management.

Disadvantages

- Food plots require an investment in seed, soil amendments, machinery and fuel which can be costly, particularly for annual plantings.
- Typical non-native food plot plants are less sustainable and less tolerant of weather extremes because they are not naturally adapted to the climate.
- Unless implemented on a large scale, food plots typically do little to improve wildlife populations.

The most economical and all-encompassing approach is managing native habitat. Wildlife need different sources of food and cover throughout the year. When used in combination, habitat practices described in this handbook provide substantial value for wildlife on your property. Preliminary results from a three-year demonstration study of food plots imply white-tailed deer consumed vegetation equally in fertilized and limed plots planted with a commercial mix, an Arkansas-equivalent mix and a natural plot. Therefore, disking and fertilizing may be as effective as planting seeds. Other habitat practices which improve native plants include thinning trees, creating forest openings, prescribed burning, herbicide treatments and planting native species.

However, there are circumstances when planting food plots is recommended, particularly when establishing native plant species (Table 4). The following wildlife-friendly tips for food plots are adapted from *Managing Wildlife* by Greg Yarrow and Deborah Yarrow, 1999.

Wildlife-Friendly Tips for Food Plots

- Select the best sites for food plots with consideration to their size and shape.
- Check soil type; then collect a soil sample, have it tested and follow its recommendations.
- Select native plant varieties according to adaptability and soil type.

Table 4. Examples of native warm-season grass and native forb (wildflower) mixes.

Species	Pounds Per Acre	Species	Pounds Per Acre	Species	Pounds Per Acre
Habitat mix:		Tall grass mix:		Short grass mix:	
Big Bluestem	1.8 PLS	Big Bluestem	1.5 PLS	Little Bluestem	3.0 PLS
Indiangrass	2.0 PLS	Indiangrass	1.5 PLS	Sideoats Grama	1.0 PLS
Little Bluestem	1.5 PLS	Little Bluestem	1.0 PLS	Indiangrass	0.5 PLS
Sideoats Grama	0.5 PLS	Switchgrass	0.5 PLS	Native forbs*	1.0
Switchgrass	0.2 PLS	Native forbs*	1.0		
Native forbs*	0.25				
TOTAL	6.25		5.5		5.5

Source for tall grass and short grass mixes: Harper, et al. 2004.

*Native forbs (wildflowers) include partridge pea, Illinois bundleflower, perennial sunflowers, purple prairie clover, purple coneflower, black-eyed susan, blazing star and lance-leaved coreopsis.

- Check on availability of seed and order if necessary.
- Prepare seedbeds beginning several months before planting.
- If needed, inoculate legumes before planting.
- Plant using the recommended dates for wildlife.
- Install caged enclosures (Figure 24).
- Follow maintenance and management requirements to enhance plant growth and sustainability.
- Check enclosure cages and measure your success.

Wildlife Food Plots Review

The following questions will help evaluate your current management and its benefits for wildlife. Ideally, you should answer “yes” to every question.

- 1 Do your wildlife food plots include a variety of plant types? *Wildlife need a diversity of plants throughout the year. Typically a mix of grasses and forbs (including legumes) is better than only one plant type.*
- 2 Along with food plots, are you implementing practices to encourage native plants on your property? *As a rule of thumb, at least 10 percent of your property (or more depending on the quality of the habitat) needs to be in non-native food plots to have any appreciable impact on sustaining wildlife populations year-round. In most instances, food plots simply attract wildlife for viewing or selective harvest. Implementing other practices which benefit native plants will help sustain wildlife on your land.*
- 3 Are your food plots providing sustenance when other food sources typically aren’t available, such as late winter or late summer? *When food is in short supply, such as a failed acorn crop, food plots could help sustain wildlife and bridge the gap until native plants become available.*



Figure 24. Set up a small enclosure cage to visually inspect plant productivity and the effect of wildlife consumption. Photo by Becky McPeake, University of Arkansas Division of Agriculture.

Resources

Following is a brief description of natural resource professionals (Figure 25) and how to contact them, books and guides, and fact sheets pertaining to wildlife and forest management in Arkansas.



Figure 25. Assistance is available from several natural resource agencies for managing wildlife habitat. Photo by Robert G. Price, USDA Natural Resources Conservation Service.

Private Lands Professionals



Private Lands Biologist – Provides wildlife species information and habitat practices. Conducts site visits and cooperates with a landowner by writing a wildlife habitat

plan for landowners with 40+ acres. Provides technical support for Farm Bill programs. Contact the Arkansas Game and Fish Commission, 1-800-364-4263, and ask for the private lands biologist in your region (www.agfc.com).



County Forester – Provides land examinations, forest management plans, timber markets, disease and insect control available free of charge. Fee-based services are fire lane construction,

prescribed burning and timber marking. To locate your county forester, contact the Arkansas Forestry Commission, 501-296-1940 (<http://www.forestry.state.ar.us/>).

Consulting Forester (private practice) – Provides scientific and long-term financial alternatives based upon the landowner's objectives. Knowledgeable about local markets and pricing your timber. A list of certified forestry consultants can be obtained from the Arkansas Forestry Commission, 501-296-1940 (<http://www.forestry.state.ar.us/manage/consultantforesters>).

District Conservationist – Assists in planning and applying conventional conservation practices on your land to maintain or improve production while conserving soil and water resources. Assistance with wetland determina-

tion and technical assistance for several Farm Bill programs. Contact the USDA Natural Resources Conservation Service – Arkansas at 501-301-3122 or visit a local service center (www.ar.nrcs.usda.gov).



Stream Team Coordinator – Provides technical and financial support (cost-share) for reducing stream-bank erosion and improving wildlife and fish habitat on private property. Contact the Arkansas Game and Fish

Commission, 1-800-364-4263, and ask for the Stream Team coordinator in your region (www.agfc.com).

University of Arkansas Cooperative Extension Agent – Provides county-based assistance with

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soil samples, plantings, herbicides, some wildlife and pond management.

Contact the University of Arkansas Division of Agriculture Cooperative Extension Service, 501-671-2000, and ask for the Extension agriculture agent in your county (www.uaex.uada.edu).

Books and Guides

Plant Identification

Autumn Leaves and Winter Berries in Arkansas by Carl Hunter. The Ozark Society Foundation. Color photos and descriptions. 52 pages.

Forest Plants of the Southeast and Their Wildlife Uses by James H. Miller and Karl V. Miller. Southern Weed Science Society. Color photos and descriptions. 454 pages.

Mushrooms and Other Fungi of North America by Roger Phillips. Firefly Press. Color photos and technical descriptions. Large book, not for the field. 319 pages.

PLANTS Database by USDA Natural Resources Conservation Service. Web site with descriptions and color photos.

Tallgrass Prairie Wildflowers: A Field Guide to Common Wildflowers and Plants of the Prairie Midwest by Doug Ladd and Frank Oberle. Falcon Press. Color photos and descriptions. 264 pages.

Trees of Arkansas by Dwight M. Moore. Arkansas Forestry Commission. A key to Arkansas trees, pen and ink drawings of the leaves, fruits and buds. Available from Arkansas Forestry Commission, <https://www.ark.org/afc/index.php>.

Wetlands by William A. Niering. National Audubon Society Nature Guides. Color photos of trees, wildflowers, fish, insects, birds and other natural wonders. 638 pages.

What Tree Is That? Web site which helps identify trees, <http://www.arborday.org/trees/whattree/>.

Wildflowers of Arkansas by Carl Hunter. Ozark Society Foundation and Arkansas Game and Fish Commission. Color photos and descriptions, 296 pages.

Wildlife Identification

The Amphibians and Reptiles of Arkansas by Stanley E. Trauth, Henry W. Robison and Michael V. Plummer. University of Arkansas Press. Color photos and descriptions. Large book, not for the field. 421 pages.

Arkansas Butterflies and Moths by Lori A. Spencer. The Ozark Society Foundation. Color photos and descriptions. 314 pages.

Arkansas Mammals: Their Natural History, Classification and Distribution by John A. Sealander and Gary A. Heidt. The University of Arkansas Press. Color photos and detailed descriptions of mammals and their life histories. Pen and ink sketches of skulls but not tracks or scat. Large book, not for the field. 308 pages.

Bird Tracks and Sign by Mark Elbroch with Elenor Marks. Color photos and sketches of tracks, droppings, pellets, nests, signs of feeding, feathers and more. Stackpole Books. 456 pages.

Enature (www.enature.com). Web site with descriptions, color photos and vocalizations.

A Guide to Freshwater Invertebrates of North America by J. Reese Voshell, Jr. The McDonald and Woodward Publishing Company. Color illustrations, pen and ink drawings and descriptions. 422 pages.

Mammal Tracks and Sign by Mark Elbroch. National Outdoor Book Award. Stackpole Books. Color photos and sketches of tracks, scat, burrows, signs of feeding and more. 779 pages.

The Sibley Guide to Birds of Eastern North America by David Allen Sibley. The Audubon Society. Alfred A. Knopf Publishers. Color illustrations and descriptions.

Habitat Management

Arkansas Deer: A Manager's Guide for Private Lands by Michael E. Cartwright, David E. Urbston, David Long and Fred Ward. Arkansas Game and Fish Commission, 162 pages. (Available for \$7.50 from Arkansas Game and Fish Commission, 1-800-364-4263, www.agfc.com.)

Arkansas Quail: Private Lands Management Guide by Fred Ward, Rick Chastain, Eddie Linebarger, Rick Fowler, Alan Pogue and Aaron Thompson. Arkansas Game and Fish Commission, 83 pages. (Available for \$7.50 from Arkansas Game and Fish Commission, 1-800-364-4263, www.agfc.com.)

A Landowner's Guide to Native Warm-Season Grasses in the Mid-South. 26 pages. Available online at <http://www.utextension.utk.edu/publications/wildlife/>.

Managing Wildlife: Managing Wildlife on Private Lands in Alabama and the Southeast by Greg Yarrow and Deborah T. Yarrow. Alabama Wildlife Federation, published by Sweet Water Press. 588 pages.

Wetland Management for Waterfowl: A Handbook by Kevin D. Nelms (editor). Mississippi River Trust, Natural Resources Conservation Service, U.S. Fish and Wildlife Service. 131 pages. (Available for \$5 from Mississippi River Trust, 662-686-3375, www.mississippirivertrust.org.)

Wildlife Management for Arkansas Private Landowners by David Long, Martin Blaney and Jon Schneider. Arkansas Game and Fish Commission. 162 pages. (Available for \$7.50 from Arkansas Game and Fish Commission, 1-800-364-4263, www.agfc.com.)

Wildlife of Southern Forests: Habitat and Management by James Dickson (editor). Chapters on white-tailed deer, wild turkey, Northern bobwhite, ruffed grouse, mourning dove, American woodcock, squirrels, rabbits, carnivores, birds and additional information.

The Wild Turkey in Arkansas: History, Biology and Management by Michael R. Widner. Arkansas Game and Fish Commission. 113 pages. (Available for \$7.50 from Arkansas Game and Fish Commission, 1-800-364-4263, www.agfc.com.)

Fact Sheets

Below is a list of wildlife and forestry publications available through the University of Arkansas Division of Agriculture–Cooperative Extension Service. Copies are available (1) free at your local county Extension office, (2) online for free download at www.uaex.uada.edu or (3) for purchase at www.uaex.uada.edu. Click on “Publications” and type the keyword “wildlife” or “forestry” for a topic listing.

Wildlife Habitat Practices

Why We Burn: Prescribed Burning as a Management Tool (FSA5009)
Managing Pastures and Haylands for Wildlife (FSA9083)
Establishing Wildlife Food Plots (FSA9092)
Seeding and Fertilization Rate Conversions for Wildlife Food Plots and Small Areas (FSA3110)
Calibrating Drills and Broadcast Planters for Small-Seeded Forages (FSA3111)
Grasses and Forbs for Wildlife: Fall and Winter Food Plots (FSA9096)
Forage Clovers for Arkansas (FSA2117)
Forage Legume Inoculation (FSA2035)
General Traits of Forage Grasses Grown in Arkansas (FSA2139)
Sunflowers Grown for Dove Hunting (FSA2150)

Best Management Practices for Waterbirds on Agricultural Lands (FSA9098)
Financial Assistance for Wildlife Habitat (FSA9104)
Landowner Resources for Wildlife Habitat Assistance (FSA9103)
12 Wildlife Habitat Tips for Small Acreages (MP478)

Soil Testing

The Soil Test Report (FSA2193)
Test Your Soil for Plant Food and Lime Needs (FSA2121)
Understanding the Numbers on Your Soil Test Report (FSA2118)

Wildlife Enterprises/Hunting

Wildlife Leases and Liability Issues on Private Lands (FSA9089)
Marketing Your Wildlife Enterprise (FSA9097)
Hunting Waterfowl and Doves on Agriculture Lands in Arkansas (FSA9082)

Wildlife Species

Arkansas Black Bears: Biology and Habitats (FSA9086)
Encountering Black Bears in Arkansas (FSA9087)
Bats In and Around Your Home (FSA9088)
Beaver Damage Prevention and Control Methods (FSA9085)
Controlling the Eastern Mole (FSA9095)
Dealing With Skunks and Odor Abatement (FSA9101)
Elk: Arkansas’ Largest Wild Mammal (FSA9099)
Encountering Native Snakes in Arkansas (FSA9102)

Forestry

A Key to Common Trees of Arkansas (MP344)
Ten Ways to Kill a Tree – And How to Avoid Them (FSA5011)
Fusiform Rust in Arkansas (FSA7543)
The Clean Air Act and Prescribed Fire: What It Means for Arkansas (FSA5016)
Why We Burn: Prescribed Burning as a Management Tool (FSA5009)
Consulting Foresters for Private Landowners (FSA5019)

Timber Management

- What Should I Know About Selling My Timber? (FSA5014)
Board Foot Loss Inherent in Scaling Double Length Logs (FSA5013)
Evaluating the Management Potential of Upland Hardwood Stands (FSA5012)
Forest Landowner's Guide to Field Grading Hardwood Trees (FSA5015)
Using Natural Regeneration to Promote Oaks in Upland Hardwood Stands (FSA5010)
Storing, Planting and Handling Southern Pine Seedlings (FSA5007)
Improve Your Pine Stand by Thinning (FSA5001)
Landowner's Guide to Determining Weight and Value of Standing Pine Trees (FSA5017)
Timber Theft – No Laughing Matter (FSA5018)

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