UT Extension
PB1687

Tennessee 4-H Junior High Wildlife Conference and Shooting Sports Camp Manual

THE UNIVERSITY of TENNESSEE UT

Tennessee 4-H Junior High Wildlife Conference and Shooting Sports Camp Manual

by
Aubrey L. Deck, Extension Wildlife Assistant
Craig A. Harper, Associate Professor
Forestry, Wildlife and Fisheries

Acknowledgments

Portions of this manual were revised from the following sources:

Harper, C.A. 2006. Tennessee 4-H Wildlife Judging Manual. UT Extension. PB 1682.

Howard, R.A., J. Smith, W.F. Stevens, J. Knasnicka, M. Bergum, J.V. Peter, J. Payne, J. Knight, S. Dann, J. Kitts, B. Winter, H.T. Davidson, B. Stavens. 2002. 4-H Shooting Sports Guide

This manual was printed with support from the Tennessee Wildlife Resources Agency (TWRA). The TWRA also supports this activity by supplying equipment, manpower and expertise to our programming efforts.

The University of Tennessee appreciates the support of the Tennessee Wildlife Resources Agency

Table of Contents

Tennessee 4-H Junior High Wildlife Conference and Shooting Sports Camp Manual

Wildlife Management

Wildlife management is the art and science of managing wildlife *habitats* and wildlife populations. However, in order to manage wildlife, we need to understand some ecological principles that relate to the interaction of wildlife with the living and non-living components of the surrounding environment, or *ecosystem*. Ecosystems consist of living *communities* (plants and animals) and the non-living environment (soil, water, minerals and air) with which communities interact. We have the ability to alter the environment and control which plants and animals are found in a particular area. Therefore, it is important to know the effects of our activities on the environment and understand the responses of wildlife to those activities.

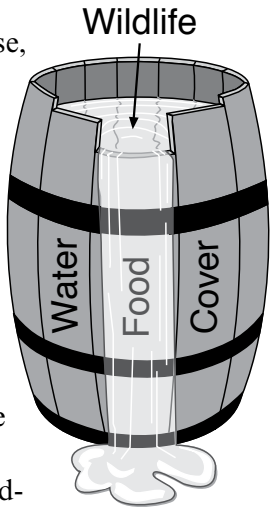
Depending on what activity (management practice) you implement, wildlife populations may increase, decrease, or remain unchanged. In cases where wildlife populations need to be increased for hunting or species protection, their habitat quality and quantity will be improved. However, when a habitat is overpopulated by a species, these practices can be used to negatively alter that habitat to prevent wildlife damage to our farms, automobiles and landscaping.

Traditionally, wildlife management has concentrated on (1.) *conservation* of wildlife through *game laws*, (2.) re-stocking when necessary (using wild-trapped animals) and (3.) habitat improvement. When wildlife populations begin to decline, people generally think and act in the order listed above. This is unfortunate because the third item is often more important than the first two. If suitable habitat is lacking, protection and re-stocking will not protect or restore populations.

Habitat management

Successful wildlife management starts with land management, or *habitat management*. Land has the ability to support only a certain number of animals. This limit is the *carrying capacity*, and it is nature's way of regulating populations. Carrying capacity depends on a number of things, such as habitat quality, predation and competition.

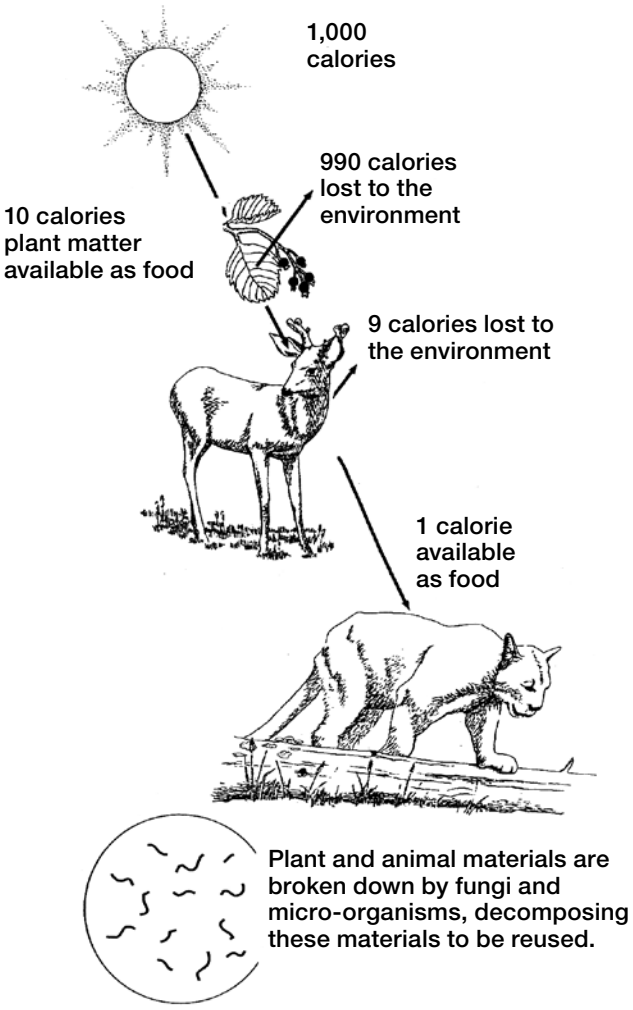
Habitat is made up of four primary components: food, cover, water and space. All these things have to be present in order to support wildlife populations in a given area. The component in shortest supply is called the *limiting factor* because it limits the population on that particular area. As populations increase beyond the carrying capacity, nature quickly reduces their numbers, often through starvation, disease, predation or a combination of factors.



The only way to sustain larger populations is to increase the carrying capacity. Habitat management is the primary method of increasing carrying capacity. By managing for additional food, cover and water on a given area, more individuals are able to sustain themselves, providing there is adequate space.

Food provides energy, which is continually transferred through ecosystems by way of *food chains*. Energy transfer begins with the sun's energy being fixed by green plants (or *producers*). This is accomplished through *photosynthesis* and by absorbing nutrients from the soil. Green plants are eaten by *herbivores* (such as rabbits and deer), and herbivores may be eaten by *predators* (such as great-horned owls and bobcats). Predators may be *carnivores* or *omnivores*. Carnivores are meat-eaters (such as wolves) and omnivores are animals that eat both plants and animals (such as black bears and man). At each step in a food chain, a considerable amount of energy is lost.

A food pyramid can be used to show the steps of a food chain. Plants capture about 1 percent of



the solar energy that reaches their leaves. Herbivores keep about 10 percent of the energy from the plants, and carnivores keep about 10 percent of the energy from herbivores. Thus, 100 pounds of forage will produce 10 pounds of beef, which in turn will produce 1 pound of flesh on a man.

All food chains end with waste products of live animals, dead plant parts and dead animals. Decomposers (such as bacteria and fungi) consume these products, break down the remaining material and release the nutrients back into the system to be used again by plants to begin a new food chain.

Succession

The amount of food and cover on a given area changes over time. *Succession* is the orderly, predictable series of changes in plant species composition on a given area over time. This is a very important principle since all wildlife species are best adapted to a particular successional stage year-round or during specific seasons. The same tools that destroy habitat are used to restore and manage it and set back succession. These tools include the chainsaw, plow, disk, bushhog (mower), fire, herbicides and grazing. Consider an area that has been cleared bare. It is reasonable to expect the following plants to come into the field over time:

With these plant changes come changes in the associated wildlife community.

Stage 1 immediately after succession has been set back	bare ground
Stage 2 annual forbs and grasses during first year after disturbance	ragweed, panicgrasses, beggar's-lice, lespedezas
Stage 3 perennial forbs and grasses during second and third years of growth after disturbance	goldenrod, broomsedge, pokeberry, blackberry
Stage 4 Perennial forbs, grasses and shrubs four to 30 years after disturbance	sumac, elderberry
Stage 5 young forest or woodland develops 30 to 40 years after disturbance	pine, persimmon, redcedar, cherry, elm
Stage 6 mature forest or woodland approximately 40 years after disturbance	oak, hickory and other mixed hardwoods (in the absence of other disturbances)

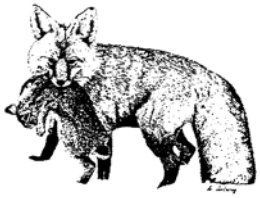
Wildlife management objectives change with plant succession. Wildlife managers first determine their management objective and then work toward the stage of succession best suited for the species managed. However, since wildlife managers rarely manage for only one species, it is desirable to manage for several different successional stages and habitat types within a given area. This way, many wildlife species benefit.

An *edge* is where two or more successional stages (or two or more habitat types) meet. Many wildlife species are found near edges because food and cover are often in close proximity. For species with small *home ranges* (such as quail and rabbits), it is important that all of the resources needed to survive are in proximity (close together). This reduces the need to travel far, which also reduces the risk of predation. Predators (such as foxes and red-tailed hawks) are often found near edges as well because that is where *prey* can be found.

The most important consideration when managing land for wildlife is to provide usable space throughout a management area and beyond (across the landscape). The goal is to enhance any and all areas that are not attractive for wildlife and make them suitable for a particular species or for as many species as possible.

Population management

When quality habitats are available, wildlife populations typically respond well. It is then necessary to manage populations. In natural situations, populations are limited by disease, competition, starvation and predation. Some people think predators are bad, that they reduce game populations and take away individual game animals that could be hunted. Some also think that removing predators would create abundant game. That is not true. In fact, predation performs a necessary function by removing surplus animals the habitat cannot support. If not reduced by predation, prey populations eventually would be reduced by some other means (such as starvation and/or disease). Often, before the population is reduced, habitat is severely damaged. In rare cases where predators limit game populations, quality habitat is lacking.



Predation is not just game being killed by foxes, mountain lions or wolves. For example, a turkey *poult* feeding on grasshoppers is just as much a predator as a great-horned owl killing a grouse. The lesson is all of our native wildlife species fill a critical role in the balance of our natural world. This role is called a *niche*.

In the absence of natural predators, it is up to us to regulate and manage our wildlife populations through habitat management and *hunting*. Hunters not only help manage game populations, they also provide the majority of the funding used to pay wildlife managers and biologists through the sale of hunting licenses and with tax money levied on the sale of firearms and ammunition. In addition, this money is used to manage and protect wildlife habitat.

Wildlife damage management

Wildlife can become a nuisance. When populations become too large or when people move into wildlife habitats, problems often occur. Managing wildlife damage may involve any of several strategies to reduce or eliminate conflicts between wildlife and humans. These strategies might include

- **trapping**—a raccoon that keeps getting in trashcans or eating corn in the garden
- **habitat** modification—mowing and picking up debris around houses to make the area less attractive to mice so fewer snakes use the area
- **exclusion**—putting up a fence to keep deer, dogs, rabbits or groundhogs out of the garden or sealing holes leading into the attic to keep bats and squirrels out
- **frightening agents**—some animals can be frightened by noisemakers (sound) or decoys of predators (sight)
- **repellents**—substances that repel animals by smell or taste are used to keep animals from eating things in the garden

- **shooting and toxicants**—many nuisance animals can be killed by shooting or by using poison baits

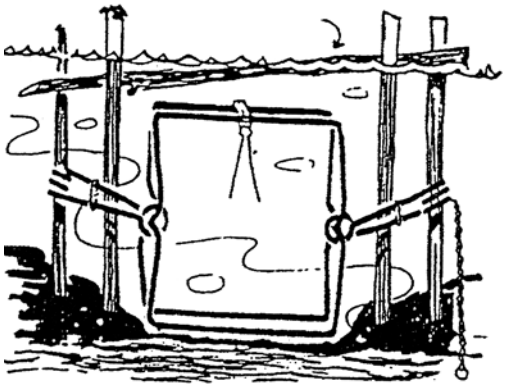
The first step in solving a wildlife damage problem is identifying the problem animal(s). This helps minimize danger to non-target species and ensures the correct strategy is used. Often, it is necessary to use two or more strategies at the same time to solve the problem efficiently and effectively.

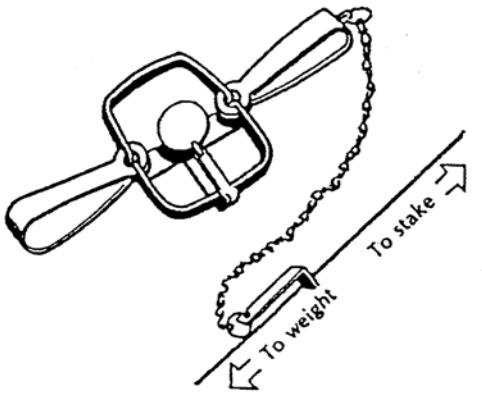
Techniques for wildlife study and management

Capture

The ability to capture animals is important not only for reducing wildlife damage; wildlife biologists also capture animals to study their behavior, their physical characteristics and the habitats they use.

Capture techniques (trapping) vary widely. There are live traps, kill-traps, snares, pit falls and many other types of traps. Traps are designed to work on a variety of species in a variety of habitats. Some commonly used traps include the box/cage (or live) trap, conibear trap, leghold trap, snap trap, snare and glue board. Other traps are specialized for certain species and habitats. For example, the *rocket net* has been used successfully to capture turkeys, waterfowl and deer. The *dart gun* has been effective in immobilizing large animals such as deer, bear and elk so they can be tagged, measured and/or transported.





Trapping has enabled the Tennessee Wildlife Resources Agency (TWRA) to capture and relocate some species (such as deer and turkeys) from high-population areas into other areas where their numbers were low after the habitat had been restored. This has allowed those species to increase throughout Tennessee. Researchers sometimes put radio transmitters on trapped animals in order to monitor their movements, behavior and habits. This is the main way biologists find out how large an animal's home range is and which habitats it prefers.

Trapping (or otherwise capturing) animals can be important when estimating populations. For example, biologists may capture animals repeatedly to see how many recaptures they get. They then use calculations to estimate the number of animals in an area.

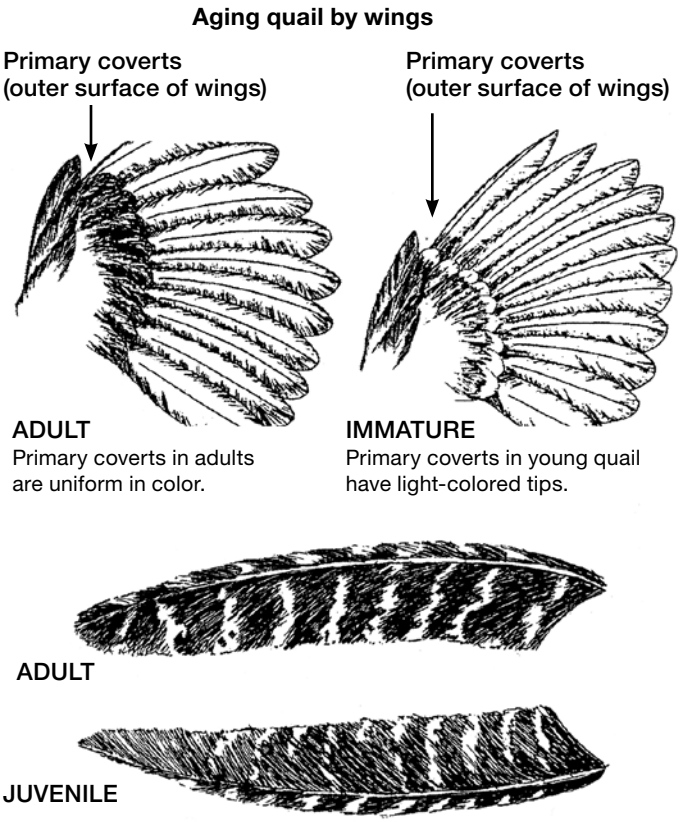
One way managers "capture" animals to estimate a population (such as white-tailed deer) is with infrared-triggered cameras. By placing these cameras in areas used by wildlife, managers are able to get pictures of certain animals and estimate how many are in the area. Other methods used to estimate trends in animal populations include track counts, roadside counts, pellet counts, flush counts and call counts.

Aging wildlife

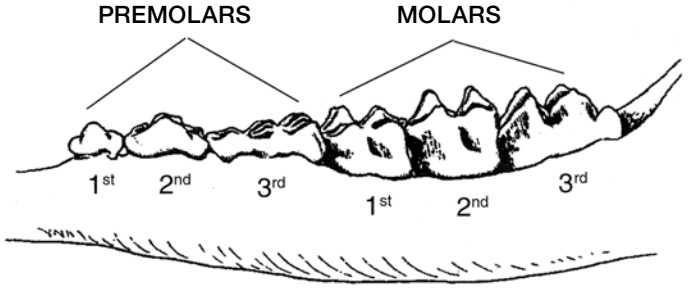
Wildlife biologists and managers use a variety of techniques and equipment to study and manage wildlife and wildlife/habitat relationships. The ability to age animals is important when studying characteristics about a given population. For example, by aging deer killed by hunters each year, biologists learn about the age structure of the herd. A deer harvest consisting of 80 percent 1 ½-year-old bucks indicates few bucks are attaining maturity; therefore, the social status of the herd may not be healthy.

The most common way to age birds is by feather characteristics. The presence, length and coloration of certain feathers can be used to determine the age of many birds, especially young birds, or juveniles, as they undergo their first few molts.

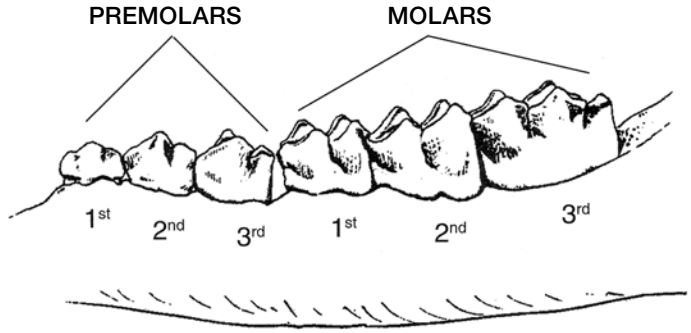
Most mammals can be aged by inspecting their teeth. Evaluating the amount of wear on teeth is a



Barring on outer primaries of juvenile does not reach end of feather. Adult primary feather is rounded at tip, while it is sharp on juvenile turkeys.



Deer is 1½ years old or less if third premolar has three cusps.



Deer is 2½ years old or older if third premolar has only two cusps.

commonly used method to age white-tailed deer. Counting the annual growth rings in teeth (similar to growth rings found in a tree) is another way biologists age mammals (such as black bears). Other methods for determining the age of mammals include eye lens weight and the length of certain bones. No one technique is useful for all species, so biologists rely on a variety of techniques.

Some mammals have *antlers*, such as white-tailed deer, elk and moose. Antlers are grown and shed annually (once every year). Animals with antlers cannot be aged by antler characteristics—so you **cannot** tell the age of a deer by the number of points on its rack.

Some mammals have horns, such as buffalo and wild sheep. Horns grow continuously and are not shed. Animals with horns can be aged by the ridges on their horns.

Sexing wildlife

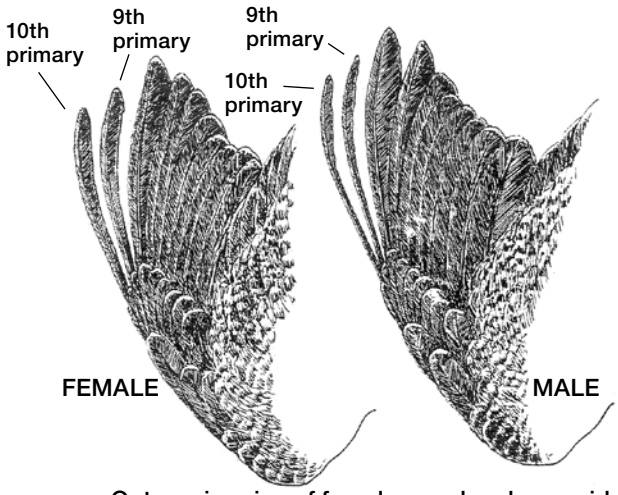
Most folks can tell a male cardinal from a female by the male's bright red plumage. And most people can distinguish a male mallard (drake) from a female (suzie) by the bright green head and white neck band. Also, it is quite easy to tell a buck deer from a doe during most seasons of the year by the antlers. However, in many wildlife species, it is difficult to distinguish the sexes. It takes an expert to distinguish a male Canada goose from a female, or a male woodcock from a female.

Feather characteristics are the most common method to determine sex among birds. As with age, the sex of many birds can be determined by the presence, length and coloration of certain feathers. Most often, male birds are more colorful than females. Drab coloration in females provides camouflage during the nesting period. Other methods used to determine the sex of some species of birds include the shape of droppings, cloacal exam, length of bill, presence of certain structures (such as spurs, beard and ruff) and the size of the bird.

In mammals, the most common sexing technique is the examination of the reproductive organs. Sometimes this is not possible. Other clues biologists use to determine the sex of mammals include the presence of antlers, urination posture and the presence of young.

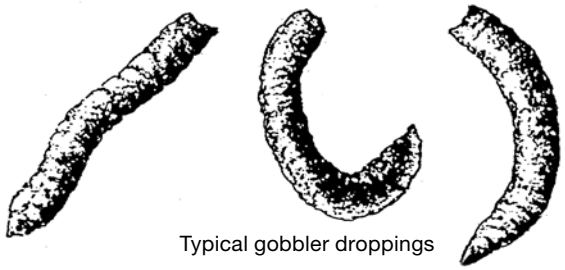
One of the oldest management tools for many species has been to harvest only one sex (males)

Breast feathers of male wild turkeys (left) are black-tipped; whereas those of females are buff-tipped (right).



Outer primaries of female woodcock are wider than those of a male.

Dropping shape indicates sex of the wild turkey.


Typical gobbler droppings


Typical hen droppings

during the hunting season. For years, hunters in Tennessee were allowed to kill only male deer (bucks), which allowed the population to grow. Hunting gobblers only also enabled wild turkey numbers to rebound. Hunters can tell the difference between the sexes of these species, and the removal of a certain number of males does not hurt reproduction of the population.

In recent years, populations of some wildlife species have increased dramatically and, as a result, exceed the carrying capacity of the habitat in certain areas. The white-tailed deer is a good example. Today, in some areas of Tennessee, deer populations have grown to the point that the habitat cannot support them. It is the responsibility of man to keep wildlife populations in check. In order to do this, female deer (does) have to be harvested as well as males. Hence, hunters are allowed to kill does in these areas to reduce the number of females and help improve habitat conditions. Either-sex hunts have enabled the TWRA to better manage the deer population in Tennessee.

Habitat Management

Managing habitats (or habitat types) is the primary method of managing wildlife. If the habitat is not suitable, wildlife will not flourish (or in some cases, survive) in that area. Wildlife managers spend a great deal of time manipulating land to ensure that suitable habitat is available for various wildlife species. In this chapter, you will learn about some of the techniques used to manage habitats. Keep in mind, however, that no one technique is going to create favorable habitat conditions for all species or even for one species during the entire year. It is essential that a variety of habitats and successional stages are available, and usually well interspersed, for many of our wildlife species to flourish.

Quality habitat should offer adequate food, cover, water and space. Habitats are managed to increase those components that are lacking. The following practices are used to enhance the habitat for many wildlife species.

Managing forests for wildlife

Timber harvest

Forests can be managed for wildlife through timber harvest. *Clearcut*, *shelterwood*, and *group selection* are three commonly used methods to regenerate (or start anew) forest stands. While the primary objective may be *regeneration* of the forest,

many species of wildlife benefit when the trees are removed. By removing trees, more sunlight is allowed into the forest, which stimulates lush growth on the forest floor. This new growth provides lots of food—leaves, twigs, and soft *mast* (such as blackberries, blueberries and huckleberries). Insects and other *invertebrates* (such as spiders and snails) are attracted to the new growth and are fed upon by wild turkey and ruffed grouse poults, songbirds and salamanders.

The lush natural growth following a timber harvest operation is normally quite dense for a few years until the trees grow large enough to shade other vegetation out. During this time, these "thick" areas provide excellent cover for many species, including white-tailed deer, ruffed grouse, black bears, rabbits, bobcats, foxes, brown thrashers, chestnut-sided warblers, gray catbirds, eastern towhees and others.

A timber harvest is especially important for wildlife where there are large tracts of unbroken, mature forest with little *early succession habitat*. Typically, timber harvests for regeneration should be 5 – 30 acres, but this can vary according to the species being managed, surrounding *land-use practices* and size of the forest stand.

Thinning

Removing undesirable trees from a stand can improve habitat for wildlife as well. *Thinning* forest stands for wildlife removes trees that are not very beneficial to wildlife (such as sweetgum, winged elm, maples, ashes and yellow poplar), while others (such as oaks, hickories, American beech, black cherry, black gum, persimmon and mulberry) provide important seed and fruit crops used by many wildlife species. Killing or removing unwanted trees allows the remaining trees to grow larger and produce more food. So, it is possible for many forests to produce more food for wildlife with fewer trees! The increased sunlight reaching the forest floor stimulates fresh growth of *forbs* and grasses, providing additional food for wildlife as well as the structure many birds require to nest.

Wildlife managers sometimes kill trees that need to be removed by girdling them (cutting a circle through the bark around the tree) and spraying herbicide in the girdle. These trees are left standing (*snags*) to provide cavities for birds and mammals for nesting, roosting and denning. Sometimes the trees to be removed are not cut all the way through, but just enough to fell the tree, leaving a hinge connecting the stem to the would-be stump (hinge-cutting). This allows the tree to stay alive, providing excellent cover at ground level for wildlife.

Prescribed fire

Perhaps the single-most important tool used to improve wildlife habitat is *prescribed fire* (or controlled burning). It is important to understand that **prescribed fire is not the same as wildfire!** Prescribed fire is most often used to decrease the amount of fuel (dead leaves, sticks and limbs) on the forest floor and stimulate growth of forbs and grasses. This not only promotes increased food and nesting cover for wildlife; it also reduces the chance of wildfire, which could destroy the forest. The benefits of prescribed fire are best realized after a stand has been harvested or thinned. Debris left from the thinning

The maple tree on the top has been girdled using a chainsaw. Severing the cambium layer just inside the bark and applying the correct herbicide to the wound kills the tree. The maple tree on the bottom has been "hacked" with a hatchet. Herbicide is being applied to kill the tree.

is burned, along with the leaf litter layer, allowing seeds in the *seedbank* (seeds found in the top layer of soil) to germinate.

Prescribed fire is "controlled" by burning only under desired conditions (correct temperatures, humidity, days after a rain and wind speed) and with the use of *firebreaks*. Firebreaks are lanes of bare ground established around the perimeter of an area to be burned. Firebreaks help keep the fire from spreading into areas that are not intended to burn. Firebreaks are usually created by plowing or disking or with a bulldozer. After burning, firebreaks can be planted or left alone. If left alone, forbs (weeds) and grasses beneficial to wildlife should germinate from the seedbank. If planted, wildlife-friendly seed mixtures that provide forage and/or seed for many species should be used (see Food plots).

Burning when it's too dry, when the wind is blowing too hard and without firebreaks can lead to uncontrolled wildfires. You should NEVER attempt burn by yourself or without experienced personnel present. Before using prescribed fire, landowners should contact the Tennessee Division of Forestry.

The mixed hardwood stand on the top has been thinned to allow more sunlight to enter the stand. Prescribed fire consumes the litter layer and stimulates additional groundcover for wildlife. The mixed hardwood stand on the bottom was thinned previously and is burned every 2 – 3 years to perpetuate quality groundcover for wildlife.

Managing fields for wildlife

Old-field management

Old-fields are fields left fallow (unplanted) and allowed to grow up in various forbs and grasses. These fields can be havens for many species of wildlife (such as rabbits, quail, deer, field mice, songbirds, hawks and foxes), especially if the fields are managed correctly. The various forbs found growing in old-fields can be particularly important. Forbs comprise approximately 70 percent of a deer's diet during spring and summer. Seeds from various forbs are the main component in a quail's diet during

Burning is by far the best way to manage fields for wildlife. Burning consumes the litter layer, allowing small wildlife to travel through the field easily. Burning also stimulates plant growth and allows the seedbank to germinate, creating a "natural food plot" for many wildlife species. The bottom picture was taken in July after the field was burned in March. Conditions for brooding quail and turkeys were optimum, browsing by deer was obvious and rabbits were seen throughout the field when the picture was taken.

Steve Capel

This landowner has gone out of his way to juxtapose different successional stages. Burning in a checkerboard fashion ensures quality brooding cover is adjacent to nesting cover. While burning half the field one year and the other half the following year is fine, burning sections such as this provides a very diverse structure across the field.

Separate acreage should be devoted to both warm-and cool-season forages where white-tailed deer is a focal species. Separate fields can be planted or half of a field dedicated to warm-season and the other half to cool-season forages. In this photo, crimson clover has been planted as a border around a patch of corn. Deer and turkeys love this arrangement!

fall and winter, providing nutrition necessary for survival until spring. *Native warm-season grasses* (NWSG), such as big, little and broomsedge bluestem; indiangrass; switchgrass; eastern gamagrass and siderats grama, are often found in old-fields and provide preferred nesting habitat for bobwhites and offer cover for many other species.

Unfortunately, many old-fields in Tennessee were planted to tall fescue, orchardgrass or bermudagrass at some time in the past. These grasses are *exotics* (not native to our country) and do not provide quality habitat for wildlife. Tall fescue, orchardgrass and bermudagrass grow dense at the ground level and make it difficult for young quail, turkeys and rabbits to travel through the field. Also, these grasses tend to grow in solid stands, keeping native forbs and grasses from germinating and growing. Further, these grasses offers poor forage for deer and rabbits and do not harbor as many invertebrates for quail and turkeys to feed upon. Thus, educated wildlife managers spray and kill these grasses with herbicides to allow the growth of other grasses and forbs.

If left alone, old-fields eventually become forests and wildlife needing early succession habitat will decline. That is why wildlife managers continually set back succession in old-fields. This is best accomplished with prescribed fire. Burning fields on a 2 – 4-year rotation promotes a variety of forbs and grasses along with scattered shrubs (such as blackberry and sumac), providing nesting cover, brooding cover, escape cover and food within the field.

Wildlife managers often disk strips in fields to promote fresh forb and grass growth. Sometimes strips are disked on a 3-year rotation. This way, both annual and perennial food and cover is available each year.

Bushhogging (or mowing) is another way wildlife managers set back succession in old-fields. This practice is much less desirable than burning or disking. Bushhogging typically creates a deep thatch layer at ground level, making it difficult for small wildlife to travel through the field and reducing the availability of seed on the ground. Bushhogging also reduces germination of the seedbank, which leads to reduced plant *diversity*. If burning and disking are absolutely not possible, bushhogging should be done in late winter, just prior to spring green-up. This way, more cover is available throughout winter and nests and young are not disturbed or destroyed during spring and summer.

Fields larer than 6 acres are often broken up into smaller fields by establishing hedgerows. The best hedgerows are planted to trees and shrubs that produce soft mast (such as persimmon, crabapple, hawthorn and wild plum) and evergreen cover (such as pines and eastern redcedar). By establishing hedgerows, travel lanes are created across the field and the amount of edge is increased. This allows wildlife managers to better *intersperse* and *juxtapose*

food and cover resources across the property. In addition, undesirable trees can be killed or felled just inside the woods around an old-field to create a soft edge—where the transition between woods and field is gradual—providing increased food and cover in proximity to one another.

Food plots

Planting *food plots* is another way wildlife managers improve available nutrition and increase carrying capacity. There are many different types of food plots. Wildlife managers decide what to plant based on site conditions (such as soil and topography) and the wildlife species being managed. Just like the forbs growing in an old-field, food plots provide forage and/or seed and, in some circumstances, cover as well. Good forage plantings include clovers, alfalfa, lablab, oats and wheat. Good seed producers include corn, grain sorghum, millets and sunflowers. Some plantings provide both forage and seed, including cowpeas, soybeans and buckwheat. **NEVER** plant tall fescue or orchardgrass in a wildlife food plot. These grasses choke-out desirable plantings and leave wildlife with no food or desirable cover.

Wildlife managers typically plant several small food plots (≤3 acres) instead of fewer larger food plots. Spreading food plots evenly over the management area improves habitat for more animals. Food plots should be planted next to good cover, such as a **bramble** thicket, dense stand of young pines or a brushy fencerow. Do not plant your food plots within sight of a road. This only increases the opportunity for **poaching**.

Managing wetlands for wildlife

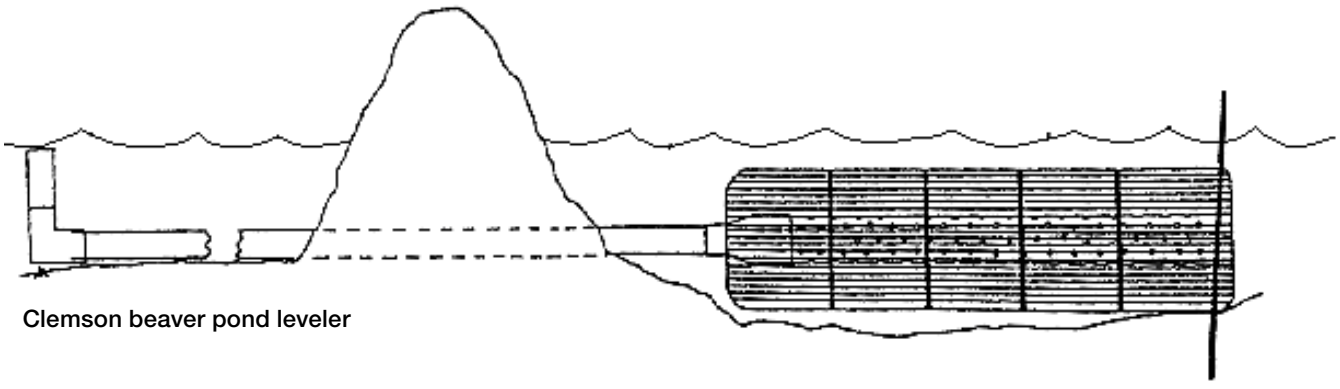
Wetlands are habitats with standing water or wet soils during part of most years. Wetlands are very important because they improve water quality, provide flood control and are needed by many wildlife species (such as waterfowl and other wetland birds; many turtles, frogs and salamanders; otters, mink and beavers). Unfortunately, most of our wetlands have been drained; Tennessee has lost 60 percent of its original wetlands. It is critical that we conserve our wetlands for future generations.

Wetlands are not all alike. Some are open water, some are marshy and some contain brush or trees. All, however, provide habitat for wildlife. As with *terrestrial* habitats, the vegetative community determines which wildlife species use the area.

Manipulating the water level is the main way wetlands are managed for wildlife. Again, the seeds present in the seedbank are very important in providing food and cover. Wildlife managers often draw down the water level, using some type of water control device, just before spring. This allows weed seeds in the seedbank to germinate and grow. Many of these seeds are valuable food for wildlife. Later, the water level is gradually brought back up, flooding the vegetation so it can be used by wetland wildlife.

In some areas, crops (particularly corn, grain sorghum and millets) or crop residue are flooded in the fall to provide feeding habitat and loafing sites for migrating and wintering ducks and other wetland birds (such as sandpipers). Crop residue isn't the only food available. *Aquatic invertebrates* are important food resources for many of these birds.

Bottomland hardwoods are also flooded in the fall for similar reasons. Mallards, wood ducks and black ducks really like these areas. Areas where the water level is manipulated are called *greentree*



Clemson beaver pond leveler

reservoirs. They are flooded during fall and winter of certain years, but left dry during spring and summer to keep the trees from dying.

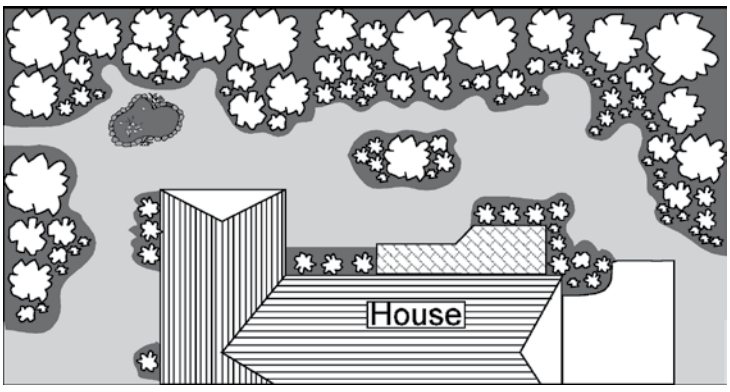
Wooded wetlands mimic some of the best wetlands of all—beaver ponds. Over time, however, vegetation within beaver ponds can thin and die out, depending on the depth and duration of flooding, as well as the vegetation present. Wildlife managers fluctuate the water level in beaver ponds (for the same reasons listed above) using a Clemson beaver pond leveler. This device allows wildlife managers to adjust the water level so the appropriate amounts of vegetation and water remain in the wetland during the appropriate seasons.

Managing backyards for wildlife

You do not have to go to a national park (an example of *preservation*) or a wildlife management area (an example of conservation) to see wildlife. With a little effort, your own backyard can attract and provide habitat for many wildlife species.

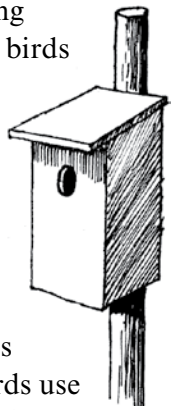
Landscaping for wildlife

Landscaping with hard and soft mast-producing trees and shrubs can provide needed food resources through the year. Many flowering plants can also be used to provide nectar for hummingbirds and butterflies. Evergreen trees (such as redcedars and hemlocks) provide thermal cover during winter. Brushpiles provide dens and crevices for lots of birds, small mammals and reptiles. When constructing a brushpile for wildlife, place the largest limbs (or logs) on the bottom and pile the smaller brush on top. This provides more dens and crevices for wildlife under the protection of brushy cover. Standing dead trees (*snags*) provide a place for birds and mammals to nest, den, roost, perch and feed upon the many insects present. Unless the snag presents a potential hazard around your home, play area or other structural property, let it stand and watch what happens. You will be amazed at how many kinds of wildlife use it.



Structures for wildlife

A great way to provide additional food and nesting habitat is to erect feeders and nest boxes. The most common feeders and nest boxes are for birds; however, many roost/nest box designs are available for mammals (such as bats and squirrels). You can cater to the species you want by using selective feeder designs and seeds. Most birds eagerly eat black-oil sunflower seeds and white proso millet. Some prefer specific seeds (such as the American goldfinch, which likes thistle seed). Other foods you might try include peanut butter squeezed into pine cones, fruit, nuts, *suet* cakes and jelly. Put out several types of foods—part of the fun is finding out who eats what! Hummingbirds use a different type of feeder — one designed to hold liquid. Hummingbirds like nectar, and you can make your own by using four parts water to one part sugar. Boil water before mixing well to dissolve sugar.



Beware of cats around your feeders, as they may kill the birds and mammals you are trying to attract. House cats kill hundreds of thousands of birds and small mammals while roaming around outside each year. For this reason, cats should be kept indoors—that is the only way to keep them from killing wildlife. House cats are NOT natural predators in our ecosystems. They were brought to North America from Asia and Africa. All *feral* cats should be reported to your local animal shelter for immediate capture and removal.

Water is an essential component of wildlife habitat, providing refreshment for thirsty animals as well as a place to splash and cool off. It is easy to provide water around your house by erecting a birdbath. It is important to keep the water in birdbaths fresh. Some folks even build small ponds in their backyards for wildlife to use.

Fisheries Management

Why manage a fish pond? Fertilized ponds produce four times as many pounds of fish as unfertilized ponds. Ponds with balanced bass to bluegill ratios yield more pounds of catchable-sized fish than ponds with unbalanced ratios—even if they both contain the same total pounds of fish. A pond's fish population is balanced when both predator and prey spawn every year, while predators control the numbers of prey so there is an adequate food supply, and both types of fish grow to harvestable sizes. Ponds without aquatic weeds tend to have better balanced bass:bluegill ratios, do not harbor as many mosquitoes (because fish can get to them better) and are easier to fish than ponds containing weeds.

There are six basic steps involved in establishing and maintaining a good fish pond. Follow these steps and you will catch more, better quality fish.

Pond Construction

It is a waste of time and effort to build a pond improperly. The first step in successful pond management is proper construction. One consideration is the pond to watershed ratio. (A pond's watershed is the land area around the pond that catches the rainfall that drains into the pond.)

Large streams should be diverted around fish ponds to prevent fertilizer nutrients and lime from washing away.

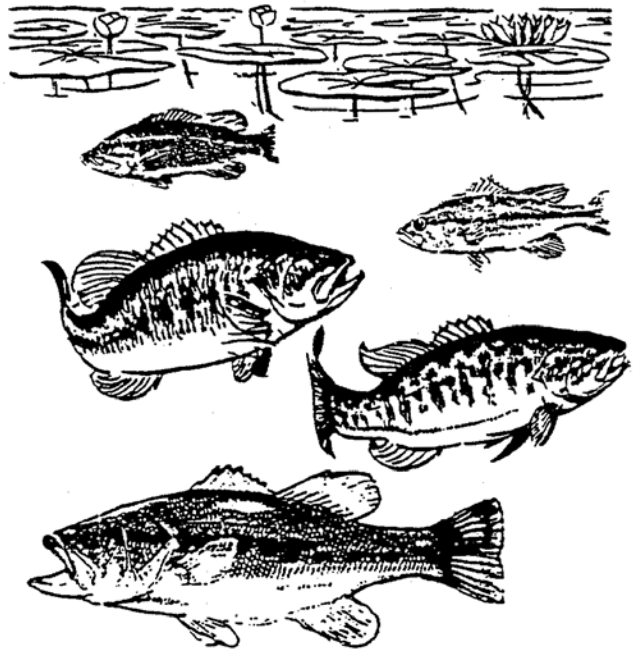
The plant cover on the watershed should be maintained in grass, shrubs and trees. The pond to watershed ratio should be adequate to maintain water levels but not so large that fertilizer, nutrients and lime wash downstream. Each surface acre of pond should have a watershed of 10 to 20 acres of pastureland or 30 to 35 acres of woodland. If the watershed is too large, a diversion ditch should be constructed around a portion of the pond to prevent excessive flow out of the pond during heavy rains.

Pond edges should be at least 2 feet deep to discourage growth of water weeds around the edge.

Other factors to consider in pond construction include the emergency spillway, drainpipe and dam. Advice concerning proper pond construction is available from the U.S. Natural Resources Conservation Service.

Eradication

It is important that a managed fish pond contain the proper ratio of recommended fish species. Successful fish ponds contain a balanced fish population with enough predator fish (bass) to keep prey fish (bluegill) under control. If there are too many bluegill (or other prey species), the population



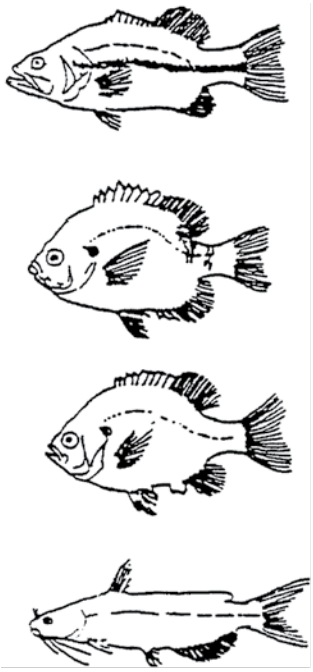
becomes unbalanced quickly and excess numbers of little bluegill limit the food supply—not leaving enough for them to grow to catchable-size. These thousands of tiny bluegill also prohibit successful bass reproduction. Further, the bluegill are unable to secure enough food to produce eggs. Thus, a pond should have all sizes of fish, including fingerlings, intermediates and adults.

For these reasons, it is important that the pond be free of all fish before the prescribed number of fish of the right species is stocked. Rotenone is the fish toxicant recommended to kill all fish in the pond before stocking. This toxicant (in concentrations recommended to kill fish) is not harmful to either man or livestock. It kills fish by constricting the capillaries in their gills so that oxygen cannot pass through,

and the fish suffocate. The killed fish should not be used for human consumption; however, livestock can safely drink water from the treated pond.

Stocking

For good fishing, follow the Tennessee Wildlife Resources Agency's (TWRA) recommended stocking rates for warm water farm ponds. In properly fertilized ponds, stock 500 bream per acre in the fall. Bream is a term used to describe several species of fish in the sunfish family. The 500 bream may be composed of bluegills only or may be divided into 375 bluegills and 125 shellcrackers (redear). The following spring, stock 100 largemouth bass fingerlings per acre. If catfish are desired in combination with bass and bream, 50 – 100 channel catfish may be stocked per acre.



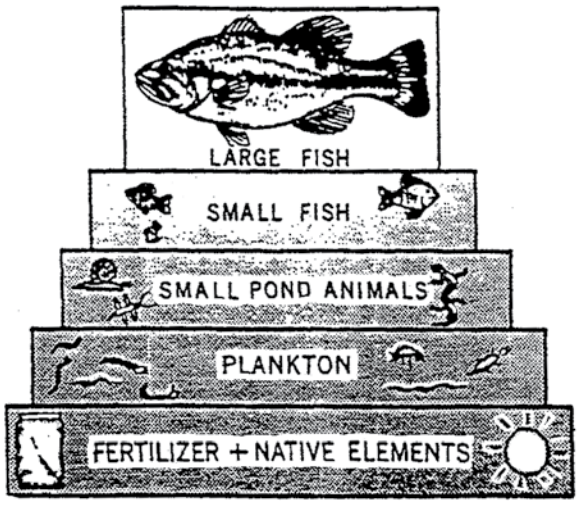
Channel catfish are not likely to reproduce successfully in bass-bream ponds. It is important that no other species of catfish be stocked, as most of them would reproduce and soon compete with the bass and bream.

IT IS VERY IMPORTANT TO STOCK ONLY THE RECOMMENDED SPECIES AT ONLY THE RECOMMENDED LEVELS.

Fingerling fish for stocking purposes are available through the TWRA. TWRA is now charging $100 per acre for bass and bream for pond stocking. Channel catfish fingerlings and Chinese grass carp can be bought from private hatcheries. Consult the TWRA, NRCS or your county Extension agent for application forms.

Fertilization

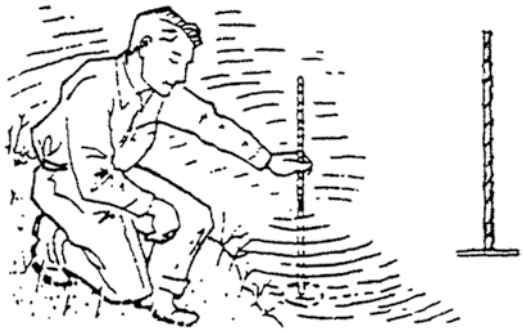
Fertilizing ponds increases the fish yield by making more food available. In an unfertilized pond with a balanced fish population, you can expect to harvest 50 - 100 pounds of fish per acre. Fertilization



starts a food chain — fertilizer provides nutrients for plankton (microscopic plants and animals); plankton provides food for insects (and other small pond animals); insects provide food for small fish; small fish provide food for larger fish; larger fish are harvested to provide food for man. You can expect to harvest 150 − 200 pounds of fish per acre from a properly balanced and fertilized pond.

Another reason for fertilization is to control submerged aquatic weeds. Fertilizer nutrients stimulate a plankton bloom, which makes the water appear greenish. A plankton bloom is composed of millions of microscopic plants and animals, suspended in water and thriving on the fertilizer nutrients. When the bloom is heavy enough, it prevents sunlight from reaching submerged weeds and they cannot grow.

Fertilizer can be applied anytime in warm weather when a white disc (*Secchi disc*) on the end of a stick can be seen 18 inches deep or deeper. To make a secchi disk, nail a paint-can lid to the end of a stick and cut a notch 18" from the lid.

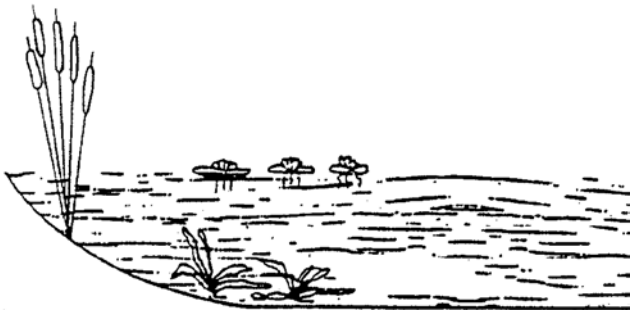


When fertilizing ponds, forty pounds of 20-20-5 per acre is recommended per treatment. This means you should apply 8 pounds of nitrogen, 8 pounds of phosphorus and 2 pounds of potash to each surface acre of water. 20-20-5 fertilizer is made especially for farm pond use.

Some ponds need liming with agricultural limestone. Liming makes the fertilizer nutrients more readily available. Mud from the bottom of the pond should be analyzed to get a recommendation on the amount of lime needed.

Weed control

If pond weeds provide excessive cover for bream, bass cannot adequately control their numbers. Bream soon overpopulate and fishing success for harvestable-size fish suffers.



Water weeds are divided into three groups:

1. **submersed** - bottom-rooted with stems and leaves underwater.

2. **emergent** - bottom-rooted with leaves on the water surface or above.

3. **floating** - not bottom-rooted and floating freely on the surface. Fertilization does not control these.

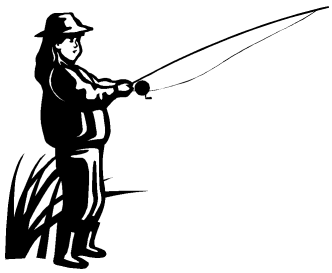
Excessive pond weeds can be controlled mechanically or with herbicides. Chinese grass carp stocked at 15 per acre provide biological weed control.

Proper fish harvest

There are three things to remember in harvesting fish from a well-managed fish pond:

1. Don't start fishing until the bass that were stocked have spawned. This is around June the year after stocking. When you can see or seine young bass, it's time to go fishing.

2. Don't over-fish. When a new pond is first opened to fishing, fish bite readily and you can get big catches in a short time. But removing too many fish too quickly upsets the preferred balance between bass and bream. Do not remove more than 150 pounds of bream and 30 bass per acre during the first year of fishing. In following years, 150 pounds of bream and all bass caught over 12 inches may be harvested. All bass under this size should be returned to the pond to grow and keep the small bream under control. Catfish may be removed as desired as they reach harvestable size.



3. Be sure to spread the harvest over the entire fishing season. The pond can be thrown out of balance quickly if the annual harvest is made in a short time. Also, mixed strings (both bass and bream) should be harvested. A good harvest ratio is 4 - 5 pounds of bream for each pound of bass.

Another consideration in successful pond management is to maintain cover in the watershed. A poorly maintained watershed (without plant cover) is subject to erosion, causing silt and muddy water to collect in the pond. Over a period of time, silt can fill in a pond.

Muddy water is unattractive, harmful to pond fish and interferes with photosynthesis. Good plant cover on the watershed will stop erosion. If the watershed is eroding, plant cover can be improved by disking, fertilizing and seeding grass, legumes and/or trees.

Wildlife Identification

Birds

1. American Kestrel

General Habitat Preference

Stages 2, 3 and 4 of plant succession for feeding and stages 5 and 6 for nesting. Large open areas where adequate nesting sites are available.

Habitat Requirements
Food: Primarily insects and small mammals associated with open areas.
Cover: Kestrels nest in tree cavities and other sites, including holes in cliffs and artificial nesting boxes.
Water: Kestrels obtain necessary water from their diet and do not need water for drinking.

2. American Robin
General Habitat Preference
Urban settings with large open areas and nearby trees and shrubs. Parks, golf courses and lawns in residential areas are favorites.
Habitat Requirements
Food: Insects and worms in warm seasons. Fruits and berries from shrubs and trees in winter. Generally, robins do not use artificial feeders.
Cover: Nesting sites and hiding areas in shrubs, evergreen trees and broad-leaf trees. Evergreen trees are preferred for early nests.
Water: Robins require water daily during warm seasons. They obtain water from yard irrigation, rain-filled gutters, low-lying areas, ponds, etc.

3. Broad-winged Hawk
General Habitat Preference
Continuous dry woodlands of oaks, beech, maples and other hardwoods mixed with conifers around lakes, streams and swamps. Stages 5 and 6 of plant succession.
Habitat Requirements
Food: Broad-winged hawks hunt from perches in deep, shady woodlands. They feed largely on small mammals, such as mice, moles, shrews and occasionally red squirrels and chipmunks. They also eat snakes, frogs, lizards, large moth larvae, caterpillars, grasshoppers, beetles, crickets, crayfish, small fish and some small birds.
Cover: These hawks nest near water in a variety of tree species — usually from 25 – 90 feet high, but sometimes as low as 3 – 10 feet. Sometimes use old crow, hawk or squirrel nests.
Water: Broad-winged hawks obtain necessary water from their diet.

4. Brown Thrasher
General Habitat Preference
Stages 3 and 4 of plant succession. Dense, woody vegetation associated with shrub thickets, hedgerows, shelterbelts, forest edges, riparian areas and young forests.
Habitat Requirements
Food: Invertebrates and plant seeds are the principal foods. Brown thrashers forage primarily on the ground and occasionally feed on fruits and berries in shrubs and trees. More food is available when there is more ground litter. The management practices listed under "Cover" usually supply sufficient food.
Cover: Nesting and hiding cover are supplied by dense shrubs with some trees. Brown thrashers will use areas that have only shrubs. They need a minimum of 2.5 acres of woody vegetation to support a breeding population.
Water: Requirements unknown.

5. Canada Goose (Breeding Habitat)
General Habitat Preference
Canada geese nest and rear young in or near stage 2 wetlands interspersed with some stage 3 wetlands. Wetlands containing 20 percent tall emergent aquatic vegetation and 80 percent open water are usually good habitat, as are riparian areas adjacent to rivers.
Habitat Requirements
Food: During the nesting season and summer, Canada geese prefer new green forbs and grasses. They also eat some aquatic insects and pond weeds.
Cover: Geese nest in a variety of places, such as mats of bulrushes, tops of muskrat houses, in trees, and most of all, on islands.
Water: Water is required as described above.
Potential Problems
In some areas, Canada geese have become a problem, causing damage to lawns, golf courses and winter wheat fields. Wildlife damage management may be necessary.

6. Common Nighthawk
General Habitat Preference
Stage 1, bare ground for nesting. Stages 2 and 3 of plant succession interspersed with areas in stages 4 and 5 of plant succession. Areas such as grasslands, open woodlands, cities and towns. In cities and towns, nighthawks are often seen flying over parks and other open areas in late evening and early morning.
Habitat Requirements
Food: Nighthawks eat flying insects captured on the wing. Flying ants, mosquitoes, moths and June bugs are examples.

Cover: Nighthawks do not build nests but lay their eggs on the ground — often gravelly or sandy — and on flat roofs of buildings. Riparian areas, ridge tops and other places with numerous sand and gravel areas are favorite nesting locations.
Do not disturb nests during nesting season (May through June). Stay off roof tops used for nesting.
Water: Nighthawks do not drink water often. They obtain ample water from their diet.

7. Eastern Bluebird

General Habitat Preference

Stages 2 and 3 of plant succession interspersed with stage 5 and 6 vegetation.

Habitat Requirements

Food: Insects and spiders make up a large portion of the bluebird's diet. A limited amount of fruit is also eaten. Bluebirds usually forage in open areas.
Cover: Nesting sites are in natural cavities and old woodpecker holes.
Water: Bluebirds obtain necessary water from their diet but will use other water sources when available.

Potential Problems

House sparrows and European starlings often take over bluebird nest boxes. Control of these species may be necessary.

8. Eastern Towhee

General Habitat Preference

Stage 4 of plant succession. Associated with a wide variety of shrubs.

Habitat Requirements

Food: Towhees forage on the ground, eating invertebrates such as ants, beetles, caterpillars and grasshoppers. About half of the diet is made up of seeds and the green foliage of forbs, grasses and shrubs.
Cover: Towhees use shrubs for hiding and protective cover. Nests are on the ground, usually under shrubs.
Water: Towhees obtain adequate water from their diet.

9. European Starling

General Habitat Preference

European starlings prefer older urban residential areas with large trees and shrubs. Most urban areas that have large trees or old buildings with holes and cavities are used.

Habitat Requirements

Food: Insects, fruit, seeds, human garbage including food scraps from restaurants, even dog and cat food. Starlings usually do not use artificial feeders.
Cover: They nest in tree cavities, old buildings and old houses and will use artificial nest boxes.
Water: They require water during warm seasons.

Potential Problems

Starlings were introduced to the United States from Europe and are considered pests because they are over-abundant and often out-compete native birds for available habitat. In such situations, the management objectives should be to reduce the quality and quantity of available habitat. Often, when their numbers are great, wildlife damage management is necessary to control them. When found competing with native bird species and in damage-causing situations, individual starlings, nests and eggs should be destroyed.

10. Grasshopper Sparrow

General Habitat Preference

Grasshopper sparrows typically nest in grasslands (stage 3 of plant succession) with less than 5 percent shrub cover.

Habitat Requirements

Food: Grasshopper sparrows eat insects of all types. As you might have guessed, grasshoppers are a favorite. In winter they eat forb (weed) seeds.
Cover: These birds prefer to nest in native warm-season grasses with abundant litter (residual vegetation from the previous year's growth).
Water: Grasshopper sparrows obtain necessary water from their diet.

11. Great Horned Owl

General Habitat Preference

Great horned owls occur in a wide variety of forested habitats, mainly stage 5 and 6 open forest or woodlands interspersed with areas of stages 2, 3 and 4, including orchards, farm woodlots and city parks.

Habitat Requirements

Food: Great horned owls prefer open areas near woodlands, such as marshes or meadows, for hunting. They consume an extremely varied diet but prefer small- to medium-sized mammals and birds. They also prey upon reptiles, amphibians, large insects and fish.

Cover: Great horned owls use the abandoned nests of hawks, herons or crows; large tree cavities; crotches; stumps; caves; and ledges.

Potential Problems

In rare instances, this species can cause damage to free-ranging poultry. Wildlife damage management may be needed.

12. Hairy Woodpecker

General Habitat Preference

Stages 4, 5 and 6 of plant succession are the best habitat. Hairy woodpeckers will use stage 3 if areas with mature trees are nearby. They also use wooded urban and riparian areas.

Habitat Requirements

Food: The majority of the hairy woodpecker's food is animal matter, such as ants, beetle larvae, caterpillars and adult beetles. Woodpeckers supplement their diet with fruits and nuts. They forage on a variety of places including tree trunks, stumps, snags, downed logs and the ground. Where adequate cover exists, food is usually not limiting.

Cover: Woodpeckers excavate holes for nesting in mature and dying trees and snags.

Water: Not limiting. These birds probably obtain necessary water from their diet.

13. House Finch

General Habitat Preference

Found in a wide variety of urban areas that have trees, shrubs and some open areas. Not as abundant in inner cities.

Habitat Requirements

Food: Soft fruits, buds and weed seeds. In the warm seasons, house finches eat some insects. They use artificial feeders of all types. Millet and sunflower seeds are favorites.

Cover: These birds prefer nesting sites on low branches of trees, on branches of bushes, in natural cavities, in old holes excavated by woodpeckers, and any projection or ledge they can find on houses and buildings. They prefer to place their nests from five to seven feet above the ground. The nest is built of weed stems, small branches and leaves.

Water: House finches require water daily in warm seasons.

14. House (English) Sparrow

General Habitat Preference

This non-native species is found in a wide variety of urban categories that have buildings, trees, shrubs and some open areas.

Habitat Requirements

Food: House sparrows eat a variety of insects, fruits, buds and weed seeds. They will use artificial feeders of all types. Millet and sunflower seeds are favorites.

Cover: House sparrows nest on low branches of trees, on bushes, in natural cavities, in old holes excavated by woodpeckers, and on any projection or ledge they can find on buildings or other structures. They prefer to place nests from five to seven feet above the ground. Nests are built of weed stems, small branches and leaves.

Water: House sparrows require water daily in warm seasons.

Potential Problems

House sparrows compete with native bluebirds, house finches and other birds for their habitat requirements. They are often a nuisance, and management objectives may be to reduce the quality and quantity of available habitat. Wildlife damage management may be needed in some cases. When they compete with native bird species and in situations where they are causing damage, individuals, their nests and their eggs should be destroyed.

15. House Wren

General Habitat Preference

In urban settings, house wrens prefer older residential areas with large shrubs and trees.

Habitat Requirements

Food: Spiders, grasshoppers, crickets, beetles, caterpillars, ants, bees, ticks and millipedes. House wrens rarely use artificial feeders.

Cover: House wrens nest in natural cavities in trees and in old buildings and other structures. They will use artificial nest boxes.

For specifics on nest box design and placement for house wrens and other species, visit your local Extension office and ask for the publication *Improving Your Backyard Wildlife Habitat* (PB1633).

Water: House wrens obtain necessary water from their diet.

16. Hummingbird

General Habitat Preference

Hummingbirds are found in or near mixed woodlands and forests rich in flowering plants. They prefer stages 5 and 6 of plant succession mixed with areas in stages 2, 3 and 4. In urban settings, they prefer areas with large trees and nearby flowering plants.

Habitat Requirements

Food: Nectar from flowers and the insects found on flowers. Hummingbirds require high-energy foods. Nectar is high in sugars that supply needed energy. Insects are an important source of protein.

Cover: Hummingbirds construct small nests on tree branches, usually 5 to 20 feet above the ground. Occasionally they build nests in secluded areas on houses and buildings. The nest is made out of leafy materials, lichens and spider silk.

Water: Hummingbirds obtain necessary water from their diet.

17. Mallard (Breeding Habitat)

General Habitat Preference

Relatively few mallards nest in Tennessee; however, preferred nesting sites include native warm-season grasses and shrubby cover. Mallards need open water (stage 2 of wetland succession) with associated emergent aquatic vegetation (stage 3) to raise young.

Habitat Requirements

Food: Aquatic plants and insects are common foods. Ducklings eat mostly aquatic insects. Most food is associated with wetlands.

Cover: Mallards nest in native warm-season grasses and associated forbs (sometimes they nest under shrubs) preferably within 1/2 mile of a wetland that provides open water with some adjacent emergent aquatic vegetation. After ducklings hatch, they use open water and adjacent emergent aquatic vegetation for protection from predators. Ideally, wetlands would have a minimum of 50 percent open water and 10 to 20 percent emergent vegetation.

Water: Mallards require and use water as previously described.

18. Mallard (Winter Habitat)

General Habitat Preference

Wetlands with open water, harvested grain crops, and riparian areas with open water.

Habitat Requirements

Food: Preferred foods include waste grain from agriculture, aquatic plants and invertebrates. Mallards will fly long distances to feed. However, the closer the food is to cover, the more valuable it is.

Cover: Mallards rest on open water bodies such as streams, rivers and warm-water sloughs that are not frequently disturbed.

Water: Mallards use water as described above.

Potential Problems

In some areas where mallards are fed by humans, large flocks of "tame" mallards can be a nuisance; therefore, wildlife damage management may be necessary.

19. Mourning Dove

General Habitat Preference

Stages 2 and 3 of plant succession with some shrubs and trees nearby. Mourning doves often feed in agricultural areas. Small areas of bare ground (stage 1) are also beneficial.

Habitat Requirements

Food: Waste grain from cropland and livestock feed lots and a variety of forb (weed) and grass seeds.

Cover: Mourning doves prefer tall shrubs and trees for nesting and loafing. Nests are made of twigs placed on branches of shrubs or trees. Nests are also placed on the ground.

Water: Mourning doves require water daily. They prefer shorelines and banks without vegetation. Where water is limited or absent, development of water sources is desirable.

20. Northern Bobwhite

General Habitat Preference

Stages 2, 3 and 4 of plant succession interspersed. Ideal habitat comprises weedy fields with native warm-season grasses well interspersed with low growing shrubs. Cropland planted to grains and well-interspersed, thinned woodlands are also used.

Habitat Requirements

Food: Young quail eat insects. Adult quail eat a variety of seeds, green vegetation (mostly forbs), insects and small grains.

Cover: Bobwhites need thick shrubs for hiding and roosting cover. Convert fields of non-native grasses (e.g., tall fescue, orchardgrass and bermudagrass) to native warm-season grasses and associated forbs.

Water: Bobwhites do not require freestanding water. They are able to obtain necessary water from their food.

21. Northern Flicker

General Habitat Preference

Open areas in stage 2 and 3 plant succession interspersed with areas of stage 5 and 6 plant succession. Northern flickers are often found in riparian and urban areas. They prefer older urban residential areas with large trees, golf courses and parks.

Habitat Requirements

Food: Ants are a favorite food and over 50 percent of their diet is insects. Northern Flickers also eat seeds, fruits and berries and are partial to the fruit of poison ivy. They usually feed in open areas.

Cover: Northern flickers excavate holes for nesting in softwood trees like poplar, cottonwood and willow. They prefer old, mature trees that show signs of dying or rotting. In treeless areas, they will nest in posts, holes in banks and holes in houses and structures.

Water: Not much is known about daily water requirements. They probably obtain sufficient water from diet.

Potential Problems

European starlings often take over flicker cavities for their own nests. Flickers can become a problem in urban areas where they may create holes in wood siding on houses or damage ornamental trees. Wildlife damage management may be necessary.

22. Northern Harrier (Marsh Hawk)

General Habitat Preferences

Stages 3 and 4. Northern harriers typically inhabit sloughs (shallow lakes next to a river), wet meadows, fresh or salt marshes, swamps, prairies and plains. They generally roost on the ground or perch on low objects such as fence posts or tree stumps.

Habitat Requirements

Food: Mammals, birds, amphibians, reptiles, insects and fishes. Northern harriers eat mostly small mammals and hunt for food while on the wing over fields, marshes and meadows.

Cover: Open country with herbaceous or low, woody vegetation for concealing nests. The northern harrier nests on the ground in tall grass, on a sedge tussock, willow clump, or over water on a stick foundation.

Water: They obtain necessary water from their diet.

23. Ovenbird

General Habitat Preference

Associated with stage 5 and 6 plant succession. Lives on or very near the ground.

Habitat Requirements

Food: Mainly insects (ants, caterpillars and beetles), slugs, snails and earthworms. Seeds and fruits are also occasionally eaten.

Cover: Ovenbirds nest on the ground. They construct a unique nest, which is arched over in the shape of a Dutch oven, out of grasses and weed stems. The nest is usually well hidden in herbaceous vegetation on the forest floor. This vegetation is also used for hiding cover.

Water: Ovenbirds usually obtain necessary water from their diet but will use other water sources when available.

24. Pigeon (rock dove)

General Habitat Preference

In urban areas, large buildings, nearby parks and open land are used extensively.

Habitat Requirements

Food: Pigeons forage on the ground. They readily eat waste grain and weed seeds. In urban areas they live mostly on human handouts.

Cover: They nest on window ledges, roof tops, bridges and a variety of structures.

Water: Pigeons require water frequently during warm seasons and are able to fly far enough to find it.

Potential Problems

Pigeons are non-native birds that have adapted well to human-altered environments, especially cities. In many areas, pigeons have become so numerous they are considered pests. In such situations, the management objectives should be to reduce the pigeon population as well as the quality and quantity of available habitat. Wildlife damage management is often needed.

25. Red-eyed Vireo

General Habitat Preference

Associated with stages 5 and 6 of plant succession. Red-eyed vireos inhabit open deciduous and mixed forests with a dense understory of saplings, wooded clearings or borders of burned areas. They are found in both upland and river bottom forests and sometimes in residential areas where abundant shade trees

1. American Kestrel

2. American Robin

W. Daniel Sudia

4. Brown Thrasher

5. Canada Goose

3. Broad-winged Hawk

W. Daniel Sudia

6. Common Nighthawk

W. Daniel Sudia

7. Eastern Bluebird

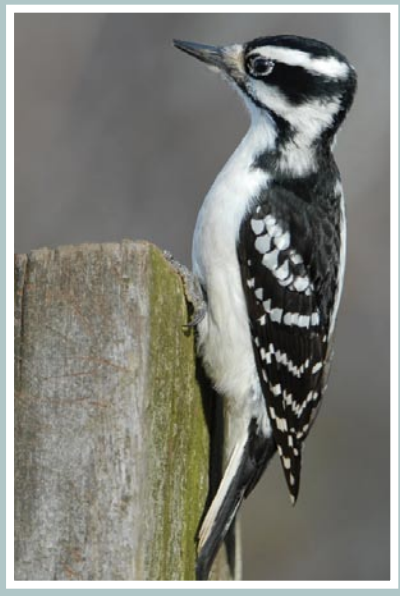
W. Daniel Sudia

8. Eastern Towhee

9. European Starling

James Giocomo

10. Grasshopper Sparrow



12. Hairy Woodpecker

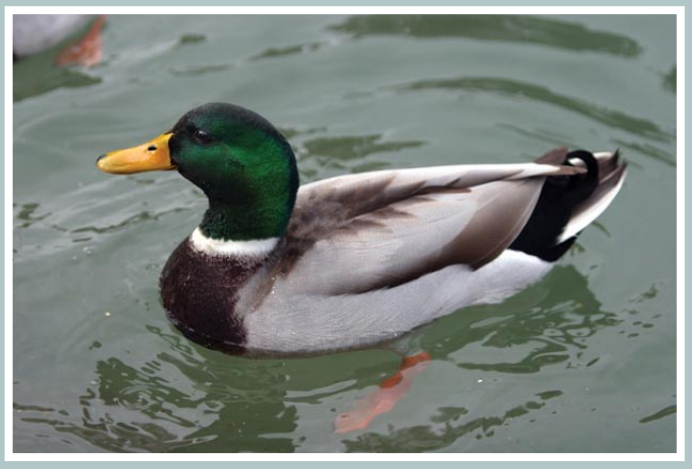
11. Great Horned Owl

13. House Finch

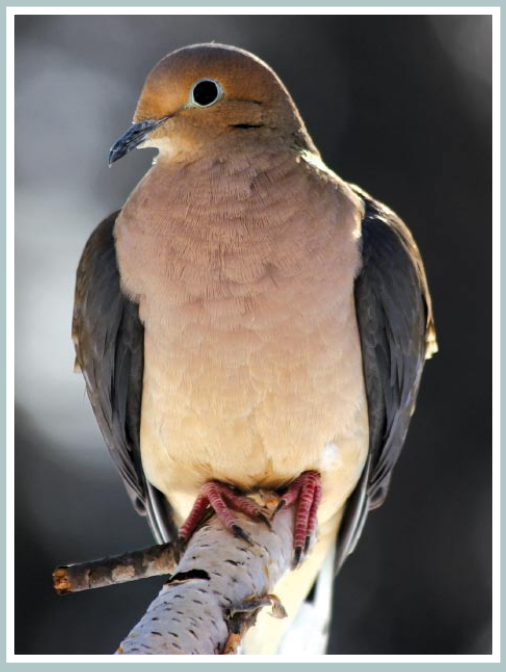
14. House Sparrow

15. House Wren

16. Hummingbird



17. Mallard



19. Mourning Dove

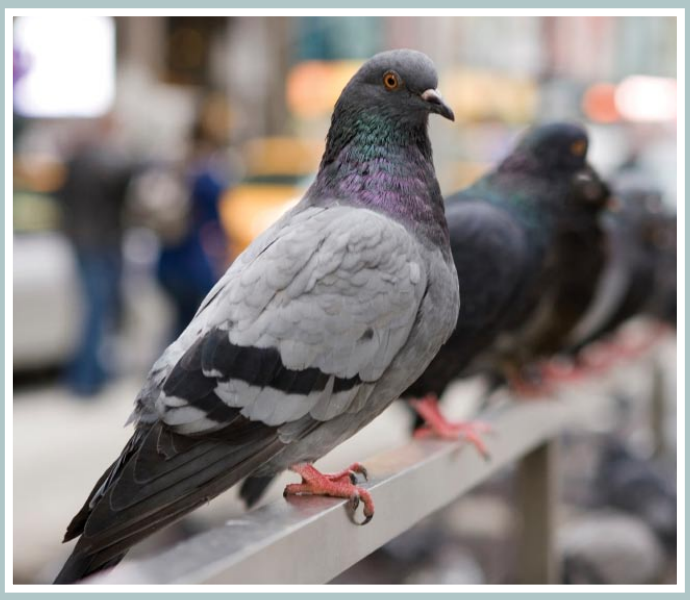
20. Northern Bobwhite

21. Northern Flicker

22. Northern Harrier (Marsh Hawk)

W. Daniel Sudia

23. Ovenbird



24. Pigeon (rock dove)

W. Daniel Sudia

25. Red-Eyed Vireo

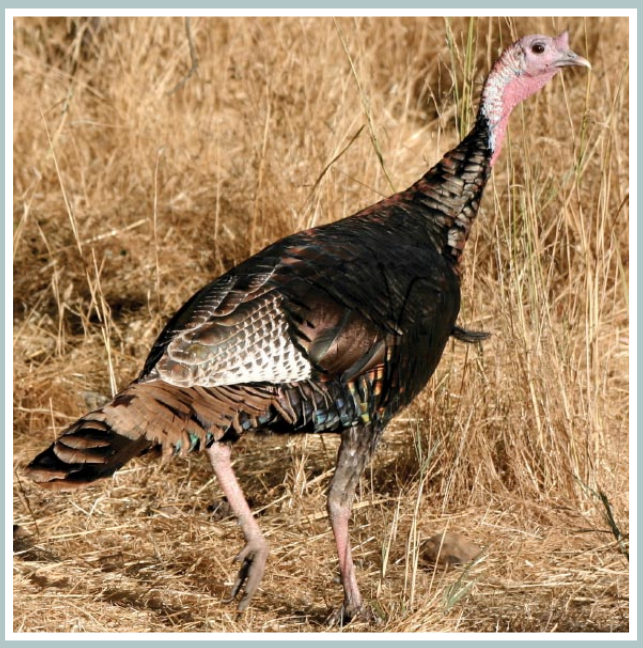
26. Redhead Duck

27. Red-tailed Hawk

28. Red-winged Blackbird

29. Ruffed Grouse

30. Song Sparrow



31. Wild Turkey

32. Wood Duck

33. Yellow-rumped Warbler

34. Beaver

35. Bobcat

36. Coyote

37. Eastern Cottontail

38. Eastern Fox Squirrel

39. Eastern Gray Squirrel

40. Mink

41. Muskrat

42. Raccoon

43. Red Squirrel

44. Elk

45. White-tailed Deer

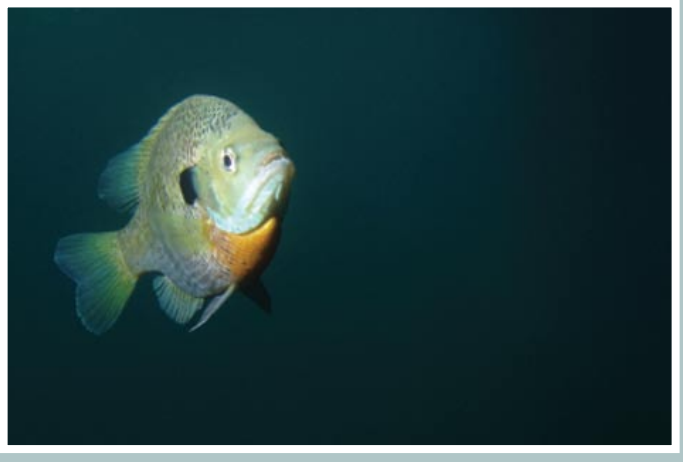
46. Bullfrog

47. Butterflies

48. Frog (leopard frog)

49. Largemouth Bass

50. Rainbow Trout



51. Bluegill

provide a continuous canopy. They are seldom found where conifers make up 75 percent or more of the basal area.

Habitat Requirements

Food: Mainly insects gleaned from leaf surfaces in mid- to upper-tree canopies. The red-eyed vireo also eats spiders, a few snails, wild fruits and berries.

Cover: These birds nest in deciduous or coniferous trees or shrubs. They suspend deep, cup-shaped nests from a horizontal fork of a slender branch, usually in dense foliage 5 to 10 feet above the ground but sometimes as high as 60 feet.

Water: Red-eyed vireos obtain necessary water from their diet.

26. Redhead Duck

General Habitat Preference

Stage 2 wetlands for most activities. Redhead ducks usually nest in emergent aquatic vegetation associated with stage 3 wetlands adjacent to stage 2 wetlands.

Habitat Requirements

Food: Redheads, and especially ducklings, eat primarily aquatic invertebrates (mollusks, snails, crustaceans) during late spring and early summer. During the rest of the year, they prefer aquatic plants such as pondweeds, muskgrass, bulrush seeds, wild celery, water lily seeds and coontail.

Cover: Redhead ducks build nests out of emergent vegetation. Nests are usually placed above water or very near the shore in dense vegetation that provides concealment.

Water: Redhead ducks require water as described above.

Note: Redheads are found in Tennessee only in winter during migration.

27. Red-tailed Hawk

General Habitat Preference

Open areas (stages 2 and 3 of plant succession) interspersed with trees (stages 4, 5 and 6 of plant succession). Single trees in open areas are often used.

Habitat Requirements

Food: Small mammals, such as ground squirrels, rabbits and mice, are the major food items. Some birds and reptiles are also eaten.

Cover: Nests are usually built 30 to 90 feet above the ground in the crotch or fork of a tree. Cliffs are used less frequently.

Water: Red-tailed hawks obtain necessary water from their diet.

28. Red-winged Blackbird (Breeding Habitat)

General Habitat Preference

Stage 3 wetlands dominated by emergent aquatic vegetation.

Habitat Requirements

Food: Red-winged blackbirds use waste grain and seeds of annual forbs in fall, winter and early spring. They eat a variety of insects in the summer. Many of the insects used for food are associated with tall emergent aquatic vegetation such as cattails, bulrushes, marsh grass and a variety of shrubs and trees.

Cover: These birds nest close to the ground or water in dense clumps of emergent aquatic or other herbaceous vegetation. They often roost (rest) in the same areas or in nearby trees and shrubs.

Water: Red-winged blackbirds frequent areas associated with water.

Potential Problems

This species can be a pest in agricultural areas where they may damage crops. In such situations, management objectives may be to reduce the quality and quantity of habitat. It is often more appropriate to manage for this species in urban wetlands and other areas where crop damage is not likely.

29. Ruffed Grouse

General Habitat Preference

Stages 4, 5 and 6 of plant succession. Optimum habitat includes all three stages interspersed in close proximity to each other.

Habitat Requirements

Food: Primarily buds, acorns, beechnuts, soft mast, and flowers and leaves of forbs. Young grouse eat insects.

Cover: Grouse prefer 6- to 20-year-old stands and mature stands with a dense midstory for cover.

Water: Grouse obtain necessary water from their diet.

30. Song Sparrow

General Habitat Preference

Open areas of stages 2 and 3 with nearby shrubs and small areas of stages 5 and 6. Often nest along forest edges.

Habitat Requirements

Food: Weed seeds and insects of all kinds. Artificial feeders of all types may be used.

Cover: Thick shrubs for nesting and hiding. The song sparrow nest, made of grass, leaves and weeds, is often placed on the ground under a shrub or in thick herbaceous cover.
Water: In warm seasons, song sparrows require water frequently.

31. Wild Turkey

General Habitat Preference

One-third to one-half of the turkey's home range in stage 6 of plant succession interspersed with one-third to one-half of range in stages 2 and 3 and one-eighth to one-fourth in stage 4 of plant succession.

Habitat Requirements

Food: Turkeys forage mostly on the ground for herbaceous plant seeds, nuts, acorns and insects. They also feed upon waste grain from croplands.
Cover: The nest is a shallow depression on the ground lined with leaves and grass. It is usually well concealed amongst vegetation or against some object (e.g., tree or log). Wild turkeys roost in trees at night.
Water: Wild turkeys will use free-standing water when available; however, they obtain necessary water mostly from their diet.

32. Wood Duck

General Habitat Preference

Shallow-water wetlands with emergent woody vegetation. Stage 5 and 6 forests shallowly flooded. Also stage 3 and 4 wetlands dominated by trees adjacent to stage 2 wetlands.

Habitat Requirements

Food: Acorns and other fruits of woody plants, some grain, seeds of several aquatic plants, and insects. Insects are especially important for young wood ducks.
Cover: Wood ducks nest in cavities in trees of flooded woodlands or adjacent to water. They use stage 2 and 3 wetlands with an abundance of aquatic vegetation to raise young.
Water: Water is required as described above.

33. Yellow-rumped Warbler

General Habitat Preference

Associated with stages 4, 5 and 6 of plant succession.

Habitat Requirements

Food: Mainly insects (ants, caterpillars and beetles) gleaned from branches and leaves of trees and shrubs.
Cover: These birds nest in both coniferous and deciduous trees. Occasionally they nest in shrubs. The nest is placed on small branches 10 to 30 feet above the ground and is made of twigs, bark strippings and weed stems. Trees and shrubs also provide hiding and protective cover.
Water: Yellow-rumped warblers usually obtain necessary water from their diet, but they use other water sources when available.

Mammals

34. Beaver

General Habitat Preference

Riparian areas in stages 4 and 5 of plant succession and wetlands with permanent water and a variety of shrubs and trees adjacent to the water.

Habitat Requirements

Food: Primarily the bark and wood of shrubs and trees, also some forbs and grasses. Beavers store shrub and tree cuttings in caches (piles of branches) for use during the winter.
Cover: Beavers construct lodges from sticks and mud or dig burrows in banks of streams and rivers. Beavers prefer slow-moving or still water with a constant water level. They build dams out of tree branches, shrubs and mud to form ponds, which stabilize water levels, slow water movement and provide shelter beneath the ice in winter.
Water: Water requirements are discussed under cover requirements. Water should be deep enough (5 feet) to allow free movement under the ice in winter.

Potential Problems

In some areas, beavers are a nuisance. Beavers can cut down trees people want to save. They often dam up ditches and streams in undesirable places, flooding cropland and causing trees to die from flooding. Wildlife damage management may be necessary.

35. Bobcat

General Habitat Preferences

Bobcats occur in a wide variety of habitats and are often associated with rocky outcrops (stage 1); semi-open farmlands (stages 2 and 3); brushy areas (stage 4); heavily wooded uplands, including the mountains; and bottomland forests (stages 5 and 6). Bobcats are nocturnal and seldom active in the daytime. The bobcat is classified as a furbearer.

Habitat Requirement

Food: Rodents (squirrels, chipmunks, voles, rats and mice), domestic poultry, rabbits, opossum, raccoons,

skunks, birds and snakes are preyed on by bobcats. Bobcats are capable of killing a mature deer, but most of the deer they kill are fawns. The bobcat is not a significant cause of deer mortality in Tennessee.
Cover: The importance of rockpiles or broken rocky ledges for bobcat dens is well known. Bobcats also use brushpiles, cavity trees and hollow logs as rest areas and birthing dens.
Water: Although water requirements are not well documented, bobcats are known to use free standing water. Much of their water requirement may be met by their diet.

Potential Problems

In some areas, bobcats can become too numerous and attack livestock and pets. To prevent this from happening, it may be necessary to periodically remove some bobcats. Bobcat pelts are valuable.

36. Coyote

General Habitat Preference

Coyotes are found throughout the continental United States. Coyotes have also been observed in large cities and urban areas. Stages 2, 3 and 4 are primary coyote habitats, particularly grasslands and areas where timberlands have been cleared for agriculture. Coyotes also use stage 5 and 6 forests. They den in a wide variety of places, including brush-covered slopes, steep banks, rock ledges, thickets and hollow logs. Coyotes may be active throughout the day but tend to be more active during the early morning and around sunset. Coyotes may live in packs, alone or in mated pairs.

Habitat Requirements

Food: Coyotes eat insects; rodents and other mammals (rabbits, deer, groundhogs, goats, cattle); persimmons, watermelons and other fruit; songbirds; and poultry. Livestock and wild ungulates (deer, elk, pronghorn) are eaten primarily as carrion. However, in some cases, coyotes have been known to prey heavily on deer and pronghorn fawns, limiting their reproductive success. In 16 studies, coyotes were responsible for 82 percent of all sheep losses caused by predation.
Cover: Coyotes are, perhaps, the most adaptable wildlife species on earth. They may use essentially any source of natural cover where prey might be found.
Water: Water requirements for coyotes are not well documented. Much of their water requirement should be met by their diet.

Potential Problems

In some instances, the predatory habits of coyotes can be a problem for wildlife managers and livestock producers; therefore, wildlife damage management may be necessary.

37. Eastern Cottontail

General Habitat Preference

Stages 2, 3 and 4 of plant succession. Ideal habitat would be one-third grassland, one-third cropland and one-third shrub cover, all interspersed. Eastern cottontails also use parks, golf courses and stream corridors in urban areas.

Habitat Requirements

Food: A variety of forbs and grasses are eaten from spring through fall. In winter, they often eat the bark of shrubs and trees.
Cover: Cottontails use thick shrub or herbaceous vegetation for hiding and resting cover.
Water: Cottontails obtain necessary water from their diet.

Potential Problems

When overabundant, they can cause damage to ornamental and garden plants and may require wildlife damage management.

38. Eastern Fox Squirrel

General Habitat Preference

Stages 5 and 6 of plant succession with interspersed small openings (stages 2 and 3 of plant succession). Riparian areas are important, and fox squirrels also use urban areas with lots of trees.

Habitat Requirements

Food: Fox squirrels spend much time foraging on the ground. They feed on a variety of nuts, acorns, seeds, mushrooms, bird eggs and, in places, corn.
Cover: Fox squirrels nest in cavities in trees or build a nest out of twigs and leaves. The nest is usually placed in the crotch of a tree over 30 feet above the ground. In areas where den sites are scarce, fox squirrels will use nest boxes.
Water: Water requirements are generally met by the food consumed. However, in late summer, this may not be adequate. In urban areas, provide a pool or pan of water if other sources are not available.

Potential Problems

Although problems are rare, fox squirrels can be a nuisance and cause property damage, thus requir-

ing wildlife damage management techniques in some situations.

39. Eastern Gray Squirrel

General Habitat Preference

Deciduous forests in stages 5 and 6 of plant succession.

Habitat Requirements

Food: Gray squirrels spend much time foraging on the ground. They feed on a variety of nuts, grains, acorns, seeds, mushrooms and buds.

Cover: Gray squirrels nest in cavities in trees or build nests out of twigs and leaves. The nest is usually placed in the crotch of a tree over 30 feet above the ground.

Water: Water requirements are generally met by the food gray squirrels consume.

Potential Problems

Gray squirrels commonly become nuisances and cause property damage. They may require wildlife damage management techniques in some situations.

40. Mink

General Habitat Preference

Mink prefer habitat associated with stream and river banks and the shores of a variety of wetlands.

Habitat Requirements

Food: Mink eat rabbits, mice, waterfowl, muskrats, fish and crayfish, depending on availability. They find most of their food in close association with dense vegetation along the shores of wetlands.

Cover: Mink use dens made in log jams, old muskrat burrows, rockpiles and under tree roots. The availability of den sites is considered to be a key factor in determining how many mink can use an area. Areas near shorelines with limited livestock grazing and lots of trees and shrubs usually have more potential den sites.

Water: Mink are found in association with water.

41. Muskrat

General Habitat Preference

Stage 2 and 3 wetlands interspersed.

Habitat Requirements

Food: Muskrats eat the roots, tubers and the green parts of emergent aquatic vegetation such as cattails and bulrushes.

Cover: Muskrats build lodges out of bulrushes and cattails usually in dense stands of the same plants. Muskrats rest on open shorelines, floating logs or on tops of lodges. They also make dens in banks.

Water: Muskrats need water, either sufficiently deep (4 feet) or flowing to allow free movement under the ice during the winter. During warm seasons, muskrats prefer water 1 to 2 feet deep, with around 20 percent of the wetland composed of open water, free of emergent aquatic vegetation.

Potential Problems

Muskrats are a common nuisance in wetlands managed for waterfowl and other wetland wildlife because they dig tunnels in dikes used to manage water levels. Wildlife damage management is often necessary.

42. Raccoon

General Habitat Preference

Raccoons are most abundant near water and in riparian areas and land adjacent to wetlands. They are also found in urban areas. They prefer areas interspersed with different successional stages. Riparian areas in stages 5 and 6 of plant succession are ideal.

Habitat Requirements

Food: Raccoons eat a wide variety of foods, including birds, eggs, fish, small mammals, insects, crayfish, grains, seeds, fruits, and foods prepared for both human and pet consumption.

Cover: Raccoons nest and rest during the day in natural tree cavities; dens in the ground; under brush and junk piles; in old, abandoned buildings; and on rocky cliffs and ledges.

Water: Raccoons require water frequently during warm seasons.

Potential Problems

Raccoons can become pests in urban areas and also in wetlands where waterfowl nesting is important. In such instances, the management objectives may be to make the habitat less suitable for raccoons. They are also major predators of quail and turkey eggs and broods. Wildlife damage management may be necessary.

43. Red Squirrel (Boomer)

General Habitat Preference

Stages 5 and 6 of plant succession.

Habitat Requirements

Food: Seeds of conifer trees, nuts, fruits, eggs and mushrooms.

Cover: Red squirrels nest in natural tree cavities or old woodpecker holes or build nests out of twigs, leaves and shredded bark. Nests are built on large tree limbs close to the trunk. Maintaining trees provides cover.
Water: Red squirrels require water regularly; however, there is usually an adequate supply of water where red squirrels are found.

44. Wapiti (elk)

General Habitat Preference

Stages 3 and 4 of plant succession intermingled with stages 5 and 6.

Habitat Requirements

Food: Perennial grasses are the primary food source, but elk also eat substantial amounts of forbs and shrubs.
Cover: Elk use thick shrubs and various types of forest cover for seclusion and calving cover.
Water: Elk use water regularly in the summer. Areas with water within one-half mile are preferred.

45. White-tailed Deer

General Habitat Preference

Stages 2, 3, 4, 5 and 6 of plant succession interspersed. Ideal habitat for white-tailed deer may include roughly 45 percent mast-producing hardwoods, 30 percent dense cover and 25 percent early successional growth, of which 2 to 5 percent may be in managed food plots.

Habitat Requirements

Food: Acorns, forbs, browse of certain plants and waste grain are favorite foods.
Cover: White-tailed deer use forests, brush thickets and tall grasses for hiding and travel cover. They also use tall emergent aquatic vegetation in riparian areas and brushy upland drainages for cover.
Water: White-tailed deer drink free water when it is available. A dugout water development may be appropriate if there is no standing water on the property.

Potential Problems

When overabundant, white-tailed deer can be a nuisance because they feed on crops, ornamental shrubbery and flowers and can seriously degrade habitat. Wildlife damage management may be necessary. Increasing bag limits for females can be essential for proper management.

Other Species (Amphibians, Fish & Butterflies)

46. Bullfrog

General Habitat Preference

Bullfrogs inhabit permanent bodies of standing or slow-moving water. They prefer shorelines with dense vegetation (stages 3 and 4 of wetland succession) that are adjacent to shallow open water areas (stage 2) dominated by floating and submerged aquatic vegetation. Bullfrogs prefer a soft mud bottom under unfrozen water for hibernation. All habitat requirements are often found in and around a single pond.

Habitat Requirements

Food: Major components of the diet include snails, insects, crayfish, other frogs, fish, reptiles, and occasionally small mammals and birds!
Cover: Bullfrogs use dense emergent aquatic and upland herbaceous vegetation adjacent to water for hiding and foraging.
Water: Bullfrogs need stable water levels for hibernation and egg development.

47. Butterflies

General Habitat Preference

In urban areas, butterflies are found in gardens, yards and parks planted with shrubs and flowers attractive to them. Butterflies often lay their eggs on a specific kind of plant.

Habitat Requirements

Food: Usually consists of sweet liquids such as nectar from flowers.
Cover: Butterflies need shelter from wind. Plant the above in areas sheltered from the wind.
Water: Some butterflies can be seen collecting on moist sand or mud around water puddles.

48. Frogs

General Habitat Preference

Weeds and aquatic vegetation on the edges of ponds, lakes and slow-moving streams. Mud bottoms are needed so frogs can bury themselves for hibernation during the winter.

Habitat Requirements

Food: Insects.
Cover: Thick herbaceous vegetation on bank or shore adjacent to water. Frogs also hide among floating vegetation in the water next to the shore.
Water: Frogs need water to hide in. If their skin is not kept moist, many kinds of frogs will dry up and die.

Potential Problems
Frogs can become so numerous that they become a problem in some areas. Vegetation control and other wildlife damage management practices may be needed.

49. Largemouth Bass/Bluegill
General Habitat Preference
Ponds, lakes and slow moving rivers.
Habitat Requirements
Food: Young bass eat insects and other invertebrates, such as worms, crayfish and zooplankton (microscopic animal life). Adult bass eat other small fish such as bluegill and a variety of minnows, tadpoles, crayfish and even ducklings. In addition, adult bass may eat small mammals (e.g., voles, bats) that accidentally get into the water. Bluegill eat a variety of zooplankton, insects, tadpoles, small minnows and crayfish.
Cover: Bass and bluegill are often found near submerged rocks, stumps, shrubs and near aquatic vegetation where small fish (used for food) hide.
Water: These fish require an adequate quantity and quality of water.

50. Rainbow Trout
General Habitat Preference
Cold-water lakes, ponds and fast-moving streams and rivers.
Habitat Requirements
Food: Trout eat primarily insects; they also eat snails, crayfish and smaller fish. The amount of available food is often related to the quality of water and available habitat for insects. In streams and rivers, many aquatic insects need fast moving water (riffles) high in dissolved oxygen along with a gravel or cobble bottom. Ideally a stream should have 50 percent riffles and 50 percent pools (slow moving water).
It is difficult to make riffles. Maintenance of riffles is important in streams with small amounts of them.
Aquatic vegetation provides habitat for insects in ponds and lakes. Some aquatic vegetation should be maintained (not over 30 percent of surface area).
Vegetation on banks and shores provides habitat for insects.
Cover: In streams and rivers, trout need pools for cover.
Water: Rainbow trout need high-quality water with specific characteristics: (1) dissolved oxygen — minimum of 6 parts per million (ppm); (2) pH should range between 6.5 and 9.0; and (3) water temperature should not exceed 70 degrees Fahrenheit at any time (one foot below surface in shade).
Test the water to see if it meets requirements. For ponds and lakes, these tests are especially important in the winter when ice prevents aquatic plants from receiving sunlight. Aerate to increase oxygen and decrease carbon dioxide.

Shooting Sports

The objective of the 4-H shooting sports program is to develop youth as individuals and as responsible and productive citizens fulfilling the 4-H mission statement by creating and sustaining positive youth development opportunities. Shooting sports also reinforce the 4-H slogan, "to learn by doing," because this is an active program that develops 4-H'ers personal growth through participation in **shotgun, traditional muzzle-loading and modern rifle, archery**, and **hunting** disciplines in a safe and fun environment. Each discipline will reinforce similar concepts of ethics and safety, while instruction and activities will vary.

Whether you are interested in exciting after school activities that you practice with friends or family members, want to improve technical skills for competition, or want to be better connected with the land by gaining a sense of stewardship and ethics through hunting, the 4-H shooting sports program is for you.

Safety, safety, safety
(applies to all disciplines)

Ultimately the shooter is responsible for his or her actions, own personal safety and the safety of every other person around. That is serious. Firearms do not think — the shooter has to control them. Shooting organizations promote a set of rules for safe firearms handling, which are often called "The 10 Commandments of Shooting Safety." In their most basic form, they include self-control, muzzle control, personal assurance of a "safe" firearm and trigger control. All the other rules are based on these. When in doubt remember (**M.A.T.S.S.**) Muzzle, Action, Trigger, Safety and Shells (for shotguns).

- **Muzzle**-Always keep the muzzle or broadhead pointed in a safe direction. Whether shooting, hunting or just handling a firearm, the muzzle must be kept under control. It should **never** be pointed at another human being, nor at anything you are not willing to shoot, destroy or kill. Your location and common sense will tell you which direction is safest under various conditions. It is usually safest to point the muzzle of a shotgun down range (into a safe shot-fa1l zone) or straight up.

- **Action**-Keep the shotgun empty with the action open and exposed except when preparing to shoot. Any firearm with its action closed should be considered loaded and ready to fire. The first act after picking up a firearm is to open the action and verify the gun is unloaded in both the chamber(s) and the magazine. Be absolutely sure. In order to keep the shooting range safe, all shotguns should have their actions open and exposed at all times except while firing. Except in the ball and dummy instruction activities, guns with closed actions should never be passed between people. Practice opening the action before passing any firearm to another person and insist that others do the same. Your life, as well as those of other people, is at stake.

- **Trigger**-Keep your finger off the trigger until you are ready to shoot. It is very tempting to place your finger on the trigger when handling a gun. This bad habit can be prevented by consciously avoiding it when handling firearms. The trigger guard protects the trigger and helps prevent accidental discharges. The finger should be placed along the trigger guard to reinforce this function. Placing your finger on the trigger of a firearm means the firing sequence has started. A sudden bump or startling noise could cause you to discharge the gun before you are ready. Be safe and stay clear of the trigger until you are ready to fire.

- **Safety**-Keep the mechanical safety on until you are ready to shoot. The safety should be on while transporting your firearm, setting up your shooting post, and until you have properly identified your target. Only turn your safety off if you are set to fire, or when your range safety officer tells you.

- **Shells (for shotguns)** -Make sure you are using the **proper ammunition** by checking the caliber or gauge on both your firearm and ammunition. Use of longer shells in any chamber not designed for them is very dangerous. Check the shotgun chamber before selecting ammunition. Another hazard is the potential of one gauge of ammunition lodging in the bore of a larger gauge. Three deadly combinations exist: 16 gauge in 10 gauge, 20 gauge in 12 gauge and 28 gauge in 20 gauge. This hazard can be avoided by making sure you carry only shells for the gun you are shooting at the time and never mixing gauges of shells.

The golden rule of firearms safety is to **treat every firearm as if it were loaded. This applies even if you have personally checked and are sure the gun is unloaded**. Shooting safety means you must pay attention to detail and be responsible with firearms at all times. By handling unloaded guns with the same respect as a loaded one, you will establish good gun handling habits and will never have to say, "I thought the gun was unloaded." If other shooters refuse to follow these guidelines, refuse to associate with them in any firearms handling situation. They are unsafe and pose a danger to both themselves and to you.

Eye and ear protection

Eye and ear protection should be mandatory for all shooters, coaches and others on the range. The likelihood of an injury is relatively small, but the impact of such an injury can be serious. Stray or deflected pellets, target chips, gases and powder residue, and other foreign objects can damage your eyes. Wearing shooting glasses protects them. Many shooters combine eye protection with corrective lenses or tinted lenses that increase contrast, reduce light intensity or enhance vision in other ways.

The sound levels produced by any powder firearm can cause hearing damage. Hearing damage is usually gradual. You seldom notice the loss until it is serious. The damage is cumulative and permanent. Infrequent shooting when hunting may have little effect, but some shooters wear ear protection even while hunting. All authorities agree the damage from prolonged target shooting is a threat. Shooting without hearing protection is foolish. Inexpensive and comfortable hearing protection (ear plugs or muffs) is readily available. Some shooters use both plugs and muffs for added protection. Instructors often use electronic muffs so they hear better for firing line control.

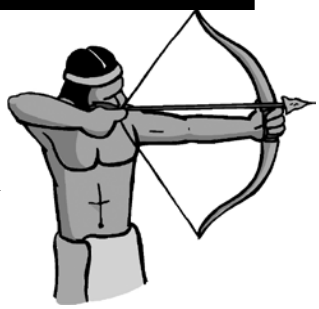
Always wear hearing protection on the range. Always wear eye and ear protection when appropriate.

Eye dominance

Whether shooting a firearm or bow, you must understand eye dominance in order to develop accuracy. Determine your eye dominance before you start shooting. Pick a partner and stand facing about 6 feet apart. Place one thumb over the other and cross your fingers over the fingers of the other hand, leaving a small triangle. Raise both hands together, keeping both eyes open and your head straight toward your partner. Look at your partner's nose through the opening. The partner should note which eye can be seen through the opening. Now, keeping the nose in the opening, bring your hands slowly back to your face. Your partner should watch for any "cheating," where your hands wander from eye to eye. The eye that your hands return to is your dominant eye. Now switch roles and try it again. Do not be concerned if your dominant eye is not on the same side as the hand you write with.

In archery, your best shooting will occur when the dominant eye is on the same side as the drawing or string hand and the "off" eye is on the same side as the bow hand. All directions will be given using those terms. The handedness of the bow is determined by holding it as you would when shooting. The sight window is on the opposite side of the bow from its handedness. That is, a right-handed bow (for a right-eyed shooter) will have the sight window cut into the left side of the bow and be held in the left hand. Once you have selected a bow that is appropriate to your eyedness, discuss its parts with your partner. If you need help, ask a parent or junior leader for assistance or advice.

Archery Discipline

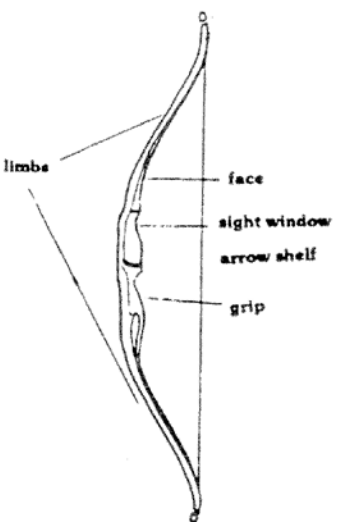


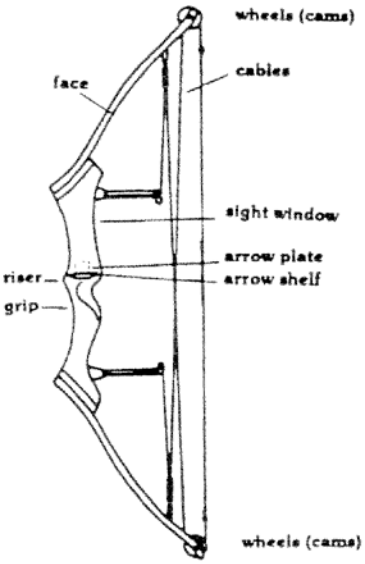
Archery can be enjoyed by all ages because the requirements are few. A new archer can be shooting fairly well within a short time, if he or she has the benefit of a planned approach to developing the basics of form.

Parts of archery tackle

Bow

A bow consists of a handle or *grip*, a center section (*riser*) and a pair of *limbs*. The bow hand grips the bow here. Just above it is a cut out area known as a *sight window*. The sight window is on the left hand side of the bow for right-handed shooters and vice versa for lefties. The *arrow shelf*, at the bottom of the sight window for conventional bows (recurve and longbows), is used to support the arrow. Modern bows use an arrow rest, positioned just above the shelf. The side of the sight window is called the *arrow plate* (sometimes adjustable). The limbs and riser are usually solid fiberglass, graphite or laminated





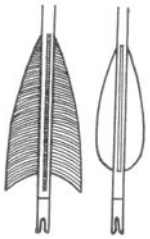
glass and hardwood. Conventional bows have nocks at the end of each limb to hold the string in place. Compound bows have wheels or cams at the tips of the limbs. They also have *cables* and some other items not found on the conventional bows. The *face* of the bow "faces" the shooter, while the part toward the target is called the *back*.

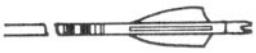
Bow string

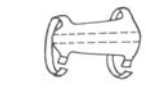
Almost all modern bow strings are made from a continuous strand of Dacron (string material looped several times). Thus, if one strand of string breaks, the entire string is useless. Most strings have loops on both ends to fit the string nocks. Those loops are protected by windings of heavy thread (servings). Part of the serving is usually monofilament to protect from wear. The middle serving has a *nocking point indicator* (metal, plastic or thread) to locate the arrow in the same place on the string every time.

Arrows

Arrows are tubed projectiles made of wood, fiberglass, graphite or aluminum. The stiffness, or spine, of these shafts is matched to the *draw weight* (strength) of the bow. The end of the arrow that is placed on the string has a *nock*, a notch, to hold the string. The other end has some type of point to penetrate the target. Target points are usually conical or bullet shaped. *Field points* usually have an elongated, thinner tip than the main body of the point. *Broad heads* usually have two or more cutting edges. Several other types of points are also available, but they are used by more advanced archers.







Near the nock, the arrow is equipped with a *fletching* to help with stabilization during flight. Usually the fletching consists of three feathers or plastic vanes. The fletching may be straight, slightly angled or swirled around the arrow. *Flu-flu* arrows have massive amounts of fletching to limit the flight distance of the arrow.

Accessories

Beginners need a few other items to be fully equipped. An *arm guard* protects the bow arm. It should be worn on the inside of the arm between the wrist and elbow to reduce the pain of string slap (usally an indicator of poor shooting form). Archers use finger tabs (for beginners), shooting gloves or mechanical releases on the string hand to hold the string in place. The tab is worn on the inside of the index, middle and ring fingers. Most tabs have a split that lines up between the index finger and the middle finger to permit split finger shooting. A single finger attachment is used on the middle finger of the shooting hand usually. Many types of *quivers* are available, but at first your coach will be "the quiver," handing you the arrows one at a time.

Imperative safety tips

Arrows produce very little shock (hydrostatic shock) on impact, but they penetrate much more effectively than rifle bullets. Unlike firearms, archery equipment has multiple points of potential danger to the user or persons standing nearby. The point of the arrow, the arrow's nock, the tips of the limbs, the nocking point indicator and the string and/or cables of the bow all are capable of producing an injury. Faulty, inadequate or mismatched equipment can also pose a threat to safety.

Bows and arrows can be dangerous penetrating weapons or safe, exciting and entertaining recreational arms. The difference lies in the mind and the control of the user. While the arrow remains on the string and the string is in your fingers, the arrow is under your mind's control. When the string is released, your control ends and the *laws of physics* take over.

Rifle Discipline

Parts of the rifle

Rifles, like many other firearms, are composed of three basic elements: an *action*, a *stock*, and a *barrel*. The stock functions as a grip or control element and helps to direct and distribute *recoil* energy. The

action contains mechanical parts responsible for cocking, loading and firing the firearm. The barrel is a launching tube for the projectile.

Action

There are many different types of actions and *calibers*. Many of the most popular actions are bolt, lever and semi-automatic. Bolt actions are known to be the most accurate. A *bolt* action or *breech block* may be involved in cocking the trigger mechanism, but its main function is to lock the cartridge in place and to firmly support its base. The *trigger* is a lever that releases the firing mechanism, causing the rifle to fire. In powder-burning rifles, the trigger releases a firing pin or hammer that strikes a primer, setting off the chemical part of the shooting process. In air guns, it releases the air charge to drive the projectile. The safety mechanism is another obvious and important part of the action. Like other mechanical devices it can fail, or break.

Stock

The grip on the stock provides a secure surface for the dominant hand and helps to locate and position the trigger finger. The remainder of the butt stock serves several functions. The *comb* supports the face and helps to align the eye with the sights. The butt supports the rifle on the shoulder and helps to distribute the recoil energy.

Barrel

The *forend* or *forearm* is supported by the non-dominant hand and provides support for the barrel and aids in directing it toward the target. The barrel is designed to contain the great pressures generated when a rifle is fired. On the action end of the barrel, a specially shaped opening, called the *chamber*, is designed to house a specific cartridge. The muzzle is where the bullet exits. The cylindrical hole between the chamber and the muzzle is the *bore*. The rifle bore has set of spiral ridges (lands) and grooves (rifling) that cause the bullet to spin, giving it greater stability in flight.

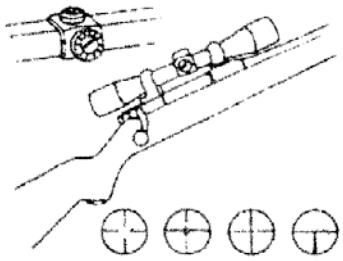
The barrel is fitted with sights serving as reference points, which help align the eye with the bore, so that the shooter looks where the bullet is going. Many different types of sights exist, but all of them serve the same basic purpose.

Optical sights come in several varieties. *Aimpoint* devices superimpose an electrically generated aiming dot on the target. While they are popular with some pistol shooters, relatively few are used by rifle shooters. *Laser sights* project an aiming dot onto the target. Although they are used by some police and military agencies, the shooting public rarely uses them. Most shooters use a *telescopic sight* when they elect to shoot with an optical sight. These optical sights eliminate the need for sight alignment and provide more precise aiming than other types of sights.

Rifle marksmanship

Sight Alignment

Once the bore and the eye are aligned, the bore can be pointed at a desired point of impact. With metallic sights, the shooter focuses on the front sight. The front sight is then positioned properly in the rear sight, keeping the front sight in sharp focus and allowing both the rear sight and the target to be slightly blurry.



Sight Picture

A *sight picture* is a properly aligned set of sights in relation to a target. Proper sight alignment is essential for developing a sight picture. Once the sights are properly aligned, they are moved as a unit into proper position relative to the target. Initial use of a gun requires "sighting-in," or adjusting sights to hit a target at a certain distance.

Trigger Control

Trigger control simply means learning to press the trigger directly to the rear in a smooth motion with constant pressure and without disturbing the sight alignment or sight picture. Proper trigger control requires that the only change in hand pressure be the straight-back push of the trigger finger on the trigger.

Precision

As you learn to shoot, do not be concerned with the point of impact as much as with the consistency (precision) of your shot. The size, or area, of the group of holes made in the target gives evidence of consistency (ability to hold a pattern). As long as your shots are on the paper, the location is not important.

Muzzleloading and Black Powder Discipline

Muzzleloading is primitive firearm shooting and is a lot more complex than shooting cartridge firearms. Returning to an earlier level of technological development in shooting demands more of the user.

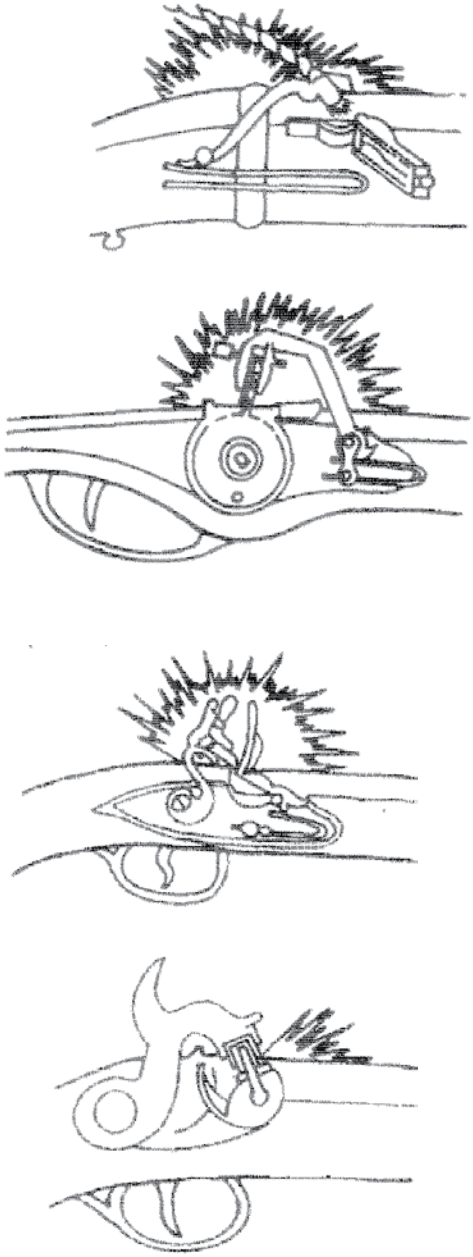
Parts of muzzleloading arms

People often use the phrase "lock, stock and barrel" to describe an entire thing. That phrase originated from muzzleloading firearms. The *lock (action)* consists of the *hammer* or *cock*, several springs, a *tumbler* and *sear*, and a *bridle* to hold the other parts in place. The hammer is driven by the main spring. The sear is controlled by the trigger and a sear spring. Flintlocks add a *frizzen spring.* The tumbler may contain a *fly* when set triggers are used. The stock provides the handles for the firearm similar to modern firearms.

The barrel is similar to the barrels of other firearms except that the breech is closed by a plug. The arm is loaded through the *muzzle*, and the load is pushed down (with a *ramrod*) firmly against the breech. The *breech plug* is threaded firmly against the barrel. At the rear of the barrel, a threaded insert continuing the *flash hole* (flintlocks) or a nipple arrangement (percussion) channels the spark into the powder charge.

Blackpowder and Pyrodex (propellants)

Black powder and its more recent substitutes, *Pyrodex* and 777, are the only types of powder that should be used in muzzleloading firearms. Smokeless powders should **NEVER** be used. Smokeless powders generate pressures that are much too high for the open systems found in muzzleloading arms, and their use may have catastrophic results.



Percussion caps (primer)

Percussion caps are open cups of copper, or a gilding metal, containing a small amount of pressure sensitive explosive. Several compounds may be used to provide the spark, but all of them are explosive. They are sensitive to both pressure and heat, and they are all damaged by exposure to water or oil. Percussion cap sizes are not standardized among

manufacturers, but usually rifles use size 10 or 11 caps (209 for hunting). The cap should fit snugly on the *nipple*. **Always** check the rifle to determine the type of cap to be used. Since the caps are exposed to the pressure of their own firing plus that of the main charge going off, the lightly constructed metal cup may come apart during firing. The potential for flying cap fragments and the blow-back of gases from the nipple or flash hole increase the need for adequate eye protection when shooting muzzleloading firearms.

Imperative safety tips

(This is ONLY an introduction to muzzleloading safety and should not be considered as a complete safety course or certification.)

A number of additional safety concerns are associated with loading a muzzleloader. Since the shooter is loading from the muzzle, care is essential. The shooter should minimize the exposure of hands, face and body during the loading process. The muzzle must be pointed away from the body. The ramrod must be handled with the minimum exposure of the hands necessary. Finally, the shooter should **NEVER** blow down the barrel to make sure the barrel is clear. This is extremely hazardous and places a vital part of the body directly over the muzzle. Remember, **NEVER** point a gun at something you do not intend to shoot.

Since black powder burns explosively, the amount of powder exposed should be minimized. A powder measure separate from the flask, or horn, should be used to transfer powder from the stock container to the firearm. Loading should **NEVER** take place from a stock container. It is equivalent to holding a bomb. To reduce the potential for an accident, seal or cover the stock container before pouring the powder into the barrel.

Sources of sparks should also be minimized. Smoking should never be permitted around gunpowder, especially black powder. Powder containers should be located so shooters will not be firing over them. A spark from a muzzle is also dangerous. Shooters should also be careful to use only non-sparking tools and equipment around black powder. Tools may be made of brass, copper, horn, wood or similar materials. Finally the shooter should make sure there are no lingering sparks in the barrel from the previous shot. Swabbing the barrel between shots with a moistened patch reduces fouling, eases loading and snuffs out any sparks that remain.

The projectile must be firmly seated on the powder. If not, it forms a barrel obstruction and poses a danger to the shooter and bystanders. Seating problems may be avoided by frequent cleanings. A clean barrel loads more easily than a fouled one and reduces the potential for a stuck load. A shooter should **NEVER** attempt to clear an obstruction, including a lodged ball, by firing. Either seat the bullet completely or remove the stuck projectile properly. Marking the ramrod provides a ready check on seating. Bullets should be seated firmly, but they should not be pounded into place.

Before attempting to use any muzzleloading/blackpowder products outside this camp, please contact your local 4-H agent for complete safety training on muzzleloading as there are additional concerns that are not covered in this manual.

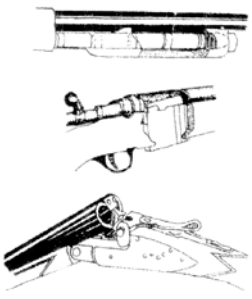
Shotgun Discipline

Shotgun design and shape are similar to that of rifles. However, the shotgun usually fires a large number of *pellets*, called shot, instead of a single bullet. Once the shot leaves the barrel it spreads out forming a *pattern*. The pattern is the area covered by the spreading pellets, increasing the likelihood of hitting the target.

Parts of the shotgun

Modern shotguns are made up of three basic groups of parts: action, stock and barrel.

Action



The moving parts that allow you to load, fire and unload the shotgun are called the action. Most of these parts are housed in a metal frame called the *receiver.* There are many different types of actions; among the most common are hinge, *bolt*, pump or slide, and self-loading or *semi-automatic*.

In nearly all cases, the action cocks a shotgun by compressing a main spring that drives the firing pin, or hammer. The spring-loaded hammer locks in place until released. Loading is done by opening the action and placing a shot shell into the chamber (or a loading port) at the breech end of the barrel. Then the shell is locked in place with a bolt or breech block as the action is closed. Operating the action on many shotguns requires you to activate a button or lever called the *action release*. The trigger is the lever pressed to fire the shotgun. It is surrounded by a *trigger guard* to help prevent accidental firing.

Some types of shotguns have a *magazine*, a part of the action that stores additional shot shells until they are ready to be used. Operating the action ejects the fired shell and loads a fresh one into the chamber. Some bolt-action shotguns have clip-fed magazines, but most shotgun magazines are tubular and located immediately below the barrel.

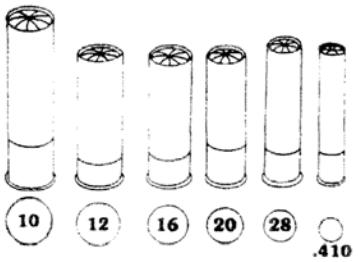
Stock

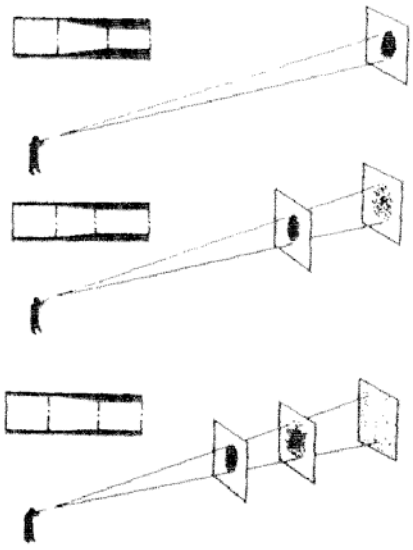
The stock is the shotgun's handle. It helps you hold and shoot the shotgun comfortably and accurately. Each part of the stock performs a function for the shooter. Stock designs affect shot placement, accuracy and shooter comfort. Most shotgun stocks have two sections, divided by the receiver. The rear part that fits the shoulder and supports the shooting hand and the cheek is called the butt stock. The part that supports the forward hand is called for forend, forearm or fore stock. Understanding the parts of the stock and how each part influences the behavior of the shotgun aids in shooting more comfortably and accurately.

Barrel

The barrel is an elongated tubular platform that sets the course for the shot. The breech end of the barrel holds the unfired cartridge. The opposite end, where the shot emerges is the muzzle. Most shotgun bores (inside of the barrel) are smooth because there are many projectiles. However, some shotguns are designed to shoot a single "*slug*," or *sabot*, and therefore have rifled barrels.

Today most shotguns are manufactured in one of six standard bore diameters (gauges). A gauge is determined by the number of bore-diameter lead





balls that could be cast from one pound of lead. Thus, the smaller the gauge number, the larger the diameter of the lead balls and the shotgun bore. A 20 gauge shotgun (20 lead balls to the pound) is substantially smaller in bore diameter than a 10 gauge (10 lead balls to the pound). Modern gauges, starting with the largest bore, include 10, 12, 16, 20 and 28 gauge guns. The sixth standard boring is the .410 bore, the exception to the rule for shotgun sizes (410/1000 inch in diameter).

The *choke* controls how fast the shot will spread out after it leaves the muzzle. Increasing choke constriction (restricting area for shot to pass through muzzle) decreases shot dispersal (tighter pattern). Tightening the pattern increases the effective range of the shotgun. A shotgun with no choke constriction has a cylinder bore. Listed in order of increasing amounts of constriction the standard chokes include: **cylinder**, skeet, **improved cylinder, modified**, improved modified, **full** and extra full. (The ones in bold print are most commonly seen in field firearms).

Shotgun ammunition

Modern shotgun ammunition is composed of five basic parts. The case or shell is a container for the rest of the components. The initial spark is provided by the battery cup or shotshell primer (the same primer used in many modern hunting muzzle-loading rifles). Like other ammunition, shotshells contain a powder charge. The powder is separated from the shot or other projectile by a *wad column* of some type. Most shotshells carry a *shot charge*, but some are designed to use a single projectile, usually a rifled slug.

Imperative safety tips

Two potential **hazards** deserve repeated warnings. Using longer shells in any chamber not designed for them is very dangerous. Be sure to check the *chambering* of the shotgun before selecting ammunition. The second hazard lies in the potential for one gauge of ammunition to lodge in the bore of a larger gauge. Three deadly combinations exist: 16 gauge in 10 gauge, 20 gauge in 12 gauge and 28 gauge in 20 gauge. This danger can be avoided by making sure you carry only shotshells for the gun you are shooting at the time and by never mixing gauges of shotshells.

Hunting Discipline

What does hunting mean to you? Obviously, hunting is a broad topic. We can barely scratch the surface during this camp. However, you will learn about why we hunt, ethics and laws/regulations in Tennessee, safety issues, and honing skills that reinforce these concepts.

Why we hunt

There are many motivations for and satisfactions from hunting. They range from enjoying wild game as food and having the satisfaction of personally providing that food for a family to striving to acquire outstanding specimens of mature game animals as trophies. Regardless, the common theme for sport hunting is recreation. Sport hunting can reestablish a connection to our past and our survival instincts. In essence, it is a tradition that we honor by passing it down to others. Hunting is sometimes

vital to the survival of certain wildlife populations and to maintaining their habitats, and it can be used as a wildlife management tool.

Hunting ethics

Ethics are the moral principles that govern a person's or a group's behavior by defining right and wrong. Society at large may develop a code of ethics that defines what is proper, accepted or expected behavior. Individuals can also define personal codes of conduct. In hunting, these ethics, or moral principles, guide **the way hunters behave when nobody is watching** in situations where they must make decisions without the assistance of a referee.

Respect is most essential to ethical hunting behavior. **Self-respect** is the foundation upon which respect for others and for wildlife depends. Respect for **others includes** respect for other hunters, for **landowners**, for **non-hunters** and even for **anti-hunters**.

Hunter responsibilities

Most sport hunting is done on land that does not belong to the hunters. Hunting is a privilege — not a right — and can be taken away. Even if you hunt only on land that belongs to you, irresponsible behavior will result in the loss of the conditions that provide a successful and enjoyable hunting experience.

All hunters share responsibility for policing their ranks and helping other hunters become better. *Game laws* are enacted to protect both people and wildlife and to provide for equitable sharing of our wildlife resources. However, the hunter's responsibilities go beyond simply obeying laws. We have responsibilities to other hunters to avoid conflict by using proper hunting etiquette, to respect their privilege to hunt, to teach others about hunting and to respect them as fellow sportsmen. Perhaps more importantly, we must respect landowners who give us permission to hunt. In addition to leaving gates the way we found them, we must genuinely care about their land and offer to help take care of it. If you are denied access, accept it and move on to the next landowner.

In addition, every hunter is a representative for all hunters and for the sport of hunting. Therefore, like it or not, every hunter is responsible for maintaining a positive image of hunters and hunting in their communities. The vast **majority of people today are non-hunters**. Their opinions of hunting and hunters are based on their observations of hunter behavior, including our hygiene, dress, language, courteousness, etc. Showing non-hunters that we are a responsible and caring group will help ensure our future privileges to hunt. Oppositely, apparent disrespect for game like openly displayed carcasses or showing off gruesome details of the hunt, irritates many non-hunters and could sway them to become anti-hunters. Awareness of our appearance and our behavior helps to **improve impressions of hunters** everywhere.

Surprisingly to some, many hunters go out of their way to respect both anti- and especially non-hunters. While in disagreement on most issues, we still respect the anti-hunters' rights to their opinions by hearing them out and refraining from derogatory comments.

Of course, respect for wildlife and wildlife habitat is an integral part of our conservation efforts. *Fair chase* dictates that we regulate the actions of the hunter so wildlife has an opportunity to escape. Game laws and ethics help define fair chase and will vary among individuals and places. Another responsibility we have to wildlife is to hone our knowledge of target species and our skills for harvesting them. The ethical hunter must be able to **identify wildlife** species effectively, even under poor light conditions or while moving. In addition, **understanding animal behavior** increases hunter success, makes evaluation of hits easier and aids in the recovery of wounded animals. **Understanding the anatomy** (vital organs are your target) of game animals is a tremendous aid to proper shot placement and making quick, clean kills.

Wildlife laws

Laws, ethics and agreed upon codes of conduct are related but not the same. Some hunting laws come from ethics. Laws against wanton waste of game stem from the ethical demands that every effort be made to recover wounded game. Most hunting ethicists would agree that ethical hunting includes adhering to all wildlife laws. Wildlife laws are intended to promote human safety, the equitable sharing of a natural resource (wildlife), and ethical fair chase. **Sometimes, however, ethics and law conflict**. For example, swiftly finishing a wounded animal may conflict with trespass laws. Perhaps the solution to this dilemma would be not to shoot at an animal that is close to a property boundary. Spending enough time at target practice to improve your accuracy can also help avoid this dilemma. Please see the current "Tennessee Hunting & Trapping Guide" for specific regulations, bag limits and related information.

Imperative safety tips

Refer to your copy of "Today's Hunter in Tennessee: A Guide to Hunting Responsibility and Safety" for a complete safety guide or contact your local 4-H agent/TWRA personnel for information.

All of the **safety tips for the other shooting sports disciplines also apply to hunting. However, hunting involves many additional safety issues that go beyond the shooting range. Some safety issues like arms handling have special situations in the field that may be under the hunter's control or not.**

Arms transportation

Hunters must be concerned about handling firearms at home, on the range and in the field. Most hunters must transport their firearms to the hunting area in some type of vehicle. States differ significantly in their requirements for transporting firearms. Very few permit the transportation of loaded firearms in motor vehicles; and even where it is permitted, the practice is unsafe and unwise. Be sure to cover all aspects of firearms transportation law for Tennessee and neighboring states.

Field arms handling

Hunters carry firearms in many different ways, and most of those techniques are acceptable under some conditions. Most methods involve at least two points of contact between the firearm and the hunter to give a better grip.

Arms handling around obstacles

Hunters must also learn how to handle firearms when obstacles or rough terrain are encountered. A

fence is probably the most commonly encountered obstacle. Place the unloaded firearm on the ground, crawl through or under the fence, retrieve your firearm, and check it thoroughly for obstructions before loading. Where several people are crossing a fence together, safe, open and empty firearms can be passed from one individual to another. Most often, it is better to crawl under or through a fence than to climb it.

Elevated blinds present frequent opportunities for safety violations because climbing into the blind with a loaded firearm strapped on one's back is very tempting. **Resist!** The safe approach is to attach a hauling line (rope) to an empty firearm, lean the firearm against the backside of the tree or an open part of the blind, and climb into the stand. Use the hauling line to pull the firearm into the stand after you are securely established in the blind. Remember to check the bore for obstructions before loading.

Guns should be unloaded to traverse obstacles or dangerous terrain, like logs, slippery banks, slopes or similar challenges. They should be unloaded at the end of the day or at the conclusion of hunting a given cover.

Firing zones

In the excitement of shooting at game, it is easy for a hunter to swing a weapon too close to other hunters. Each hunter must know where his or her companions are and which areas permit safe shots or are off limits to shooting. Take the time to discuss each person's *zone of fire* to make sure that nobody makes an error.

Target ID and shot selection

The final element of firearm safety in the field involves target identification and shot selection. Since human control stops and chemistry and physics take over when the trigger is pressed, complete and absolute identification of any potential target is essential. Following this rule provides safety for people, livestock and non-game animals.

In contexts where camouflage is not a requirement for hunting success, blaze orange clothing makes the hunter more easily visible to other hunters. This helps responsible hunters avoid shooting at other hunters. On the other hand, bright colors can negatively affect success in many hunting situations like bowhunting, turkey hunting, waterfowling and dove hunting. Turkey hunters, for example, should **never** wear or use items in white, blue, yellow, orange or red because these are the releaser colors that say gobbler to excited hunters. The wave of a handkerchief or a glimpse of a sock top above the boot can cause a careless hunter to shoot without waiting for full identification. Remember that failure to see orange does not make a shot safe. YOU must think every shot through carefully to be sure of its safety.

Equipment Checking and Storage

A wise hunter includes equipment checks in his or her routine. In the field, every firearm should be checked thoroughly before it is loaded. One of the keys to keeping arms functional is proper cleaning. Storage is a matter of personal choice, but some standards should be recognized. In general, gun cases are not intended for long-term storage. Moisture, body salts, or other contaminants that are trapped in the case can cause contact damage to the firearm that will go undetected until the next time the case is opened. Usually, long-term storage should involve a cool, dry place where the firearm is safe from both damage and access by unauthorized persons. Regardless, guns and ammunition should be stored in separate locations, both with controlled access.

Glossary

action – the parts of the firearm that load, fire and eject the cartridge

action release – a device that unlocks the action; normally found on semi-automatic or slide-action firearms; also called a bolt release in some cases

antlers – a pair of bony structures protruding from the skull of deer, elk, moose and caribou; grown and shed annually; on males only (except caribou)

aquatic invertebrates – invertebrates associated with and found in aquatic habitats (such as flies and mosquitoes)

arm guard – protective device worn on the inside of the bow arm to keep the clothing out of the string's path and to protect the arm from abrasion by the string

arrow plate – lateral rest for the arrow; pad or part of the arrow rest holding the arrow away from the side of the riser

arrow rest – a device for supporting an arrow while it is at rest or being drawn

arrow shelf – the flattened area at the bottom of the sight window on bows with a center shot cutout

back – those parts of the bow pointing down range when the bow is properly held in shooting position

barrel – the tube that contains and directs the projectile [see also bore, chamber, rifling, muzzle]

bolt – 1) moveable locking device that seals a cartridge in the chamber of a firearm, usually contains the firing pin and a means of extracting cartridges from the chamber; 2) a quarrel, or arrow, for a crossbow

bore – channel through which the projectile(s) travel while in the barrel

bramble – any of the species of blackberries and raspberries

breech block – solid block of metal, either moveable or fixed in position, that seals or locks a cartridge in the chamber of a rifle or shotgun

breech plug – threaded plug that seals the breech end of a muzzleloader barrel

bridle – plate that holds internal working parts of the lock in place

broadhead – an arrowhead designed for hunting large game animals and to kill by hemorrhage

bushhog – a rotary mower mounted behind a tractor; primarily used to mow brushy, overgrown areas

cable – wire ropes used to provide mechanical advantage on compound bows and cammed limb bows.

caliber – diameter of a firearm bore measured in hundredths or thousandths of an inch or in millimeters

cam – 1) an eccentric wheel with changing radius around its perimeter; 2) eccentric wheel designed to prolong the peak draw weight of the compound bow, altering its draw force curve to increase its efficiency

carnivore – a meat-eater

carrying capacity – the maximum population an area can hold without causing damage such as over browsing; usually measured in number of animals per unit area

chamber – rear portion of the firearm barrel, shaped to hold and support a specific cartridge

chambering – v., milling or cutting the breech end of the barrel to the dimensions specified for the appropriate cartridge; n. 1) the process of cutting the chamber in a firearm; 2) the dimensions of the chamber on a firearm or the cartridge for which it was cut

choke – 1) a device or barrel structure designed to control the pattern of a shotgun, generally available in cylinder, skeet (or skeet1), improved cylinder, quarter choke, skeet 2, modified or half choke, improved modified, full and extra full; 2) the amount of choke present in a particular barrel

clearcut – a forestry practice that cuts all trees in a stand at one time

cock – "hammer" of a flintlock action

comb – upper edge of butt stock that comes in contact with the shooter's cheek

communities – the living components of an ecosystem; the animal community and the plant community together form the biotic community

conservation – the wise use of something; biologists act to conserve our natural resources

dart gun – a specialized gun used to immobilize animals by shooting a dart containing a drug

diversity – being distinct (or different) in kind; represented by different species

draw weight – force required to draw an arrow to the anchor point

early succession habitat – habitats that have been disturbed recently; vegetation usually represented by grasses and forbs

ecosystem – an area where living components (such as animals and trees) interact with nonliving components (such as soil, air, water, and sunlight)

edge – the contact zone where two habitats come together; may be hard or soft; a hard edge is distinct; a soft edge is gradual

ethics – a set of criteria that defines right and wrong

exotic – non-native; imported from some other area

face – 1**)** the belly of the bow, the part that faces the shooter when the bow is in shooting position; 2) a target

fair chase – to pursue game in an ethical manner; giving game a change to get away; allowing wildlife the opportunity to use their instincts to escape hunters

feral – refers to normally domestic animals that have escaped and gone wild

field point – a heavy point with a more or less elongated tip of smaller diameter than the body of the point, often designed to match broadheads in mass or flight characteristics

firebreak – a strip of land that has been plowed, disked or bulldozed to expose bare ground, thus limiting the spread of fire

flash hole – channel from the priming pan of a flintlock to the breech and main powder charge

fletching – feathers or vanes used to steer and stabilize the flight of an arrow

flu-flu – specialized arrow designed for limited flight distance and often used in shooting flying targets, game birds or small game; use spirally wound full-length feathers or six full-length feathers to slow arrow flight

fly – connecting arm in the lock of a muzzleloader

food chain – the step-by-step passage of food and energy through an ecosystem

food plots – patches of food planted specifically for wildlife to feed on

forbs – broad-leaved herbaceous plants; many are commonly referred to as grasses

forearm – front portion of a stock on firearms with a two-piece stock; forend or fore stock

forend – portion of a stock between the action and the muzzle, also called a forearm or fore stock

forest – a community of trees and associated plants and animals

frizzen spring – spring that holds the frizzen in place prior to firing and directs the spark into the flash pan

game laws – laws enacted to protect our wildlife resources, ensure fairness and protect human safety while performing hunting practices

greentree reservoirs – a forested area flooded in the winter and drained before spring — managed in such a way so the trees are not killed from flooding

grip – v., to grasp or hold the firearm or bow in a manner that enables the shooter to control the arm; n. 1) the stock or handle of a handgun; 2) the area immediately behind the trigger guard on a rifle, musket or shotgun

group selection – a forestry practice that cuts small groups of trees

habitat – the physical and biological surroundings of an organism

habitat management – the science, art and practice of managing habitats for various wildlife species

hammer – a spring-loaded striker that provides the force, directly or by transferring it to the firing pin, needed to detonate a primer, percussion cap, battery cup or priming compound in the rim of a cartridge

herbivore – a plant eater

home range – the area where an animal spends the majority of its life

horn – a structure protruding from the skulls of goats, sheep, antelope, cows, bison and rhinos; occur in both sexes; not shed

hunting – the art of pursuing game for food or sport; a necessary practice to manage several species of wildlife successfully

interspersion – the mixture of habitats in a patchwork pattern

invertebrates – animals without backbones (beetles, bugs, grasshoppers, spiders and snails)

juxtapose – to place adjacent to land-use practices – the way an area is being managed or used (such as different types of agriculture and forestry)

laser sight – sight that projects a laser dot onto the target

laws of physics – fundamental relationships describing mass and movement of objects and the interactions of those factors
limb – flexible portion of the bow from the riser to the tip
limiting factor – the factor needed for survival (such as food, cover, water or space) that is in least supply
lock – mechanical parts of a muzzleloader or other firearm
magazine – 1) part of a firearm where ammunition is stored prior to being inserted into the chamber for firing; 2) a controlled storage area for ammunition or components
mast – fruit from brambles, shrubs and trees; may be hard (acorns, beechnuts, hickory nuts) or
soft (persimmons, grapes, mulberries, blackberries, apples, plums)
muzzle – terminal end of the bore, opening from which the projectile or projectiles emerge
native warm-season grasses – those grasses occurring naturally, which grow during the summer and are dormant in winter. Examples for Tennessee include big, little and broomsedge bluestem; indiangrass; switchgrass; eastern gamagrass and siderats grama"
natural resources – substances found in nature that can be used by people and, therefore, have economic value. Examples include minerals, forests, water, fertile land, coal and petroleum
niche – the functional role of an organism in the area where it lives
nipple – a protrusion that holds a cap, which ignites a propellant in a muzzleloader
nock – 1) slotted device at the end of an arrow to receive the string; 2) slots in the ends of conventional bow limbs to anchor the string
nocking point indicator – device for maintaining the proper nocking point on the middle serving of a string, commercial and homemade types available
old-field – a grassy area or pasture (usually small in acreage) that has been left fallow (or allowed to grow into mid- and late-successional plant stages)
omnivore – an animal that can eat plant or animal matter for nutrition
pattern – cluster or cloud of projectiles fired from a shotgun using shotshells
pellets – 1) projectiles developed for use in pellet rifles and pistols, consisting of a hollow-based lead cup; 2) shooter's synonym for shot in shotshells
photosynthesis – the chemical reaction in green plants where solar energy converts carbon dioxide and water into oxygen and sugars
poaching – the illegal kill of wildlife
poult – a young turkey, grouse or quail
predator – an organism that depends on killing another animal for food
prescribed fire – the use of fire as a management tool for improving plant and animal communities
preservation – to protect from harm; in natural resources management, preservation implies protection without management, even if it is detrimental to the plant or animal community; see conservation
prey – an organism killed and eaten by a predator
producer – represents the trophic, or bottom, level of the food chain — green plants
Pyrodex – black powder substitute developed by the Hogdon Powder Company
quiver – device to hold arrows
ramrod – rod used for loading or cleaning firearms
receiver – part of a firearm to which all other parts connect; housing for the action, fire control and safety mechanisms
recoil – reaction of a firearm being fired, usually in the form of an abrupt backward movement
regenerate – to start a forest stand anew
regeneration – young trees occurring from seed, sprouts or roots after a timber harvest
resident – wildlife that stay in a local area year-round, permanently
rifling – spirally arranged lands and grooves that impart a spin to a projectile or modify the dispersal of shot
riser – central portion of the bow, including the handle, or grip
rocket net – a trap net that is propelled by canisters of gun-powder charges
sear – interlocking surfaces that hold a mainspring, hammer, firing pin or similar device in place until released by moving the mating surface
Secchi disc – a circular disc, usually quartered in black and white; used to monitor water clarity by lowering it in the water to measure the depth where it disappears

seed bank – seeds present in the top few inches of soil, waiting for optimum conditions to germinate and grow

semi-automatic (semi-auto) – self-loading firearm design in which some of the energy developed by the fired cartridge is used to operate the action; may be operated by gas or recoil

serving – windings placed on a bowstring to protect the string loops and the center portion of the string and to provide a smooth surface for a cleaner release

shelterwood – a timber harvest technique where part of the existing stand is removed; then, once the regeneration is established, the rest of the stand (called the overwood) is removed

shot charge – weight of shot in a shotshell

sight picture – combination of a properly aligned set of sights and a target

sight window – cutout area on a bow to permit the arrow a straighter path to the target and to permit the use of a sight

snags – dead, standing trees

spine – stiffness of the shaft, a feature of its materials, length, diameter, mass, wall thickness and accessories

stock – wooden or composite materials acting as a handle for a firearm

succession – the predictable, orderly change of vegetative growth following a disturbance

suet – animal fat; commonly cooked and melted down with various seeds, cornmeal and/or fruit added as a high-energy bird food in fall/winter

telescopic sight – optical sight with or without magnifying lenses, adjusted either internally or externally and containing a reticle, or sighting device

terrestrial – of, or pertaining to, land — as opposed to water

thinning – a silvicultural operation where a certain number or percentage of trees are removed from the forest to allow increased sunlight into the stand and help the remaining trees grow faster

trigger – lever used to release a sear and fire a firearm

trigger guard – protective device surrounding the trigger

tumbler – device in a muzzleloader lock that permits the hammer to fall on the firing pin

wad column – total array of wads in a cartridge or charge

wetland – an area with standing water or wet soils during part of most years; critical for many wildlife species

wildlife management – the art and science of managing wild animals as well as the habitats necessary for their existence

zone of fire – the danger area ahead of the muzzle; must be clear before any shooting equipment can be discharged safely.

PB1687-0.0M-0/00 R12-4910-056-000-00 07-0191