2024-25 Club Year

Alabama Wildlife Habitat Education Program (WHEP)

State Manual & Study Guide

ALABAMA 4-H
Alabama Cooperative Extension System

Extension
ALABAMA A&M & AUBURN UNIVERSITIES

4-H NATURAL RESOURCES ENVIRONMENTAL EDUCATION

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Introduction to Alabama WHEP

The Alabama Wildlife Habitat Education Program (WHEP) is designed to teach youth about native wildlife species: what they eat, where they live, and how to manage terrestrial and aquatic environments to meet their needs. Youth ages 9 to 18 are eligible to participate in WHEP through independent study or a local club. In addition to learning natural resource management, youth benefit from developing life skills and meeting other young people and professionals who have interests in natural resources.

The information in this manual may be used to teach concepts of wildlife management and to prepare youth participants for the annual statewide WHEP competitive event. By learning how to identify species, vegetation types, and quality habitat, we build the foundation for problem solving and everyday decision making in the wildlife management field.

Before making recommendations about wildlife management, it is important to know all possible information about the life requirements of the species for which the area is being managed. We provide basic information related to wildlife ecology and the life requirements (food, water, cover, shelter) of various wildlife species in the introductory sections of this manual.

Wildlife managers must be able to inventory and evaluate the present condition of habitat (i.e., vegetation types that provide the necessary food, cover, and shelter for a species) at a particular site, and then be able to explain the condition to landowners and other interested individuals. Once the inventory is complete, a decision must be made as to how to manage the environment to improve the condition. We define and detail relevant management practices in this manual that can be implemented to improve the habitat for certain wildlife species.

The on-site management recommendation activity (aka Wildlife Management Practices) provides experience with this decision-making process. Finally, the written management plan activities enable participants to explain and illustrate management decisions.

Youth who participate in Alabama WHEP are equipped with the knowledge and skills to pursue natural resources career pathways, engage in citizen science, and act as stewards of the environment. Participants are divided into two age divisions- Junior (ages 9 to 13) and Senior (ages 14 to 18). Senior level participants may be eligible to participate in WHEP at the national level.

History of the National Wildlife Habitat Education Program

The Wildlife Habitat Education Program (WHEP) began in 1978 under the direction of Drs. James L. Byford and Thomas K. Hill, Extension Wildlife and Fisheries Specialists, respectively, at the University of Tennessee. They realized the passion many youth have for wildlife and modeled the Tennessee 4-H Wildlife Judging Contest after the popular livestock judging contests. The program was immediately accepted throughout Tennessee. With support from the U.S. Fish and Wildlife Service, a conference was held in 1985 to explore the possibility of a Southern Region Program. The first Southern Region Invitational was held in 1987. In 1988, the second Southern Region Invitational was supported by the International Association of Fish and Wildlife Agencies, and a conference was held concurrently to discuss the possibility of a national event. In 1989, the first national event was held with the support of the U.S. Fish and Wildlife Service and the International Association of Fish and Wildlife Agencies.

In 1990-91, the program was expanded nationally, and this manual was produced with sponsorship by Champion International Corporation and the U.S. Fish and Wildlife Service. The manual was revised in 1998-99 to reflect 4-H leaders' suggestions over the years and to incorporate new information in wildlife science and management. The Ruffed Grouse Society, Rocky Mountain Elk Foundation, and the USDA Cooperative State Research, Education and Extension Service were added as sponsors of the manual revision. The manual incorporates the basic concepts originated by Byford and Hill with the addition of landscape regions across the United States, urban activities, and a wider array of habitat wildlife management practices and wildlife species. Since 1991, the manual has been revised as necessary to incorporate new information as knowledge is added through wildlife research. This process is important and highlights the need to always keep an open mind and strive to continue learning. Starting in 2010, FFA teams were invited to compete in WHEP. FFA teams and 4-H teams do not compete against each other, but rather against teams within each organization. The National WHEP Contest is open only to senior division (ages 14-18) 4-H and FFA members.

Learning the Material

The Alabama WHEP program and contest is organized into 5 components that we refer to as activities: Wildlife Identification, Wildlife Foods, Interpreting Wildlife Habitat from Aerial Photographs, On-Site Recommendation of Wildlife Management Practices (WMPs), and Written Urban Management Plan.

Learning the WHEP material requires time, dedication, and practice. This learning should take place through independent study and/or local wildlife clubs. Participants should first read about and understand the wildlife management concepts and terms section of the manual. This section is important because the WHEP activities build on the knowledge of these concepts and terms.

Once the concepts are understood, you can proceed to learn about individual species, the foods in nature that they rely on for their diet, identifying vegetation types and successional stages from an aerial view and on the ground, manipulating habitat to make it suitable for wildlife species, and making recommendations and writing management plans.

Learning the WHEP material should be fun. Adult leaders of clubs, parents, and assisting subject matter experts may use research-based videos, field guides, and other teaching materials to further learning. State wildlife biologists, Extension specialists and agents, and private industry professionals make good resources for helping to teach background knowledge and skills to youth participants.

Outside resources often aid in learning, but the Alabama WHEP State Contest content will come solely from the state manual and study guide. Please keep this in mind as you learn the material and prepare for the contest.

Alabama WHEP Contest Rules and Guidelines

All contestants should study this manual and be prepared before coming to the State event. Questions will not be allowed during the contest except for those related to contest procedure.

Contestants and Eligibility

The Alabama WHEP Contest is open to active members of Alabama 4-H who have been a member for a minimum of 90-days. Any youth in Alabama can sign up for 4-H for free in their county of residence (or an adjacent county) and may choose to participate in Alabama WHEP as an individual participant or through a chartered Alabama 4-H club that has experiential learning in regularly scheduled and planned meetings.

The Alabama 4-H club year begins on August 1 and ends on July 31. Age eligibility is based on the age of the youth prior to January 1 of the Alabama 4-H club year. To be eligible for 4-H, the youth must be 9 years old and not older than 19 years old prior to January 1 of the Alabama 4-H club year. The **Alabama 4-H Age and Eligibility Chart** will help families, volunteers, and staff to determine the divisions of 4-H membership.

Please Note: An individual or team may win the Alabama WHEP Contest only once during his/her 4-H and FFA career. For example, a team (or individual) may not compete as a 4-H team one year, then come back another year as an FFA team or individual.

Team Selection

Youth participants may participate in the state contest on their own as an individual representing their 4-H county, or as part of a team representing their 4-H county. The Wildlife Identification, Wildlife Foods, Interpreting Wildlife Habitat from Aerial Photographs, and On-Site Recommendation of Wildlife Management Practices (WMPs) contest activities are all performed individually (not working together as a team), and therefore, youth participants are able to earn individual 1st through 5th place awards for each. The Written Urban Management Plan is the only contest activity performed together with team members.

An official team consists of 3 or 4 youth participants. A county may have as many individual participants or teams as they choose as long as teams within the same age division are coached by different coaches and at different times and locations.

Code of Conduct

All participants are required to follow the **4-H Code of Conduct**.

General Contest Rules

Alabama WHEP Contest rules vary from year to year and are specified at the time that the contest for that particular year is announced. Youth participants should know and

understand all contest protocols and rules prior to participating in the state contest. The following are general contest rules that are subject to change:

1. All participants must provide their own pen or pencil and clipboard.
2. No electronic devices of any kind are allowed at the contest site.
3. No talking by participants will be allowed during the contest, except when working on the designated team activity or as directed.
4. Anyone caught cheating may be disqualified at the discretion of the State WHEP Planning Committee.
5. All adults, except contest officials, are required to be off-site at all times while the contest is in progress.
6. Participants will work independently on Wildlife Identification, Wildlife Foods, Interpreting Wildlife Habitat from Aerial Photographs, and On-Site Recommendation of Wildlife Management Practices (WMPs); the Written Urban Management Plan is a team activity.
7. Participant contest scoresheets will be submitted to a contest official immediately after completion of each activity.
    a. Official committee members and helpers will grade the contest scoresheets and analyze the results. Their decision is final.
    b. The team score will be the sum of the scores in the individual activities, plus the team score for the Written Urban Management Plan.
    c. After the event, individual and team scores may be made available to team leaders.
8. Distribution of awards is determined by the Alabama WHEP Planning Committee. Junior and Senior Division 4-H and FFA participants will typically be recognized as follows:
    a. Team Awards: 1st, 2nd, and 3rd places by age division
    b. Individual Awards: 1st, 2nd, 3rd, 4th, and 5th places for each individual activity by age division, as well as 1st, 2nd, and 3rd places for overall high individuals by age division
    c. All participants will receive participation ribbons

Introduction to Wildlife & Management

It is important to know basic concepts about wildlife habitat and how different wildlife species relate to habitat. Once you develop an understanding of these concepts, you can begin to make management recommendations and problem solve. Wildlife management is both an art and a science that deals with complex interactions in the environment.

For the purposes of this program, several assumptions and simplifications have been made to make the material more understandable. In actual management cases, trained, experienced professionals should assist you in making the proper decisions. We encourage you to look up the definitions of words or terms you do not understand in a dictionary, wildlife management or ecology textbook, field guide, or in the glossary found at the back of this manual.

First, let's think about the big picture. We need to know some basic but important terms like ecosystem, species, and habitat. An **ecosystem** is a combination of living (biotic) and non-living (abiotic) elements that interact. A living, or **biotic** community, includes all the plant and animal populations living in a defined area. These interact with the nonliving, or **abiotic**, resources like soil, air, water, and sunlight. Together, the biotic community and abiotic environment form an ecosystem.

The composition of a biotic community changes over time in response to factors such as climate (e.g., temperature and rainfall) and plant succession. Also, the size of the area involved when defining communities or ecosystems can vary. For example, there are populations of organisms associated with an ephemeral pond or seasonal pool of water in a forest that form a community.

Figure 1. Aquatic ecosystem with submerged vegetation and freshwater bryozoan

A **species** is a group of organisms having similar genetics that can breed with each other and produce fertile offspring. All of the species that we focus on in WHEP are **vertebrates** (having a backbone). Vertebrate animals are categorized as mammals, fish, birds, reptiles, and amphibians.

- **Mammals** are warm-blooded, give birth to live young, have fur or hair, and breathe with lungs
- **Fish** are cold-blooded, lay eggs, and breath with gills
- **Birds** are warm-blooded, lay eggs, have feathers, and breathe with lungs
- **Reptiles** are cold-blooded, most lay eggs, and breathe with lungs
- **Amphibians** are cold-blooded, lay eggs, and breathe with gills, lungs, and skin

Animal species that reproduce, grow, and originate in a certain region are considered **native**. Those that are introduced into a new area are considered **non-native**. Animals can be categorized as wild or domestic. **Wildlife** refers to untamed animals that live in a natural habitat where they provide for their own food and shelter needs and survive and reproduce. Animals kept in captivity by humans and bred for special purposes are considered **domesticated**.

Wildlife species that are managed for harvesting by humans for goods, recreation, or economic purposes are classified as **game species**. Species that are not traditionally hunted, fished, or captured are classified as **non-game species**. Those that bite or sting and inject toxins are **venomous**. Lastly, those that live on land are **terrestrial**, while those living in water are **aquatic**.

Figure 2. Copperhead is one of six venomous snakes found in Alabama

In Alabama, there are 62 native mammal species, 93 native reptile species, 73 native amphibian species, 325 native freshwater fish species, 420 native bird species, and many additional species that migrate and winter here. Our state bird is the Northern flicker, the red hills salamander is our state amphibian, largemouth bass is our state

fish, the black bear is the state mammal, the Eastern wild turkey is the state game bird, and the Alabama red-bellied turtle is our state reptile.

Figure 3. Eastern wild turkey is the state game bird

Habitat refers to the physical and biological resources that are required for survival and reproduction. The components of habitat are **food, water, shelter, and space**. Specific habitat requirements vary by species. For example, they each have specific dietary requirements that support their existence. Some species have similar habitat requirements while others are very different. For example, Eastern cottontails and Northern bobwhites both obtain their water from plants, they both eat grains and insects, and when food availability and shelter are good, they do not need a lot of space.

In contrast, Eastern gray squirrels and mourning doves have very different habitat requirements. They use different vegetation types for their food and shelter, and mourning doves require daily free-standing water while squirrels can generally obtain it through their diet.

Figure 4. Eastern gray squirrel

Some of the habitat components among wildlife species may be similar, while other components are not. For example, both Northern bobwhites and American kestrels require the same cover; but while bobwhites primarily eat various plants, seeds, mast, and insects; kestrels prey on other animals and insects. Thus, even though they may use the same type of cover, their habitat requirements are different.

Food is one of the key habitat components and understanding the diets of different species will help us to know how to manage different environments for them. A **food chain** involves the transfer of food energy from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member.

- The sun gives producer organisms (e.g., plants) the energy to make their food (converting solar energy to food by photosynthesis),
- which is then consumed by the first consumer (e.g., white-tailed deer, Eastern cottontail, Canada goose) or herbivore (plant-eating animal),
- which is then consumed by a carnivore (meat-eating animal) or secondary consumer (e.g., Eastern screech owl, gray rat snake, red fox) which transfers nutrients and energy to it,
- and then that animal can be consumed by a **predator** or scavenger species (tertiary consumer) such as a turkey vulture, American alligator, or human

Figure 5. The coyote is an example of a tertiary consumer

Any part of the food chain can be broken down by **decomposers** or detritivores like bacteria and fungi. A decaying plant, for example, will be broken down into nutrients that enrich the soil. This process supports the growth of more plants. Also, many animals fit into more than one group (e.g., an omnivore which eats both plant and animal matter) and some food chains are more complex than others. Different food chains interacting in an ecosystem create a **food web** or network of interconnected food chains. There are many different feeding relationships in a food web.

Where species find their food source is an important consideration. It is ideal to have all four habitat components in a smaller area than large. The **arrangement** or placement of their food, water, shelter/cover, and space must be appropriate for its needs. They are more susceptible to predators if they are exposed or far from their home shelter and will expend more energy the further they travel.

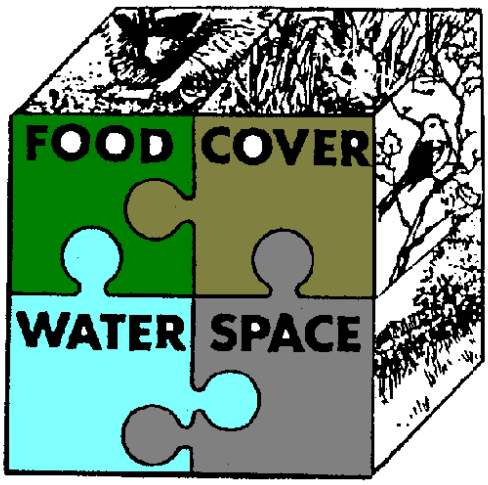

Figure 6. The spatial arrangement of the 4 habitat components influences a species' range

The entire area in which an animal lives is called its **home range**. For each species, the size of the home range depends on the quality of the habitat. If the habitat is high quality, they don't have to move around as much so the range is smaller. It is also possible for species to use a different area during different seasons. This is called **migration**.

For instance, birds traveling to wintering grounds. Bald eagles migrate south in late fall/early winter, leaving their nesting sites for feeding sites in warmer areas. This type of long migration requires available habitat along the route. This is important for wildlife managers to consider when planning for a particular species. A rubythroated hummingbird can migrate 2,000-miles from its breeding site to wintering grounds. Migration is common for other types of animals too- not just birds. Elk migrate from high elevations to low elevations each spring and fall due to changes in food availability. This is considered a short migration.

In the United States, there are many **public preserved areas** such as national and state parks, wildlife refuges, wildlife management areas (WMAs), and national forests managed for recreation and conservation that provide important habitat to native, non-native, and migratory species. In Alabama for example, there are 11 National wildlife refuges, 22 state parks, 34 WMAs, 4 national forests, and a National Estuarine Research Reserve (NERR).

Figure 7. Rubythroated hummingbird can migrate 2,000 miles to wintering grounds

When habitats for wildlife species are removed or significantly reduced, their populations are threatened or severely damaged. Development, infrastructure, changes in land use, pollution, and climate change are examples of such threats. The Endangered Species Act (ESA) was signed into law in 1973 to protect plants, animals, and their habitat (16 U.S.C. 1531-1544). Species that need protection under the ESA are categorized as either **threatened** or **endangered**. A threatened species is defined as “any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range”, in other words, those that are likely to be on the verge of extinction-where the species no exist (U.S. Fish & Wildlife Service, 2003). An endangered species is defined as “any species that is in danger of extinction throughout all or a significant portion of its range”, or those that are on the verge of extinction now (U.S. Fish & Wildlife Service, 2003).

Under the ESA, **critical habitat** is designated for threatened and endangered species for protection and recovery. The U.S. Fish and Wildlife Service determines which areas to designate based upon the habitat requirements of the species and how the area provides for its food, water, shelter/cover, and space.

The previously mentioned red hills salamander (Alabama’s state amphibian) was listed as a threatened species several decades ago and many conservation efforts such as land preservation, forest best management practices, and awareness have been made toward the recovery of the populations. **Fragmentation** of land (which affects the arrangement of a species’ food, water, shelter/cover, and space) contributed to the decline of the Eastern indigo snake which is another federally threatened species in Alabama. **Conservation** efforts such as land management practices like longleaf pine restoration and prescribed fire have been implemented in unfragmented areas (e.g., Conecuh National Forest) to increase suitable habitat for these snakes.

Figure 8. The Eastern indigo snake has been reintroduced in parts of Alabama

Our state reptile, the Alabama red-bellied turtle, is a federally listed endangered species found in south Alabama waters. The loss and degradation of its habitat, especially submerged aquatic vegetation, has posed great threats to its survival (U.S. Fish & Wildlife Service, 2013). The Alabama sturgeon is another aquatic species that is listed in our state as a federally endangered species. This rare species has been nearly wiped out due to recreational harvesting, flow and temperature changes due to river flow alteration from dams, and diminished water quality (U.S. Fish & Wildlife Service, 2013). Critical habitat for this fish was designated on portions of the Alabama and Cahaba Rivers (Endangered and Threatened Wildlife and Plants, 2009).

Species diversity refers to the number of different species present in an area and their distribution and abundance. **Species richness** refers simply to the number of different species present in an area. When thinking about species survival, it is important to understand that there are only so many animals that can live in an area. As we have already stated, the home range is the area in which an animal lives and the availability of food, cover/shelter, water, and space will influence where they are found. The **biological carrying capacity** refers to the maximum number of animals of a given species that an area can support before that species or another is negatively affected. Once the capacity has been exceeded, the population health will decline, and food sources for other species will be depleted. Quality and quantity of food, cover/shelter, water, and space is what determines the carrying capacity. In management, we can try to increase the one that is in shortest supply (limiting factor) and therefore increase the area's biological carrying capacity.

Biological carrying capacity varies from season to season and often from year to year. For most species, it is usually greatest from late spring through fall when food and cover are most abundant. This is when most young are born, which helps ensure adequate nutrition and cover are available for growth and survival. With the coming of winter or summer drought, food and cover gradually diminish. More animals are produced each year than will survive. Surplus animals are lost to predation, starvation, competition, or disease. Young wildlife and animals in poor health experience the highest mortality

rates. Hunting and fishing remove some animals and help prevent overpopulation for some species.

While the biological carrying capacity may be able to support a given number of animals, humans may demand that the density of certain animals be lower because of wildlife damage issues. The **cultural carrying capacity** is the number of individuals that humans can tolerate in their community, or the point at which human and wildlife conflicts (e.g., crop damage and vehicle collisions) increase. For instance, homeowners may have a low tolerance for white-tailed deer feeding on their expensive landscaping plants. The deer population would need to be reduced to limit the damage. In this case, the cultural carrying capacity is lower than the biological carrying capacity.

Figure 9. Wildlife damage to home landscaping by armadillos

Another consideration in wildlife management is whether the goal is to provide habitat for as many different species as possible, or to manage for a maximum number of individuals of a species. For instance, a landowner or wildlife manager may have an objective or concern about a particular or **focal species**. The first step is to determine the habitat requirements for the focal species and evaluate the capability of the area to provide. If one or more of the habitat requirements is in short supply or lacking, there are various wildlife habitat **management practices** that we can implement to improve the area's ability to supply the needed requirements (i.e., constructing a pond to provide a water source). It is usually best to address the most lacking habitat requirement that is limiting the population first. For instance, if a species requires trees for cover and nearby water but the area we are evaluating has plenty of trees but no water, a management practice that will supply water will improve the area more effectively than planting trees.

It is important to remember that management practices that improve habitat for some species will influence other species in some manner, whether it be positive or negative. For example, if you were interested in managing a deciduous forest for ruffed grouse

and planned to clear-cut the trees to improve its habitat, other species such as Eastern wild turkey, white-tailed deer, and Eastern cottontail may also benefit. However, species such as ovenbird, wood thrush, and Eastern gray squirrel which prefer unbroken mature deciduous forest will be forced to use a different area.

Figure 10. Ponds provide an important water source for many wildlife species

The protection and management of habitat for wildlife species is crucial not only to wildlife population survival, but also for maintaining healthy ecosystems for human health and the environment. We can do our part to secure a sustainable future through stewardship, citizen science, and advocacy. Learning about wildlife species and how to manage for them is important and exciting work. Our natural resources are state treasures that should not only be protected but celebrated and enjoyed.

The **North American Model of Wildlife Conservation (NAMWC)** is a good topic to review when thinking about the big picture and why we manage for wildlife. The NAMWC paved the way for the conservation and management of wildlife in the U.S. and Canada. Before we get into evaluating habitat and learning how to apply management practices, it is important to understand this history and how we got here. The premise of the model is that fish and wildlife resources belong to the people and should be managed in a sustainable way so that populations flourish. The guidelines that comprise this model have led to a successful conservation and management in our country:

1. Wildlife resources are a public trust
2. Markets for game are eliminated
3. Allocation of wildlife is by law

4. Wildlife can be killed only for a legitimate purpose
5. Wildlife is considered an international resource
6. Science is the proper tool to discharge wildlife policy, and
7. Democracy of hunting is standard.

In addition to the ESA, the Migratory Bird Treaty Act, Marine Mammal Protection Act, Wild Bird Conservation Act, Lacey Act, Federal Aid in Wildlife Restoration Act of 1937 (Pittman-Robertson), and the Federal Aid in Sport Fish Restoration Act of 1950 (Dingell-Johnson) are important laws that were passed to protect wildlife. While we do not test youth participants on conservation law, it is helpful to have a basic understanding of these types of laws and how wildlife governance and management practices are intertwined.

Figure 11. The bald eagle is an example of a species that is protected under the Migratory Bird Treaty Act and Lacey Act

Introduction to Wildlife Habitat

As we discussed in the previous section, **habitat** refers to the physical and biological resources that species require for survival and reproduction. The components of habitat are food, water, shelter, and space. Generally, habitat requirements are provided for more wildlife species when a variety of vegetation types are present. Across time and space, nature is always changing. In this section we will cover basic concepts and terms related to terrestrial and aquatic habitats and the role that **succession** or the orderly change in composition of species occurring in a particular area over time plays.

Plant succession is the changing of plant composition in an area over time. In areas where the temperature is really warm and there is a lot of rainfall, succession will happen more rapidly. In areas where there is less precipitation plant succession will happen more slowly. We typically will refer to the categories of progression through plant succession as **stages**. The stages of **plant succession on land** are as follows:

Stage 1: Bare ground
Stage 2: Annual grasses and forbs
Stage 3: Perennial grasses and forbs
Stage 4: Brushy cover, mostly shrubs
Stage 5: Young forest
Stage 6: Mature forest

Figure 12. Bare ground with very minimal plant growth is categorized as Stage 1

Figure 13. There are quick growing plants that do well in full sun and species diversity is low in Stage 2

Figure 14. Perennial grasses replace a lot of the annual grasses and forbs, and species diversity starts increasing in Stage 3

Figure 15. A mixture of shrubs and herbaceous plants are established (providing more food sources and habitats for wildlife) in Stage 4 as shrubs shade out some perennials

Figure 16. Tree species dominate, the canopy starts to close, and understory starts to open in Stage 5 as a young forest emerges

Figure 17. Many shrubs are shaded out and different canopy layers established as the final stage mature forest develops

It is important to remember that because succession is continual and one stage gradually develops into the next, sometimes it is difficult to distinguish one stage from another. So, you will want to consider what the dominant plants are in that area. For example, both annual and perennial grasses, as well as forbs are often present in early successional areas. Brushy areas often slowly develop into young forests, depending on the species present. If tree species dominate, the canopy is beginning to close, and the understory is beginning to open, it is a young forest. The structure is no longer representative of brushy cover. Is it a forest or a woodland? A savanna or grassland? These can be differentiated by tree density.

- A **forest** is defined as an area with more than 60-square feet of basal area (a relatively dense stand of trees)
- A **woodland** contains 20-square feet to 60-square feet of basal area (a lot of trees, but widely spaced apart)
- A **savanna** contains 5-square feet to 20-square feet of basal area (only a few trees, very widely spaced apart)
- A **grassland** has less than 5-square feet of basal area (very few, if any, trees)

When evaluating a woodland or savanna for wildlife habitat, we do not focus on defining the successional stage. Instead, consider the structure and composition of the plant community and whether it provides habitat for the wildlife species under consideration.

In a forest or woodland, there may be three distinct layers of vegetation: 1) **understory**- grasses, forbs, ferns sedges, shrubs, and young trees up to 4.5-feet tall, 2) **midstory**- shrubs and trees more than 4.5-feet tall but below the overhead canopy, and 3)

overstory- trees in the canopy. How the different layers of vegetation are arranged in relation to each other is important to many wildlife species. For example, the red-eyed vireo, a bird found in our deciduous forests that nests in the understory or midstory, but feeds in the middle to upper forest canopy.

Figure 18. Longleaf pine understory

The forest **structure** may vary dramatically from site to site, even within a given forest type. For instance, one mature oak-hickory forest may have a well-developed understory and midstory with visibility of no more than 20-feet, while another has very little understory vegetation and no midstory at all. Although they are the same forest type, these two forests would not necessarily provide suitable habitat for the same wildlife species. The structure could be manipulated on these sites depending on the objectives.

How different successional stages or vegetation types are situated in relation to each other is often referred to as **horizontal arrangement** or juxtaposition. While some wildlife species obtain all their habitat requirements from only one successional stage, many wildlife species need more than one successional stage to provide all their habitat requirements. For example, ruffed grouse may forage on acorns in mature mixed-hardwood stands during fall and winter but use young forest stands with high tree stem densities during this time for escape cover. Likewise, when a field with abundant forb cover is located near a field containing native warm-season grasses, distance from nest sites to brooding areas are reduced for Northern bobwhite.

Figure 19. Northern bobwhite is a popular managed game species in Alabama

Required successional stages must be close to each other to allow for safe travel to and from those areas. This is especially true for species with relatively small home ranges. The frequency of different vegetation types or successional stages within a landscape is called **interspersion**. Interspersion typically supports a greater diversity of wildlife, but the quality of the cover and the food resources they are providing is more important. In addition, increased interspersion is not necessarily beneficial to all species. As interspersion increases, so does the amount of **edge**, or area where two or more vegetation types or successional stages meet.

Figure 20. Native grasses provide quality cover for Northern bobwhites

The transition in vegetation types and/or successional stages can be abrupt or gradual. An example of an abrupt change would be where a hayfield meets mature woods. This type of edge has high contrast and is called a **hard edge**. An example of a gradual change would be where a 30-year-old forest meets a 60-year-old forest, or where an overgrown field with grass, forbs, and scattered shrubs meets a brushy area. Where these communities meet would represent a **soft edge**.

Figure 21. Hard edge from woods to pasture

The concept of edge is important in wildlife management. If there is increased edge, then there is increased interspersion of vegetation types or successional stages. This may be beneficial for a particular wildlife species if the types or stages in the area provide for a habitat requirement; if the arrangement of the types or stages is suitable and within the home range of the focal species; or if the specific vegetation types and successional stages for the focal species are in proximity.

Increased interspersion can also lead to increased species diversity as more vegetation types and/or successional stages are available and can potentially provide habitat requirements for a larger number of species. But it is important to realize the presence of edge is not always beneficial for any wildlife species. If the vegetation types or successional stages present do not provide any habitat requirement for the species in question, the interspersion and resulting edge is meaningless. Thus, if you were to look at an aerial photograph of the area and count the number of times two vegetation types or successional stages meet, that would not necessarily be a good measure of habitat quality for any particular species. In addition, some species may actually avoid edges and seek areas that are uniform.

Further, some species often found along an edge have been relegated to use the edge because the interior of the adjacent vegetation type is unattractive or does not provide any habitat requirement. For example, Eastern wild turkey and Northern bobwhite broods might be found along the edge of a field dominated by tall fescue or bermuda grass. The reason the birds are not in fields is not because they necessarily like the

edge, but because there are not suitable cover or food resources in the field, or the structure of the vegetation in the field is so thick at ground level the birds cannot walk through it. Thus, if the composition and structure of the field were improved to provide high quality, early successional cover, there would be as many birds in the middle of the opening as along the edge. As a result, there would be more usable space for the birds and the carrying capacity of the property would be increased. The edge is not what is necessarily important, but rather the composition and structure of the vegetation.

Fragmentation is the disruption of vegetation types either man-made or by natural processes. All wildlife species do not respond to fragmentation the same way. For some, the edge between a young forest and an older forest may fragment their habitat, while others may not respond to fragmentation except under extreme circumstances such as an interstate highway bisecting a forest or prairie.

Some species, like the grasshopper sparrow, need large unfragmented areas in a particular successional stage to provide all or some of their habitat. These are called **area sensitive** species. This means that they are absent from or rare in small patches of habitat, and more abundant within extensive areas of undeveloped land. For these species, large areas in one successional stage are desirable. Unfragmented habitat of at least 100-acres is considered the minimum requirement for many area sensitive species. The grasshopper sparrow may require a minimum of 1,000-acres of relatively unfragmented habitat to sustain a viable population. Others, such as the prairie chicken, may require 30,000-acres of relatively unfragmented habitat.

Some have large home ranges, whereas others must travel a considerable distance to meet mates. The northern goshawk, for example, does not inhabit small woodlots because it has a large home range and requires large, forested areas free from human disturbance. Many forest-dwelling amphibians also need large tracts of mature forest in which to survive and reproduce successfully.

In this section we have discussed vegetation types and plant succession. We described the progression from bare ground to mature forest, and the importance of vertical structure and horizontal arrangement of vegetation types and successional stages. In addition, we introduced concepts such as edge, interspersion, fragmentation, and how they affect species with different habitat needs. Now we will talk more about aquatic habitats.

Plant succession on water progresses from deep water with sparse vegetation, to solid ground with lots of vegetation:

Stage 1: Deep water with little vegetation
Stage 2: Shallow water with submerged and floating aquatic vegetation
Stage 3: Very shallow water or wet ground with emergent aquatic vegetation
Stage 4: Drier ground with upland vegetation similar to surrounding area

The amount of open water and vegetation is important in determining how suitable the habitat is for different wildlife species. For instance, young ducks need open water and **emergent** vegetation (rooted in the bottom with leaves and steams out of water) for hiding. **Floating** (free-floating) and **submerged** (grows completely underwater) vegetation supports large amounts of food high in protein such mollusks like snails and clams that young ducks need for fast growth.

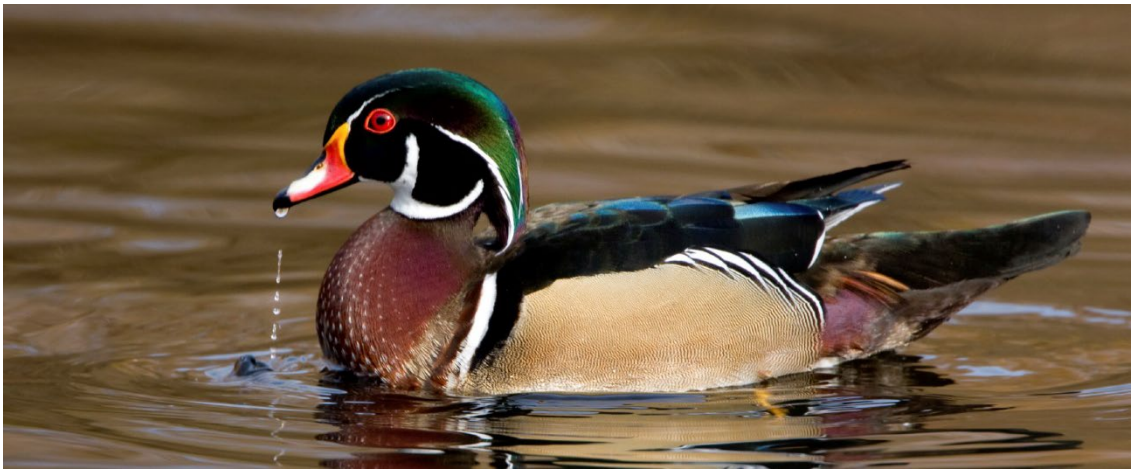

Figure 22. Small beaver ponds can provide good habitat for wood ducks

Wetlands can be described as the zone between deep water and upland habitats. They are characterized by various amounts of open water, aquatic vegetation and soil that is often wet or covered with shallow water. There are many different types of wetlands including beaver ponds, potholes, playas, manmade ponds, small lakes, marshes, rivers, streams, and swamps.

Grass and grass-like vegetation such as cattails, bulrushes, saltgrass, cordgrass, saw grass, sedges, arrow grass, shoal grass, eel grass, and wild rice are examples of emergent aquatic vegetation found in wetlands. Water lilies, pondweeds, wild celery, water milfoil, duckweeds and coontails are examples of floating and submerged aquatic vegetation.

Wetlands with stable, non-flowing water levels go through successional stage of vegetation development similar to those found on adjacent upland areas. The open-water areas fill with silt and dead vegetation, allowing emergent aquatic vegetation to become dominant. As the wetland continues to fill, it becomes drier, allowing upland vegetation to become dominant.

The vegetation found in association with wetlands varies with permanence of the water, depth of water, salinity, and substrate (bottom). Aquatic vegetation can survive in the water or on lands flooded or saturated with water for extended lengths of time. Conversely, upland vegetation cannot tolerate areas saturated or flooded with water for long periods.

Figure 23. Wetland with dense emergent vegetation

Rivers, **streams**, and **creeks** are bodies of water moving in a definitive pattern following the course of least resistance, or within a well-defined path (with rivers being the largest and creeks the smallest). Because water volume and rate of land erosion fluctuate along their courses, the bottoms and shorelines are relatively unstable. As the water moves, it carries materials that have been picked up such as gravel, sediment, and debris and redistributes them along the water course. When water flow is restricted to a narrow area, the river/stream/creek can create more erosion, resulting in deeper areas or pools. As it passes through wider passages, the water flow slows and material is deposited to form areas known as riffles.

Pools and riffles are important habitat features for various fishes that inhabit moving water. **Pools** provide areas for fish to feed and find refuge from fast-moving water that requires more energy for swimming. **Riffles** are usually preferred areas for spawning. It is important that fish have the ability to move freely between various features in the river/stream/creek. While some species can complete their life cycle within a small portion of the water body, other species, such as salmon, must migrate to the ocean and return to the stream to spawn.

Aquatic ecosystems provide important habitat for aquatic species, water sources for a variety of wildlife species, and many ecosystem services such as storing floodwaters, nutrient cycling, and water filtration. Management of water levels is an important tool.

Plant succession on both land and water is affected by disturbances. Plant succession involves an orderly change in the species of plants occurring in a particular area over time. In climates with sufficient rainfall, plant communities dominated with herbaceous species (nonwoody plants such as grasses, forbs and legumes) succeed to

woody species. In drier climates, perennial (plants that live more than two growing seasons) grasses and forbs or shrubs may represent the ultimate, or climax, successional stage. In other words, the climax stage is the final stage of a site if no disturbance takes place. Disturbance events, such as fire, grazing, ice and windstorms, lightning and flooding—continually set back succession and the process starts over.

Although succession is **set back** through natural disturbance, many natural disturbance events have been **altered by humans**:

- levees have been built to prevent natural flooding
- great effort is expended to suppress and control fire
- extensive plantings of non-native sod-forming grasses have unnaturally altered or interrupted succession in nearly every region of the country- because of their dense nature at ground level, the seedbank is suppressed, and response (thus succession) is limited

Natural disturbance events have been altered and the compositional and structural changes of plants following disturbance events are fairly predictable within a given region. Thus, wildlife managers intentionally manipulate succession to provide the appropriate successional stage(s) for various wildlife species or groups of species.

Wildlife management practices, such as prescribed burning, timber harvest, selective herbicide applications, grazing and disking, can be used in the absence or interruption of natural disturbance events. Alternatively, planting select plants and the lack of disturbance can be used to allow succession to advance.

Please Note: Understanding the wildlife and habitat management concepts and terms described in this section is extremely important as a first step in WHEP. From here, you can expand on your knowledge of wildlife species, their habitat requirements, and how to manage for them.

References

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Alabama WHEP State Contest Activities

Activity I: Wildlife Identification

Junior and Senior Individual Event

Objective

- To identify wildlife species within various ecoregions in Alabama

Content

- Changes yearly

Species displayed may be

- Adult or juvenile
- Male or female

Species may be presented for identification by

- Visual display (e.g., photograph)
- Specimen display (e.g., pelt, skull, scat, body part)
- Audio recording (e.g., bird call)

Study Tips

- Use credible field guides, websites, and resources to study each species
- Make observations of both juvenile and adults, both male and females, and all body parts

Competition

- Each participant will be given a scoresheet containing the name of each species on the wildlife ID list and will record the number of the corresponding animal on the scoresheet.
- Points will be awarded for each correctly identified species.

Activity I: Wildlife Species Identification

Name _____ County _____ Circle One: Jr. Sr.

	Birds		Mammals		Reptiles		Amphibians		Fish
	American crow		armadillo		Alabama red-bellied turtle		American bullfrog		Alabama hog sucker
	American kestrel		beaver		American alligator		cave salamander		Alabama sturgeon
	American robin		big brown bat		black racer		Eastern newt		alligator gar
	barn owl		bobcat		broad-headed skink		green treefrog		black crappie
	barred owl		coyote		copperhead		mudpuppy		black madtom
	blue jay		Eastern cottontail		cottonmouth		red hills salamander		bluegill
	canvasback		Eastern red bat		Eastern box turtle		Southern leopard frog		bronze darter
	Carolina wren		Eastern spotted skunk		Eastern coral snake		Southern toad		channel catfish
	Eastern screech owl		gray fox		Eastern diamondback rattlesnake		spotted dusky salamander		common carp
	grasshopper sparrow		gray squirrel		Eastern fence lizard				flathead catfish
	great blue heron		mole		Eastern garter snake				grass carp
	great egret		opossum		Eastern glass lizard				largemouth bass
	great horned owl		raccoon		Eastern hognose snake				lipstick darter
	house finch		red fox		Eastern mud snake				paddlefish
	killdeer		river otter		flattened musk turtle				rainbow trout
	mourning dove		shrew		gopher tortoise				redbreast sunfish
	Northern bobwhite		Southern flying squirrel		gray ratsnake				redear sunfish
	Northern flicker		striped skunk		Midland water snake				redeye bass
	osprey		white-tailed deer		Northern green anole				riffle minnow
	purple martin		woodchuck		pigmy rattlesnake				shadow bass
	red-headed woodpecker				scarlet kingsnake				smallmouth bass
	red-tailed hawk				timber rattlesnake				speckled madtom
	sandhill crane								spotted bass
	summer tanager								threadfin shad
	tufted titmouse								white bass
	turkey vulture								white crappie
	whooping crane								yellow perch
	wood duck								
	yellow-bellied sapsucker								

Activity II: Interpretation of Aerial Photographs

Junior and Senior Individual Event

Objective

- Identify and interpret landscape features and habitat resources present across a large area
- Evaluate wildlife habitat and from an aerial perspective

Content

- Aerial photographs used in this activity will be drawn from any urban and rural locations with various stages of vegetation, features, and development.
- Aerial photographs are often helpful for viewing features that are not evident from a ground view. For example, the proportion of open area to forested area, and the presence or need for riparian corridors or other travel corridors.
- Aerial photos do not replace the need for on-site habitat evaluation.
- While large differences in vegetation types or successional stages (landscape composition) may be evident in aerial photos, vegetation composition and structure cannot usually be determined.
- Fine-scale habitat features must be evaluated on the ground, thus ranking aerial photos as habitat for various wildlife species is often not possible without on-site verification. For example, an aerial photo containing almost all Stage 6 eastern deciduous forest could be considered better habitat for Eastern gray squirrels than a photo containing almost all Stages 3 and 4. However, that distinction could not be made for more general species such as white-tailed deer or wild turkey. This is because the dominant tree species and structure of the understory in the forest would greatly influence habitat quality for deer and turkeys. Similarly, the species of grass, forbs and shrubs would influence habitat quality in Stages 3 and 4.

Aerial photographs presented may be

- In hard copy form
- Posted on large screen
- Black and white or color

Study Tips

- When looking at aerial photos, imagine how the countryside would look if you were a bird flying over or if you were in an airplane. For example, buildings look like squares or rectangles, silos appear round, woods are jagged, and hayfields are smooth.
- Hold the photo so the shadows of objects fall toward you.
- All objects are small, but you can determine what they are by comparing their size with the size of a known object.
- Tone (shade of gray), shape and shadow are important considerations. The length of shadow indicates the height of an object. The tone varies with the seasons of the year, so it is important to know the season when aerial photos were made.
- The scale of aerial photos can vary, but often either 4 or 8 inches on the photo equals 1 mile on the ground.
- Learn to recognize what different shapes, textures and colors in aerial photos represent in terms of natural resources.
- Terraserver®, Google Maps®, and Google Earth®, are free resources for samples of aerial photos. Your local Natural Resources Conservation Service (NRCS) or government planning office may also be able to provide you with sample aerial photos.

Competition

- Identify general landscape composition and the interspersion and arrangement of vegetation types
- Identify detailed features such as:
    - rivers/ streams, ponds/lakes
    - structures (houses, barns, commercial buildings, etc.)
    - stages of succession
    - agricultural land, pasture, hard edge, soft edge, residential/urban areas, roads, power lines, etc.
- Evaluate present and potential wildlife habitat
- Junior and senior division participants will receive different scoresheets. Junior division participants will answer questions about habitat resources that are less complex than those asked of senior participants.
- Points will be awarded for correct answers.

Aerial Photograph Example of Pine vs. Hardwood

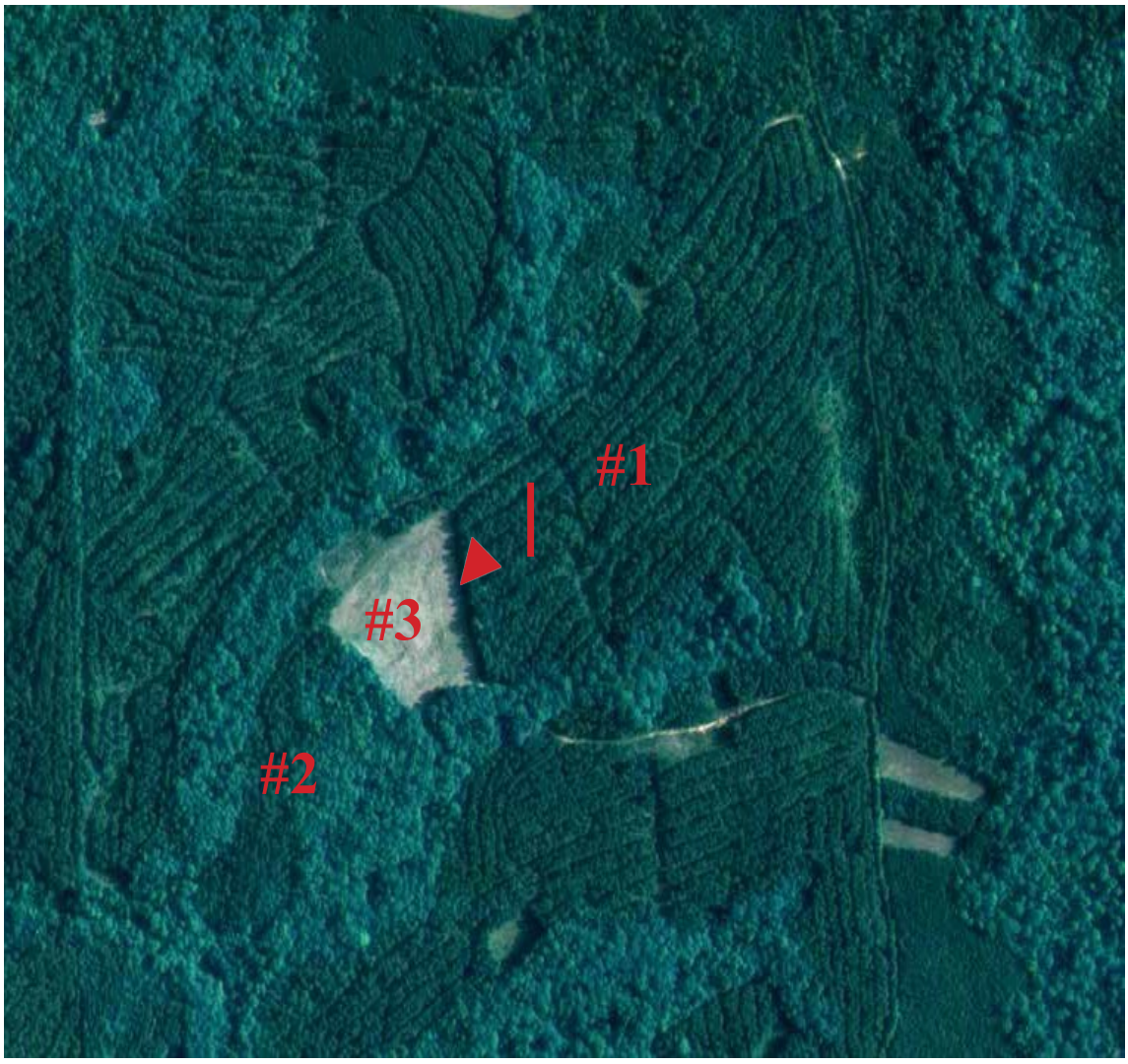

Figure 1. Aerial photograph featuring planted pines, mixed hardwoods, and open fields

#1: Row or planted Pine
The pine trees are planted equally spaced in straight rows. This planting arrangement, usually called a pine plantation, makes it easier for foresters to harvest the trees for lumber. In the aerial photo, this arrangement makes the planted pines appear to have lines or wrinkles running through them (#1). They stand out against the more natural, random arrangement of trees in the hardwood forest (see Figure 3). You can tell the pines are tall, because they cast a shadow on to the field (arrow).

#2: Mixed deciduous hardwoods
Because the hardwoods sprout and grow naturally (or randomly) the canopy appears to be even, without the 'wrinkles' of the planted pines.

#3: Open field
Notice that the field appears very smooth compared to the surrounding forest.

Figure 2. Ground view of the row pines (#1) in Figure 1

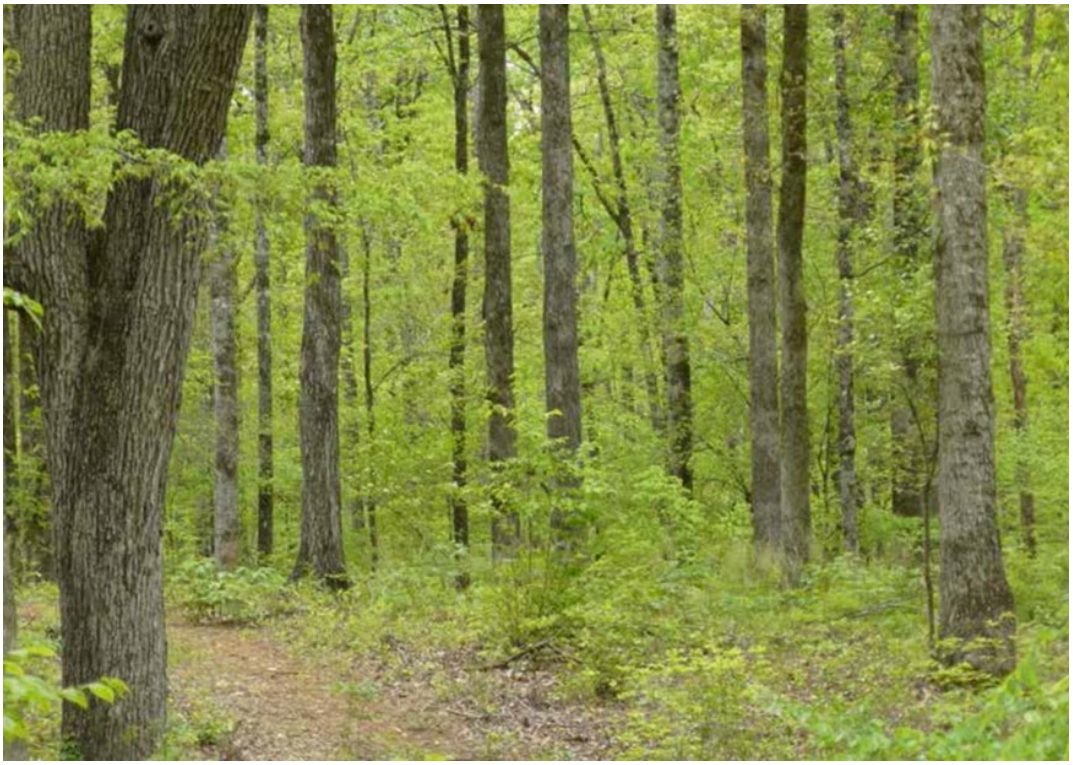

Figure 3. Ground view of the mixed deciduous hardwoods (#2) in Figure 1

Figure 4. Ground view of the open field (#3) in Figure 1

Aerial Photograph Example of Open Water, Utility Swath, & Dam

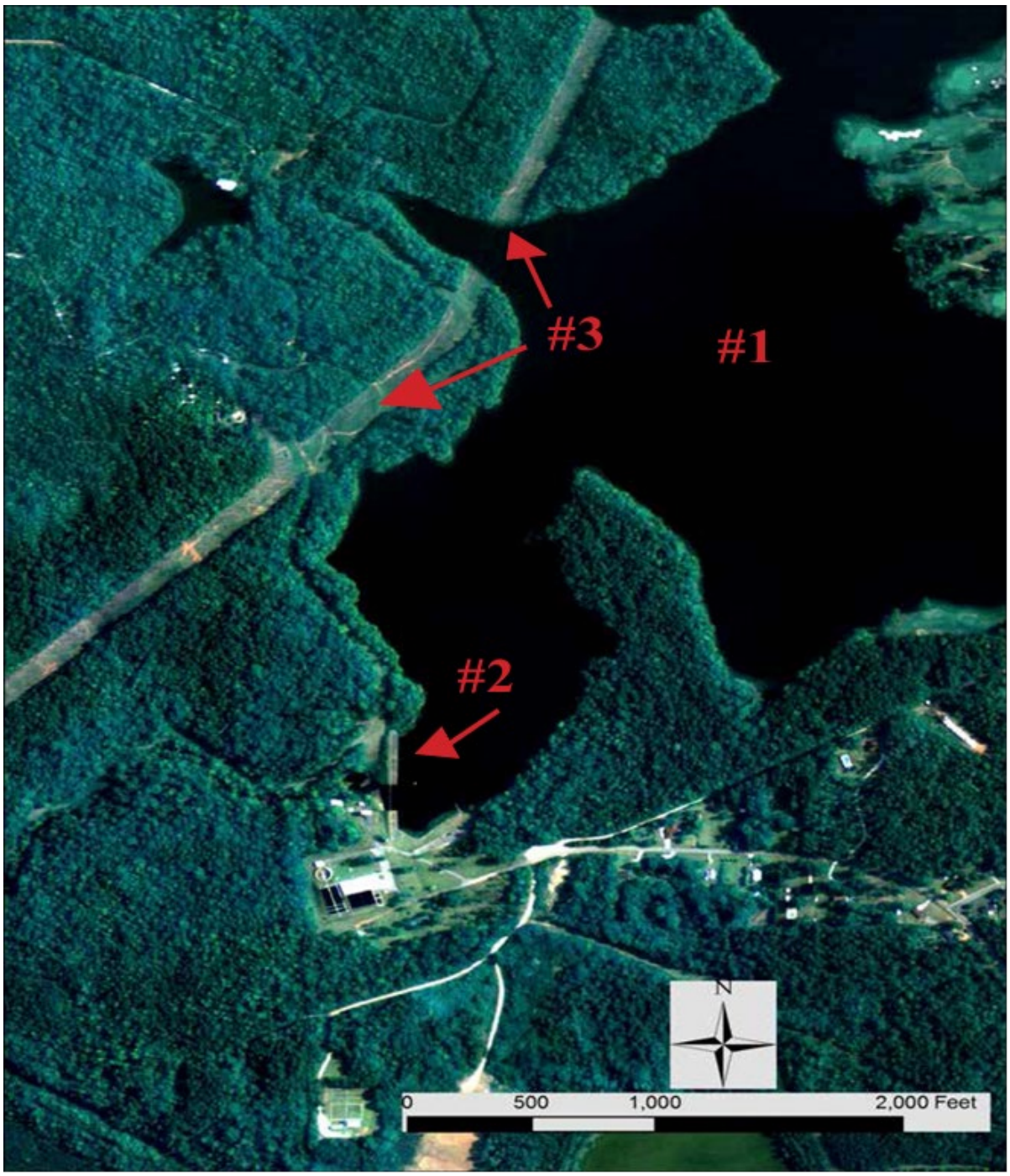

Figure 5. Aerial photograph of predominantly mixed hardwoods with a lake, dam, and utility swath

#1: Large lake
Very deep due to dark color. Shallow lakes look light green or turquoise on aerial photos.
#2: Dam
#3: Utility swath (a row of cut grain or grass)
Look very straight which is unusual in natural landscapes so they are a good indication of human activities such as farming, timber harvest, road construction and suburban home construction.

Figure 6. Ground view of the lake (#1) looking northeast from the south end of the dam (#2) in Figure 5

Figure 7. Ground view of the dam (#2) in Figure 5

Figure 8. Ground view of utility swath/corridor (#3) in Figure 5

Interpretation of Aerial Photographs Competition Example

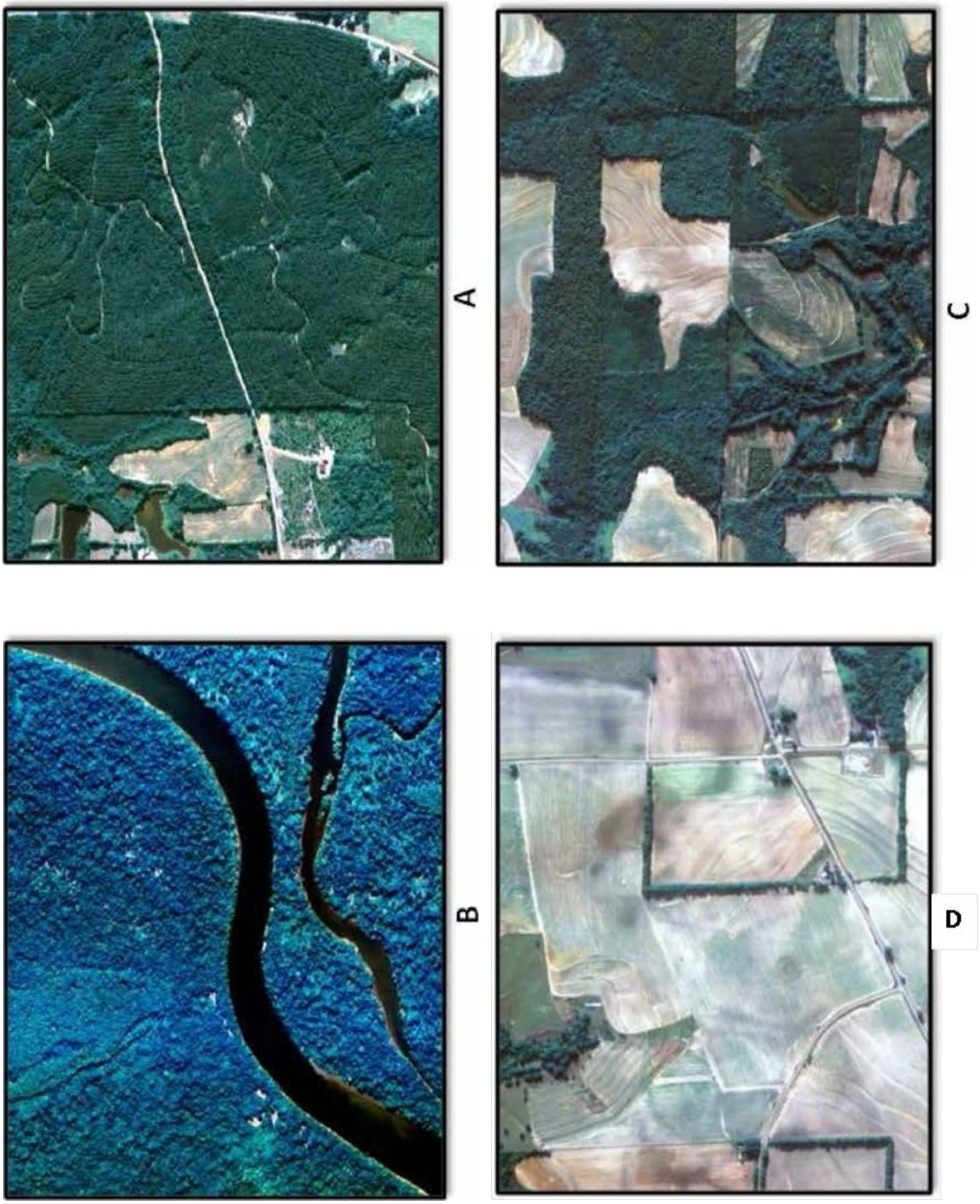

Figure 9. Aerial photographs labeled ‘A’ through ‘D’ that are used to complete the example competition questions on the example scoresheet

Example Scoresheet

Name _____ County _____

These aerial photos were taken in 2006 in the Alabama outer coastal plain. All photos are shown at a 1:8000 scale.

1. Which of these properties is being managed for pine production? _____

2. Rank these properties from 1 (the best) to 4 (the worst) for Black Bear habitat.

Rank	Property
	A
	B
	C
	D

3. Rank these properties from 1 (the best) to 4 (the worst) for American Kestrel habitat.

Rank	Property
	A
	B
	C
	D

4. Which of these properties includes a large riparian corridor? _____

5. Which one of these properties would be most suitable for Wood Duck? _____

6. What are the dominant successional stages in photo D? (Circle the correct answer.)

    A. Stage 3&4
    B. Stage 2&3
    C. Stage 1&2
    D. None of the above

7. Which of these photos shows the least amount of interspersion? _____

8. Which of these photos shows the least amount of successional stages 5 & 6? _____

9. Rank these properties from 1 (the best) to 4 (the worst) for Ovenbird habitat.

Rank	Property
	A
	B
	C
	D

10. Rank these properties from 1 (the best) to 4 (the worst) for Eastern Cottontail.

Rank	Property
	A
	B
	C
	D

Answer Key:

1. A
2. B, A, C, D
3. D, C, A, B
4. B
5. B
6. C
7. B
8. D
9. B, C, A, D
10. C, A, D, B

Activity III: Wildlife Foods

Junior and Senior Individual Event

Objective

- To Identify common wildlife foods and identify which species eat them.

Content

- Species represented in this activity will be drawn from the foods charts in the Southeastern Mixed and Outer Coastal Plain Forest ecoregion and Urban and Wetland special areas unless otherwise specified.
- Food Groups are detailed on p. 213

Wildlife Food items displayed may be

- represented by pictures
- preserved specimens
- live specimens

Study Tips

- All wildlife species in a certain group do not eat all the foods listed for that group. For example, not all turtles eat fruit and not all turtles eat crayfish.
- A certain type of wildlife may not eat all species in a certain food group. For example, deer do not eat tender twigs and leaves from all varieties of trees and shrubs.
- Under certain circumstances, most wildlife species will eat unusual things.

Competition

- Participants will be given a blank scoresheet like the food tables found in each region's description in this manual.
- Food items will be displayed on tables and numbered 1 through 10.
- Participants form a line and move from 1 to 10, identifying the represented wildlife foods.
- They return to their seat and fill out the rest of the scoresheet.
- Points will be awarded for every food group that is correctly identified. Points will also be awarded when a box that should be marked is marked, and when a box that should be left blank is left blank.

Activity III: Wildlife Foods Identification Sample Scoresheet
Individual

1) Identify the provided specimen.
2) Record the name of the official food group of the identified specimen.
3) Check the boxes beneath each species name if it uses that food group for its diet. It is possible that some wildlife species listed may not eat any of the food items presented.

	Species will be listed here by the WHEP Committee:													
Students will ID food groups here:														
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Activity IV: On-site Recommendation of Wildlife Management Practices (WMPs)

Senior Individual Event

Objective:

- To recommend WMPs necessary to manage wildlife and habitat on a given site

Content:

- Wildlife species and management practices are selected from Southeast Mixed and Outer Coastal Plain ecoregion and Urban and Wetland special areas.
- Selected species will change each year.
- The WMP charts used are located in the “Regions” section of the manual.

Study Tips

- This activity considers one species at a time and makes wildlife management practice recommendations as if each species was the only species on the site.
- There are many types of wildlife habitat management practices, but only the management practices that are appropriate for the ecoregion/special area are listed in the charts.

Competition

- This activity occurs at an outdoor location to be determined by the Alabama WHEP Committee.
- Prior to starting Activity IV, participants will be given a scoresheet and a written scenario/field condition sheet describing conditions at the site and the landowner’s objectives.
- Participants are shown the designated WMP site and walk the boundaries.
- Based on the information provided in the scenario, and the participant’s observations of the site, participants will circle each “X” on the WMP scoresheet that should be implemented to achieve the goals in the scenario for each species listed.
- Points will be awarded for circling “X”s that should be circled, and for not circling ones that should not be circled.

Example Scoresheet

Wildlife Management Practices Scoresheet Name:__________ County:_______

	black bear	bluegill	coyote	Eastern indigo snake	Northern raccoon	red-eyed vireo	wild pig	wood duck
Habitat Management Practices								
Conservation Easement				X				X
Control Non-Native Invasive Vegetation	X		X	X	X	X		X
Create Snags					X			
Delay Crop Harvest								
Edge Feathering	X		X		X			
Field Borders			X		X			
Forest Management	X		X	X	X	X		X
Leave Crop Unharvested	X				X			X
Livestock Management		X	X		X			
Nesting Structures								X
Plant Food Plots	X				X			X
Plant Native Grasses and Forbs			X	X				X
Plant Shrubs	X		X		X			X
Plant Trees	X			X	X	X		X
Repair Spillway/Levee		X			X			X
Set-back Succession	X		X	X	X			X
Tillage Management	X				X			X
Water Control Structures		X			X			X
Water Developments for Wildlife				X	X			X
Population Management Practices								
Decrease Harvest	X	X	X		X			
Increase Harvest	X	X	X		X		X	
Wildlife Damage Management	X		X		X		X	
Wildlife or Fish Survey	X	X	X	X	X	X	X	X
Fish Pond Management Practices								
Construct Fish Pond		X						
Control Aquatic Vegetation		X						
Fertilize / Lime Fish Pond		X						
Reduce Turbidity in Fish Pond		X						
Restock Fish Pond		X						

Activity V: Written Urban Management Plan

Junior and Senior Team Event

Objective:

- To make written wildlife habitat management recommendations for an urban area based on landowner objectives for a designated site.

Content:

- Manage for multiple species and different objectives at the same time
- Interprets objectives
- Identifies the focal species
- Recommends WMPs and their intended impact
- States how plan will be evaluated

Study Tips:

- Learn the habitat requirements of the Urban species
- Practice writing management plans using the template
- Practice drawing site maps with detailed management practices

Competition:

- Participants will be provided with a site scenario/field condition sheet. Junior division participants will receive a management plan template to complete. Senior division participants will use blank paper to write out their plan and draw their site sketch.
- Senior division Written Plans should be written in complete sentences and paragraphs.
- All participants must complete a sketch of the site, locating where recommended practices will be implemented, is required.
- Points will be awarded to the team according to the Judge's scoring sheet criteria.

Example Written Urban Management Plan Field Condition Sheet

The Mary Olive Thomas Tract (MOT) is a teaching forest of Auburn University. It is managed to demonstrate sustainable forestry practices as well as multi-use habitat management techniques. The MOT manager wants your help to develop a management plan to enhance this property.

Eastern Bluebirds are a popular and highly visible species on the property. There are many Eastern bluebirds in the surrounding area, but very few of them nest or forage in the MOT. American kestrels are also very popular in the MOT. Several kestrels reside on the property, where they have been a regular sight for many years. The MOT's managers would like to maintain these American kestrels, while increasing the number of Eastern bluebirds on the property.

Recently, the MOT's managers began to sight coyotes on the property, especially in the early mornings and evenings. Some of the MOT's neighbors are also complaining about coyotes on their own properties. The MOT's managers want to reduce the number of coyotes on the property, because they may become a nuisance in the area.

Prepare a plan to meet the MOT's objectives for Eastern bluebird, American kestrel, and coyote.

Example Junior Division Template

County: _____ Team Members: _____

Part I: Plan Background (20-points)

What are the species that need to be managed? (10-points)

What are your management goals for each of these species? (10-points)

Part 2: Plan Development (20-points)

What are the basic habitat requirements for each of the species you are managing? (10-points)

What habitat is present on this site that is needed by each species? What habitat is missing that the species need? (10-points)

Part 3: Plan Implementation (70-points)

What wildlife management practices do you plan to use on this site? How will these practices affect the habitat and the species that you are managing?

Part 4: Plan Evaluation (10-points)

What will you do to determine if your management plan worked

Part 5: Site Map

1. Please draw a sketch of the site that shows where your management practices will take place.
2. Create a legend that tells what any symbols or features on your sketch represent.

Example of Written Plan content

Part 1: Plan Background (20 Points)

What are the species to be managed? (10 points)

The species to be managed are Eastern bluebirds, coyote, and American kestrel.

State the management objectives (10 points)

The management objectives are to increase numbers of Eastern bluebirds, decrease the coyote population, and maintain the number of American kestrels on the property.

Part 2: Plan Development (20 Points)

Species Habitat requirements (10 Points) State the basic habitat needs for each species.

For example: Eastern bluebirds are found in early successional areas interspersed with trees and shrubs where they forage on insects. In addition, American Kestrels feed on small rodents like field mice. Water is obtained from their diet. Eastern bluebirds and American kestrels nest in cavities when available, but will readily use nesting boxes. Coyotes are very adaptable. They have a broad diet and will forage in almost any habitat type.

Habitat Assessment (10 points)

Evaluate the area and state what is present and lacking with respect to the needs of each species. For example: The area is primarily Stages 5 and 6. Stages 2 and 3 are lacking for Eastern bluebird and American kestrel. Coyotes can utilize all successional stages on this property.

Part 3: Plan Implementation (70 Points)

This section should indicate the team understands the appropriate WMPs that should be implemented and the effects of those practices on the habitat and other species managed. For example: Forest regeneration and chain sawing will open the Stage 6 forest and provide more usable space for bluebirds. Native grasses and forbs should be established to provide suitable foraging areas and attract flying insects for Eastern bluebirds to feed on. A few cavity trees are available and should be retained when implementing forest regeneration and chainsaw work. Additional nesting cover is desirable and nest boxes should be put in place for both bird species.

Wildlife Damage Techniques will be necessary to reduce the coyote population on this property. This might include trapping and euthanizing coyotes on the property.

Part 4: Plan Evaluation (10 Points)

State what you will do to determine if your plan worked. For example: Spring counts and nest box checks will be conducted to determine presence of bluebirds. Vegetation surveys will evaluate if establishment techniques for native grasses and forbs were successful. Game cameras will be used to survey for coyotes and determine if different wildlife damage techniques are needed.

Example of Judge's Scoring

Scoring Scale: 0 = no points; 2 = poor; 4 = fair; 6 = good; 8 = excellent; 10= outstanding

Part 1: Plan Background (20 points maximum)							
Accurately identified the wildlife species to be managed	0	2	4	6	8	10
Accurately identified the management objectives	0	2	4	6	8	10
Part 1 subtotal						

Part 2: Plan Development (20 points maximum)							
Demonstrated understanding of the habitat needs of each species	0	2	4	6	8	10
Accurately evaluated existing habitat for each species (what is present and what is lacking) and species to be managed	0	2	4	6	8	10
Part 2 subtotal						

Part 3: Plan Implementation (50 points maximum)							
Included the appropriate management practices	0	2	4	6	8	10
Full explanation when and where each practice should be implemented	0	2	4	6	8	10
Knowledge of practices' effects on existing habitat & benefits to each species	0	2	4	6	8	10
Used the appropriate native plant species or recognized nonnative invasive species	0	2	4	6	8	10
Recognized the management compromises necessary to meet the needs of each species and showed understanding of the mutual benefits of implementing certain practices	0	2	4	6	8	10
Part 3 subtotal						

Part 4: Plan Evaluation (10 points maximum)							
Presented realistic methods for monitoring success of the recommendations	0	2	4	6	8	10
Part 4 subtotal						

Part 5: Content (20 points maximum)							
Presented in the appropriate narrative format	0	2	4	6	8	10
Included a drawing or sketch of the area, reflecting the recommended management practices and where they should be implemented	0	2	4	6	8	10
Part 5 subtotal						

Total points Part 1 _____
Total points Part 2 _____
Total points Part 3 _____
Total points Part 4 _____
Total points Part 5 _____

Final Score_____

Alabama WHEP State Contest Ecoregions

Ecoregions

Areas of the country can be separated into ecoregions having similar climate, vegetation, and wildlife. These ecoregions are: Eastern Deciduous Forest, Hot Dessert, Intermountain, Mediterranean, Northeast Mixed Forest, Pacific Coastal Forest, Prairie Brushland, Shortgrass Prairie, Southeast Mixed and Outer Coastal Plain Forest, Tallgrass/Mixed Prairie, and Woodland (Figure 1). Each ecoregion has dominant land uses, vegetation types, and wildlife species. Urban and Wetland areas are found within all ecoregions.

Alabama WHEP uses the Southeast Mixed and Outer Coastal Plain Forest ecoregion and Urban and Wetland special areas.

It is important to understand the characteristics of each region/area in order to prepare yourself for thinking critically about how to make management recommendations for sites found within them.

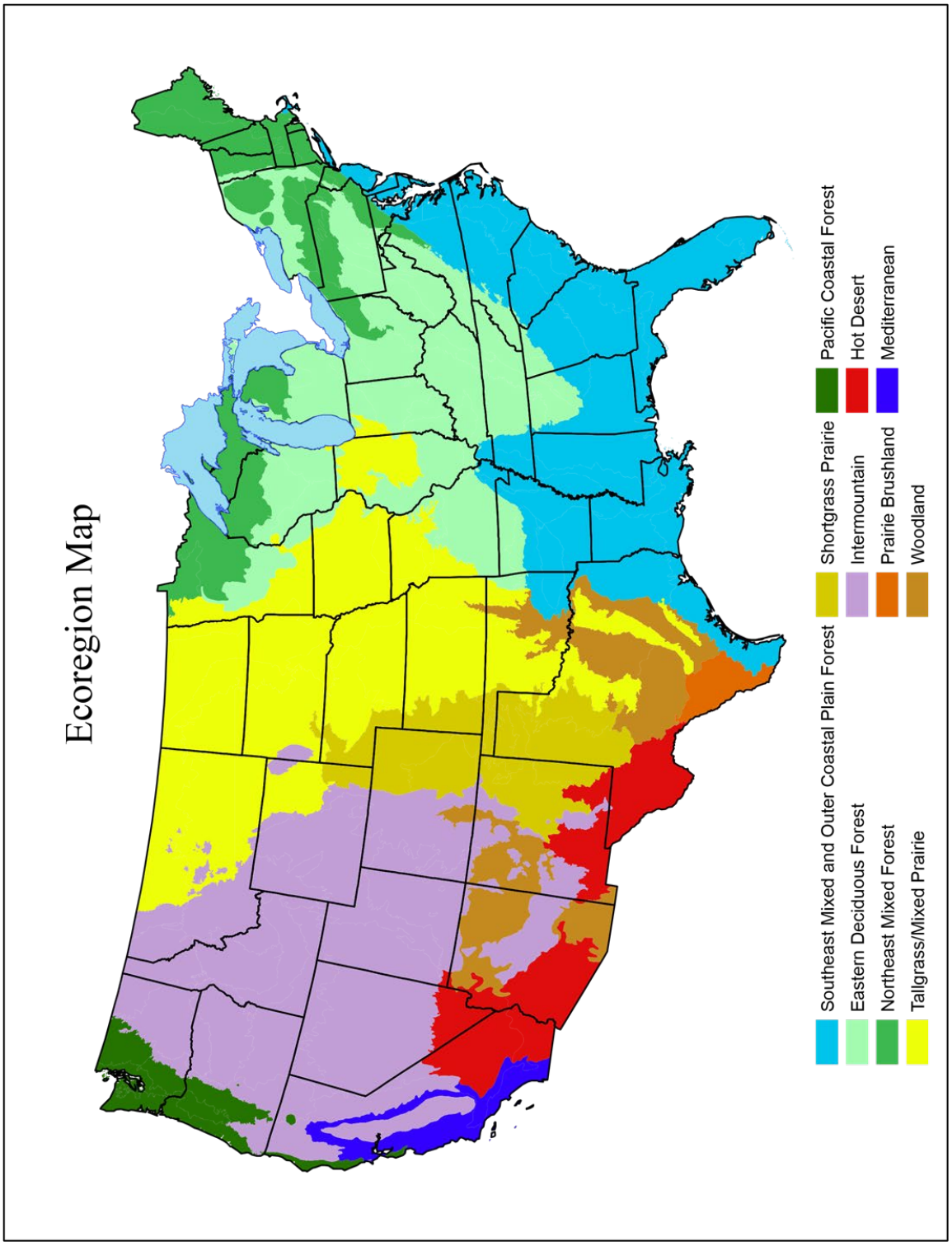

Figure 1. Map of ecoregions found within the U.S. Source: NTL WHEP.

Southeast Mixed and Outer Coastal Plain Forest Region

The Southeast Mixed and Outer Coastal Plain Forest (SMOCPF) region covers most of the state of Alabama and has terrain that varies from rolling hills to mostly flatlands. There are numerous marshes, lakes, and swamps along the coastal plain. Precipitation is year round and ranges from 40 to 60-inches annually. Summer seasons are hot while winters are mild.

Plant succession in the SMOCPF is as follows:
Stage 1: Bare ground
Stage 2: Annual forbs and grasses
Stage 3: Perennial grasses and forbs
Stage 4: Shrubs
Stage 5: Young forest
Stage 6: Mature forest

Figure 2. Cotton crops have replaced many forest lands in the SMOCPF region

Many wetlands along major rivers have been drained and forests cleared to grow crops such as cotton, tobacco, soybeans, corn, and other grains. Large areas of forests have also been cleared and planted to non-native grasses and legumes as forage for livestock. Unfortunately, most of these are not beneficial for wildlife. Deciduous trees such as oaks, hickories, American beech, blackgum, red maple, redbay, Southern magnolia, laurel oak, American holly and winged elm are dominant in the SMOCPF final succession stage. However, on upland sites where prescribed fire is still used, longleaf and/or shortleaf pine may be the primary overstory species. Fire suppression has largely decreased the longleaf pine community throughout the region. Planted loblolly pine is widespread, but without fire and judicious thinning, the value of loblolly plantings for wildlife is decreased.

Figure 3. Hickory trees are common in the SMOCPF ecoregion

Gum and cypress trees are dominant on moist areas along Alabama's Gulf coast and along major river drainages. Midstory trees that are found throughout the region include American hornbeam, dogwoods, redbud, sweetbay, titi, and shadbush.

Figure 4. Dogwoods are common in the midstory within the SMOCPF ecoregion

There are many native forbs and grasses commonly found in Stages 2 and 3 of this region. For example, lespedezas, partridge pea, ragweed, pokeweed, bluestems, paspalums, wiregrass, and povertygrass. Vines such as Virginia creeper, trumpet creeper, yellow jessamine, greenbrier, and grapes are common. Common SMOCPF shrubs include sumacs, viburnums, elderberry, wild plum, blueberry, blackberry, hawthorns, and wax myrtle.

Figure 5. Blueberry shrubs are found throughout the SMOCPF

Dominant wildlife species in the SMOCPF region are as follows:

American kestrel
black bear
bluegill
channel catfish
coyote
Eastern cottontail
Eastern indigo snake
gopher tortoise
largemouth bass
mallard
mourning dove
Northern bobwhite
Northern raccoon
protonotary warbler
red-eyed vireo
white-tailed deer
wild pig
wild turkey
wood duck

Southeast Mixed & Outer Coastal Plain Forest	American kestrel	black bear	bluegill	channel catfish	coyote	Eastern cottontail	Eastern indigo snake	gopher tortoise	largemouth bass	mallard	mourning dove	Northern bobwhite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild pig	wild turkey	wood duck
aquatic plant				x						x									x
bark						x													
birds	x				x		x		x				x				x		
buds		x				x						x				x		x	
carrion		x			x								x				x		
crayfish		x	x	x					x	x			x				x		
earthworms			x						x				x				x		
eggs			x		x		x						x				x		
fish		x	x	x			x		x				x						
forbs		x				x						x				x	x	x	x
frogs and salamanders			x		x		x		x				x				x		
fungi		x														x	x		
grain		x				x				x	x	x	x			x	x	x	x
grass		x				x		x								x	x	x	
hard mast		x										x	x			x	x	x	x
insects and spiders	x	x	x	x	x				x	x		x	x	x	x		x	x	x
leaves and twigs		x				x										x		x	
lizards					x		x						x				x		
mammals	x	x			x								x				x		
mussels							x						x						
nectar																			
seeds		x		x				x		x	x	x	x	x			x	x	x
snails				x						x	x	x	x	x			x	x	x
snakes							x		x				x				x		
soft mast		x			x	x		x				x	x	x	x	x	x	x	x
tubers													x				x	x	
turtles																			

Southeast Mixed & Outer Coastal Plain Forest	American kestrel	black bear	bluegill	channel catfish	coyote	Eastern cottontail	Eastern indigo snake	gopher tortoise	largemouth bass	mallard	mourning dove	Northern bobwhite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild pig	wild turkey	wood duck
Habitat Management Practices																			
Conservation Easement							X	X				X							
Control Non-Native Invasive Vegetation	X	X			X	X	X	X		X	X	X	X	X	X	X		X	X
Create Snags	X												X	X					X
Delay Crop Harvest										X									
Edge Feathering		X			X	X						X	X			X		X	
Field Borders	X				X	X						X	X			X		X	
Forest Management		X			X	X	X	X		X		X	X	X	X	X		X	X
Leave Crop Unharvested		X				X				X	X	X	X			X		X	X
Livestock Management	X		X	X	X	X			X	X	X	X	X	X		X		X	
Nesting Structures	X													X					X
Plant Food Plots		X				X				X	X	X	X			X		X	X
Plant Native Grasses and Forbs	X				X	X	X	X		X	X	X				X		X	X
Plant Shrubs	X	X			X	X					X	X	X			X		X	X
Plant Trees	X	X					X	X			X		X	X	X	X		X	X
Repair Spillway/Levee			X	X					X	X	X		X	X					X
Set-back Succession	X	X			X	X	X	X		X	X	X	X			X		X	X
Tillage Management	X	X				X				X	X	X	X			X		X	X
Water Control Structures			X	X					X	X	X		X	X					X
Water Developments for Wildlife							X			X	X		X	X		X		X	X
Population Management Practices																			
Decrease Harvest		X	X	X	X	X			X			X	X			X		X	
Increase Harvest		X	X	X	X	X			X				X			X	X	X	
Wildlife Damage Management		X			X	X							X			X	X	X	
Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond Management Practices																			
Construct Fish Pond			X	X					X										
Control Aquatic Vegetation			X	X					X										
Fertilize / Lime Fish Pond			X	X					X										
Reduce Turbidity in Fish Pond			X	X					X										
Restock Fish Pond			X	X					X										

Urban Area

Urban areas are areas throughout the state that are either 1) urbanized areas- large central places with a total population of 50,000 or more people, or 2) urban clusters- large central places with populations between 2,500 and 50,000 people. An urban area can occur within the SMOCPF region or any other region. The urban landscape is characterized by residential and commercial development and infrastructure like roads, train tracks, and utilities. Neighborhood parks are an example of contiguous wildlife habitat within an urban setting.

Plant succession in an urban area is as follows:
Stage 1: Bare ground
Stage 2: Annual forbs and grasses
Stage 3: Perennial grasses and forbs
Stage 4: Shrubs
Stage 5: Young forest
Stage 6: Mature forest

Figure 6. Parks may provide wildlife habitat within urban areas

Urban areas can provide habitat features that many species need such as roosting, nesting, and foraging sites. They typically contain Stage 1 in the form of bare ground and paved areas, annual plantings, perennial grasses and forbs, shrubs, and young to mature trees. The vegetation is as likely to be an introduced species (non-native) as it is a native species. Additionally, vegetated areas are typically manipulated in a landscaped manner versus natural growth as in rural areas. Interspersion is an

important concept to understand in urban areas because of the fragmented landscape from residential and commercial development.

Attracting wildlife for viewing is popular among people in urban and suburban areas. However, many wildlife species can quickly become a nuisance, especially when they find protective shelter in unintended areas (under houses, in attics) or begin to damage property (chewing/drilling holes in wooden siding, defecating on property). Care must always be exercised when attracting wildlife in urban and suburban areas. This is especially true when providing artificial feeders, which can also attract unwanted species such as mice and rats and make desirable species more susceptible to unnatural predators (house cats).

Figure 7. Bird feeders can easily attract nuisance species

When nests of desirable species are found, care should be taken not to disturb them. Otherwise, the nest/nestlings may be abandoned. Another consideration is the use of pesticides. Insects are a great source of protein, calcium, and various vitamins and minerals and are the primary diet item for many birds seen in urban and suburban areas. Thus, it should be obvious that pesticides should be used sparingly and carefully. When using pesticides, follow all directions on the manufacturer's label and wear protective clothing.

Many forests and wetlands have been replaced by urban developments to supply housing, infrastructure, and community spaces. Though wildlife habitat is greatly reduced, preserved areas and public green spaces can provide essential wildlife habitat in urban areas. Management of the urban region takes a variety of human activity into account.

Dominant species in the Urban area are as follows:

American robin
big brown bat
butterfly
common nighthawk
Eastern bluebird
Eastern cottontail
European starling
Eastern gray squirrel
frog
house finch
house sparrow
house wren
hummingbird
Northern flicker
Northern raccoon
rock dove
song sparrow

Urban Areas	American robin	big brown bat	butterfly	common nighthawk	Eastern bluebird	Eastern cottontail	European starling	Eastern gray squirrel	frog	house finch	house sparrow	house wren	hummingbird	Northern flicker	Northern raccoon	rock dove	song sparrow
aquatic plant																	
bark						x		x									
birds															x		
buds						x		x		x	x						
carrion															x		
crayfish									x						x		
earthworms	x						x		x		x	x		x	x		
eggs								x	x						x		
fish															x		
forbs			x			x											
frogs and salamanders									x						x		
fungi								x									
grain						x	x	x			x				x	x	
grass			x			x											
hard mast								x						x	x		
insects and spiders	x	x		x	x		x	x	x	x	x	x	x	x	x		x
leaves and twigs			x			x											
lizards															x		
mammals															x		
mussels															x		
nectar			x										x				
seeds							x	x		x	x			x	x	x	x
snails									x						x		
snakes															x		
soft mast	x		x		x	x	x	x		x	x			x	x		x
tubers															x		
turtles																	

Urban Areas

	American robin	big brown bat	butterfly	common nighthawk	Eastern bluebird	Eastern cottontail	European starling	Eastern gray squirrel	frog	house finch	house sparrow	house wren	hummingbird	Northern flicker	Northern raccoon	rock dove	song sparrow
Habitat Management Practices																	
Conservation Easement																	
Control Non-Native Invasive Vegetation	X		X		X	X		X				X	X	X	X		X
Create Snags		X			X									X	X		
Delay Crop Harvest																	
Edge Feathering					X	X				X					X		
Field Borders					X	X				X					X		
Forest Management						X		X		X				X	X		X
Leave Crop Unharvested						X		X		X					X		
Livestock Management				X	X	X		X		X					X		
Nesting Structures		X			X							X					
Plant Food Plots						X		X		X					X		
Plant Native Grasses and Forbs			X		X	X			X								X
Plant Shrubs	X		X		X	X				X		X	X	X	X		X
Plant Trees	X	X	X		X			X		X		X	X	X	X		
Repair Spillway/Levee										X					X		
Set-back Succession	X	X		X	X	X				X				X	X		X
Tillage Management						X				X					X		
Water Control Structures									X						X		
Water Developments for Wildlife	X	X	X						X	X					X		X
Population Management Practices																	
Decrease Harvest						X		X		X					X		
Increase Harvest						X		X		X					X		
Wildlife Damage Management		X				X	X	X		X	X			X	X	X	
Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond Management Practices																	
Construct Fish Pond																	
Control Aquatic Vegetation																	
Fertilize / Lime Fish Pond																	
Reduce Turbidity in Fish Pond																	
Restock Fish Pond																	
Additional Urban Practices																	
Artificial Feeders			X					X		X			X	X			X
Plant Flowers			X										X				
Rooftop/Balcony Gardens			X										X				

Wetlands Area

Wetlands can be described as the zone between deep water and upland habitats. There are several million acres of wetlands in Alabama. They are characterized by various amounts of open water, aquatic vegetation and soil that is often wet or covered with shallow water. There are many different types of wetlands including beaver ponds, potholes, playas, manmade ponds, small lakes, marshes, rivers, streams, and swamps. The Mobile-Tensaw River Delta in south Alabama is one of the largest wetland systems in the country.

Plant succession in wetlands is as follows:
Stage 1: Deep water with little vegetation
Stage 2: Shallow water with submerged and floating vegetation
Stage 3: Very shallow water or wet ground with variety of emergent vegetation
Stage 4: Ground is drier and upland vegetation becomes dominant

Figure 8. Bald cypress trees are commonly found in Alabama wetlands. Picture by Patrick G. Thompson, Auburn University.

Succession proceeds slowly in wetlands with large amounts of deep water or a rocky bottom. Fluctuations in water levels can cause the final stage of succession to regress to an earlier stage. For example, if a wetland in Stage 3 succession is flooded with deep water for a period of time, the aquatic emergent vegetation may die, leaving a wetland in Stage 1 or Stage 2 succession. The extent of this regression depends on the length of time the wetland is flooded with deep water, how much the water level changes, and the extent (length of time) the present vegetation can survive in the changed water level. Wetlands with stable, non-flowing water levels go through successional stage of vegetation development similar to those found on adjacent upland areas. The open-water areas fill with silt and dead vegetation, allowing emergent aquatic vegetation to become dominant. As the wetland continues to fill, it becomes drier, allowing upland vegetation to become dominant. Please note, the succession process we are describing

is often not applicable to wetlands with constantly moving water such as rivers, streams, and tidal areas.

Aquatic vegetation can survive in the water or on lands flooded or saturated with water for extended lengths of time. Upland vegetation cannot tolerate areas saturated or flooded with water for long periods. The vegetation found in association with wetlands varies with permanence of the water, depth of water, salinity, and substrate (bottom).

- **Trees** often found in wetlands are willows, cottonwood, oaks, various gum trees, tamarack, cypress, mangroves, red bay, black spruce, Atlantic white cedar, and pond pine.
- **Shrubs** commonly found in and adjacent to wetlands include willows, alders, bog birch, bog laurel, Labrador tea, coastal sweetbells, inkberry, sea myrtle and marsh elder.
- **Grass** and grass-like vegetation such as cattails, bulrushes, saltgrass, cordgrass, saw grass, sedges, arrow grass, shoal grass, eel grass, and wild rice are examples of emergent aquatic vegetation found in wetlands.
- Water lilies, pondweeds, wild celery, water milfoil, duckweeds and coontails are examples of floating and **submerged aquatic vegetation**.

Dominant species in the Wetland area are as follows:

American beaver
bluegill
bullfrog
Canada goose
largemouth bass
mallard
mink
common muskrat
Northern pintail
Northern raccoon
redhead
river otter
tiger salamander
wood duck

Wetland Areas	American beaver	bluegill	bullfrog	Canada goose	largemouth bass	mallard	mink	common muskrat	Northern pintail	Northern raccoon	redhead	river otter	tiger salamander	wood duck
aquatic plant	x		x	x		x		x	x		x			x
bark	x													
birds					x		x			x				
buds	x													
carrion										x				
crayfish		x	x		x	x	x		x	x	x	x		
earthworms		x	x		x					x			x	
eggs		x	x				x			x			x	
fish		x	x		x		x			x		x		
forbs	x			x				x						x
frogs and salamanders		x	x		x		x			x		x		
fungi														
grain				x		x			x	x				x
grass				x										
hard mast										x				x
insects and spiders		x	x	x	x	x			x	x	x	x	x	x
leaves and twigs	x													
lizards							x			x				
mammals							x			x		x		
mussels							x			x	x			
nectar														
seeds				x		x			x	x	x			x
snails				x		x			x	x	x		x	x
snakes			x		x		x			x				
soft mast										x				x
tubers								x		x				
turtles			x											

Wetland Areas	American beaver	bluegill	bullfrog	Canada goose	largemouth bass	mallard	mink	common muskrat	Northern pintail	Northern raccoon	redhead	river otter	tiger salamander	wood duck
Habitat Management Practices														
Conservation Easement														
Control Non-Native Invasive Vegetation	X			X		X	X	X	X	X	X	X	X	X
Create Snags										X				X
Delay Crop Harvest						X								
Edge Feathering										X				
Field Borders										X				
Forest Management						X				X				X
Leave Crop Unharvested				X		X			X	X				X
Livestock Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nesting Structures														X
Plant Food Plots				X		X			X	X				X
Plant Native Grasses and Forbs				X		X			X				X	X
Plant Shrubs	X									X			X	X
Plant Trees	X									X			X	X
Repair Spillway/Levee		X	X	X	X	X	X	X	X	X	X	X		X
Set-back Succession				X		X	X	X	X	X	X			X
Tillage Management				X		X			X	X				X
Water Control Structures	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Water Developments for Wildlife			X	X		X	X	X	X	X	X	X	X	X
Population Management Practices														
Decrease Harvest	X	X	X		X		X	X		X		X		
Increase Harvest	X	X	X		X		X	X		X		X		
Wildlife Damage Management	X			X			X	X		X		X		
Wildlife or Fish Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Pond Management Practices														
Construct Fish Pond		X			X									
Control Aquatic Vegetation		X			X									
Fertilize / Lime Fish Pond		X			X									
Reduce Turbidity in Fish Pond		X			X									
Restock Fish Pond		X			X									

Alabama WHEP State Contest Wildlife Species for Management

Wildlife Species for Management

- Bird, mammal, and other species featured in the Southeast Mixed and Outer Coastal Plain Forest ecoregion and the Urban and Wetland areas within it.
- Information about the habitat requirements of each species- diet, water, and cover is provided. This information is applicable to Activities II, III, IV, and V.
- Key wildlife management practices used in some regions. These vary from region to region, and not all the Wildlife management practices listed for a species will be applicable in all regions.

BIRDS

American kestrel
American robin
Canada goose
common nighthawk
Eastern bluebird
European starling
house finch
house sparrow
house wren
hummingbird
mallard
mourning dove
Northern bobwhite
Northern flicker
Northern pintail
prothonotary warbler
red-eyed vireo
redhead
rock dove
song sparrow
wild turkey
wood duck

MAMMALS

American beaver
big brown bat
black bear
common muskrat
coyote
Eastern cottontail
Eastern gray squirrel
mink
Northern raccoon
river otter
white-tailed deer
wild pig

OTHER SPECIES

bluegill
bullfrog
butterfly
channel catfish
Eastern indigo snake
frog
gopher tortoise
largemouth bass
tiger salamander

WHEP BIRDS

for

Wildlife management purposes

Applicable to Activities II, III, IV, and V

American kestrel
American robin
Canada goose
common nighthawk
Eastern bluebird
European starling
house finch
house sparrow
house wren
hummingbird
mallard
mourning dove
Northern bobwhite
Northern flicker
Northern pintail
prothonotary warbler
red-eyed vireo
redhead
rock dove
song sparrow
wild turkey
wood duck

American kestrel

General information

- Small raptor resembling
- Found year-round throughout U.S.
- Males and females both have black slashes on the sides of their faces
- Often spotted perching on power lines searching for prey
- Predated by larger raptors
- Nest in cavities
- Also use man-made nesting boxes
- Males defend cavities and present to potential mate
- Clutches contain 4 to 5 eggs
- Chicks must be fed and cared for
- Listed as a threatened species in some states due to poor habitat quality

Habitat requirements

Diet

- Primarily insects and small mammals associated with open areas

Water

- Obtained from diet

Cover

- Nest in natural and artificial cavities
- Stages 4, 5 and 6 for roosting and nesting

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation competes with native plant species and reduces habitat quality for kestrels or their prey

Create Snags: where needed for perches and increase potential nest cavities

Field Borders: to increase cover for prey around row crop fields

Livestock Management: to prevent overgrazing and maintain sufficient cover for prey and maintain early succession vegetation with scattered shrub cover

Nesting Structures: can be used where a lack of natural nesting cavities is limiting the population; nest boxes can be placed on fence posts in open areas, and even on the back of road-side signs in open landscapes

Plant Native Grasses and Forbs: where necessary to provide desirable cover for prey

Plant Shrubs: in large open areas where shrub cover is limiting

Plant Trees: where trees are lacking for future perching sites and cavities for nesting

Set-back Succession: Prescribed Fire, Chaining, Drum-chopping, and Herbicide Applications can maintain shrub cover and stimulate herbaceous cover; Dozer-clearing and Root-plowing can be used to convert forest to early succession

Tillage Management: will facilitate hunting prey when waste grain is available

Wildlife or Fish Survey: observation counts, point counts, and nest box usage rates may be used to estimate trends in populations

American robin

General information

- Found throughout North America; may migrate out of areas with sustained cold and snow in the winters
- Use a variety of vegetation types, from mowed grassy areas to forested areas
- Use large open areas and nearby trees and shrubs in urban areas
- Build nests of grass and mud on tree or shrub limbs; occasionally nest on building ledges
- Spend a lot of time on the ground feeding on earthworms; will also perch on branches to eat berries, fruit, and insects

Habitat requirements

Diet

- Insects and worms during spring and summer
- Soft mast from shrubs and trees in winter
- Rarely use artificial feeders

Water

- Require water daily in warm seasons
- Obtains water from low lying areas, ponds, and rain-filled gutters

Cover

- Shrubs, evergreen trees, and deciduous trees used for nesting and escape
- Evergreen trees often used for early nests

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for American robins

Plant Shrubs: where soft mast is lacking; examples might include dogwoods, hollies, golden currant, and winterberry

Plant Trees: both deciduous and evergreen; where nesting sites may be limiting

Set-back Succession: Prescribed Fire, Disking, and Mowing can be used to set-back succession and provide suitable structure for robins; Mowing may be used to maintain foraging and loafing cover for robins in Urban areas

Water Developments for Wildlife: birdbaths and pans of water can be provided in urban areas; do not place water in areas where cats can catch the birds

Wildlife or Fish Survey: observation counts and point counts are used to estimate trends in populations

Canada goose

General information

- Breeding range extends across northern half of U.S. across Canada and Alaska
- Many winter in Canada but majority fly south to southern areas of U.S. Mexico
- Many live year-round in southern areas of U.S.

Habitat requirements

Diet

- Variety of forbs, grasses
- Grains
- Some aquatic insects

Water

- Relatively open water wetlands, ponds and lakes are used for brood rearing, feeding, loafing

Cover

- Nest in variety of places such as mats of bulrushes, tops of muskrat houses, and most of all, in relatively thick cover on islands, usually within 200 feet of water's edge
- Nest, rear young in or near Stage 2 wetlands interspersed with some Stage 3 wetlands
- Riparian areas, wetlands containing 20 percent tall emergent aquatic vegetation and 80 percent open water

Wildlife Management Practices

Control Nonnative Invasive Vegetation: applies to both uplands and wetlands; nonnative invasive vegetation can degrade nesting cover in uplands and make wetlands unattractive to Canada geese

Leave Crop Unharvested: to provide additional food during winter

Livestock Management: proper grazing can maintain lush vegetation for foraging Canada geese; restricting livestock grazing from areas where geese may nest can increase nesting success

Plant Food Plots: both forage (green growing wheat) and grain (corn) food plots can provide additional food where food is limited

Plant Native Grasses and Forbs: to provide nesting cover where limiting

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire and Herbicide Applications set back succession in cattail-choked wetlands and stimulate lush vegetation in uplands where geese may

feed; Chainsawing and Dozer-clearing can create more early succession for nesting cover near wetlands

Tillage Management: fall tillage in grain crops can be delayed until spring to provide supplemental food source

Water Control Structures: allow water level manipulation to maintain 80 percent open water and 20 percent emergent vegetation

Water Developments for Wildlife: can be used to temporarily flood fields for feeding and raising broods

Wildlife Damage Management: may be needed where Canada geese damage lawns, golf courses, and crop fields, and other areas in cities and suburban areas

Wildlife or Fish Survey: broods counts and visual surveys can provide estimates of goose abundance

Common nighthawk

General information

- Found throughout U.S. during breeding season
- Migrate to South America during winter
- Common visitors to grasslands, open woodlands, cities, towns
- In cities. towns, they are often seen flying over city parks and other open areas in late evening. early morning
- Nocturnal

Habitat requirements

Diet

- Flying insects, including flying ants, mosquitoes, moths, June bugs
- Feed “on-the-wing” on flying insects

Water

- Obtain ample water from diet (water sources attract insects, which provide food)

Cover

- Riparian areas, ridge tops, flat rooftops, other places with numerous sand and gravel areas are favorite nesting locations
- Nest on ground on gravel. bare soil areas (Stage 1) common in fields or on rooftops
- Stages 2 and 3 for foraging

Wildlife Management Practices

Livestock Management: grazing regimes that maintain open herbaceous areas provide foraging sites for common nighthawks

Set-back Succession: Prescribed Fire, Disking, and Mowing can maintain early successional areas for foraging; Disking and Herbicide Applications can promote bare ground for nesting; Chainsawing, Dozer-clearing, and Root-plowing can convert wooded areas to open, early successional areas; Mowing may be used to maintain foraging and loafing cover for common nighthawks in Urban areas

Wildlife or Fish Survey: observation counts can be used to estimate trends in populations

Eastern bluebird

General information

- Found across the Eastern U.S.
- Found in early successional habitat (Stages 2, 3) interspersed with woods, shrubs (Stages 4, 5, 6)
- Use herbaceous openings, savannas, pastures, parks, backyards, edges of hayfields and crop fields (and other early successional areas) well-interspersed with trees and shrubs for perching, foraging, and nesting
- Nest in cavities, especially old woodpecker cavities, as well as nest boxes
- Clutches are normally 3 to 6 eggs
- May have 1 to 3 broods per year
- Nest box programs have helped restore populations

Habitat requirements

Diet

- Insects, especially grasshoppers, crickets, adult beetles and larvae
- Invertebrates such as spiders
- Small amounts of soft mast
- Forage in open areas, but typically near trees, shrubs or fence that provide perches.

Water

- Obtain necessary water from diet but may use other water sources when available

Cover

- Large open areas without interspersion of hedgerows, fencerows, woodlots may not receive as much use by bluebirds as those areas with more structural diversity needed for perching, nesting
- Nest in old woodpecker cavities, cavities of trees, fence posts, nesting boxes (major impact in restoring bluebird populations in some areas)

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduces habitat quality for eastern bluebirds

Create Snags: where cavities are limited to provide potential nest sites and perching sites in open areas (not in forests because eastern bluebirds do not use forests)

Edge Feathering: to increase foraging opportunities, perching sites, and potential cavity trees (if trees are killed and left standing) around fields

Field Borders: to increase foraging opportunities around crop fields

Livestock Management: livestock must be excluded from recently planted trees and shrubs

Nesting Structures: should be erected where a scarcity of natural cavities may be limiting the population; nest boxes should be approximately 5 feet high with an entrance hole 1½ inches in diameter; nest boxes should be placed no closer than 80 yards apart to limit territorial fighting among males

Plant Native Grasses and Forbs: to aid in establishing herbaceous groundcover where planting is necessary; forb component is important to attract insects

Plant Shrubs: in relatively large open areas where perching sites or winter foods may be limiting

Plant Trees: in relatively large open areas where perching sites are limiting; may provide potential nest sites in distant future

Set-back Succession: Prescribed Fire, Disking, Herbicide Applications, Mowing, Chaining, and Drum-chopping can be used to maintain and rejuvenate early successional areas and prevent them from becoming dominated by young trees and shrubs; Chainsawing and Root-plowing can be used to convert forested areas to savannas and early successional communities; Mowing may be used to maintain foraging and loafing cover for eastern bluebirds in Urban areas

Wildlife or Fish Survey: point counts can be used to monitor bluebird populations; nest boxes should be checked to monitor use and nest success

European starling

General information

- Found throughout North America
- Introduced to U.S. from Europe and are considered pests
- Commonly cause damage to crops and in urban areas
- Deplete food resources, nesting cavities for native wildlife
- Wildlife damage management is necessary to reduce their populations and exclude them from areas where they are causing damage
- Prefer suburban and urban residential areas with large trees and shrubs interspersed with open areas; also abundant in agricultural areas
- Cavity nesters and nest in large trees or old buildings
- No management practices should be implemented to attract or benefit starlings

Habitat requirements

Diet

- Feed on ground
- Insects, soft mast, seeds, earthworms, grain, human garbage, dog/cat food

Water

- Require freestanding water during warm seasons

Cover

- Nest in tree cavities, old buildings

Wildlife Management Practices

Wildlife Damage Management: exclusion practices to prevent access to buildings and other areas where they are not wanted; food, water, and cover available to starlings around buildings should be removed; various harassment practices may be effective; trap and euthanasia are appropriate to reduce starling populations

Wildlife or Fish Survey: observation counts, point counts, and wildlife damage management questionnaires are used to monitor starling populations

House finch

General information

- Native to western U.S.
- Introduced species in eastern U.S.
- Current range is entire U.S.
- Found in urban, suburban, agricultural areas that have trees (Stages 5, 6), shrubs (Stage 4), and some open areas (Stages 2, 3)
- Found in canyons, semi- arid regions in western part of country

Habitat requirements

Diet

- Soft mast, buds, seeds from ground. in trees
- In warm season, eat some insects

Water

- Free-standing water needed daily in warm season

Cover

- Nest 5 feet to 7 feet above ground on low branches of trees, branches of bushes, in natural cavities, old holes excavated by woodpeckers, any projection or ledge on buildings
- Nest made from weed stems, small branches, leaves

Wildlife Management Practices

Artificial Feeders: may be used to attract finches in Urban areas; millet and sunflower seeds are favorites

Plant Native Grasses and Forbs: to provide forb seed in rural areas where forbs are lacking

Plant Shrubs: for nesting and hiding cover adjacent to open areas where shrubs are lacking

Plant Trees: for nesting cover in areas where trees are lacking

Set-back Succession: Mowing may be used to maintain foraging and loafing cover for house finches in Urban areas

Water Developments for Wildlife: birdbaths and pans of water can be provided, or a low area in the yard can be filled with water; do not place water in areas where cats can catch birds; cats should be removed

Wildlife or Fish Survey: point counts are used to estimate trends in populations

House sparrow

General information

- Introduced species from England (also called English sparrows)
- Found throughout U.S. in urban areas
- Common in, around agricultural buildings
- Usually considered a nuisance
- Outcompete bluebirds and other species for cavity nesting space. food

Habitat requirements

Diet

- Variety of insects, soft mast, buds, forbs, weed seeds, waste grain
- Feed on, above ground in woody vegetation

Water

- Free-standing water is required daily in warm seasons

Cover

- Nest in natural cavities, low branches of trees and bushes 5 feet to 7 feet above ground, on any projection or ledge they can find on buildings or other structures

Wildlife Management Practices

House sparrow populations often grow to levels where they cause wildlife damage or will cause detrimental conditions for native wildlife by out competing native species for habitat requirements; therefore, wildlife damage management most likely will be necessary in all situations, especially in suburban/urban and agricultural areas. Habitat management to attract house sparrows should never occur.

Wildlife Damage Management: trap and euthanasia are often appropriate to reduce house sparrow populations; exclusion practices may prevent house sparrows from accessing an area; remove food, water, and cover available to house sparrows; various harassment practices may be effective

Wildlife or Fish Survey: observation counts, call counts, and questionnaires related to wildlife damage management are useful in estimating trends in populations

House wren

General information

- Found throughout U.S. during breeding season
- Migrate to deep southern U.S. during winter months
- Nest in a variety of high cavities (up to 30-feet)
- Forage on the ground and aboveground

Habitat requirements

Diet

- Spiders, grasshoppers, crickets, beetles, caterpillars, ants, bees, ticks, earthworms & millipedes
- Artificial feeders are usually not used
- Forage both on and above ground

Water

- Obtained from diet

Cover

- Nest in natural cavities in trees old buildings, other structures, as high as 30 feet above ground
- In urban settings, prefer older residential areas with large shrubs (Stage 4), trees (Stages 5, 6)
- Use forested (Stages 5, 6) and open areas (Stages 2 and 3) at higher elevations, as well as stands of aspen (Stages 5, 6)

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative species begin to compete with native vegetation and degrade habitat for house wrens

Nesting Structures: nest boxes may be provided where adequate nesting sites are lacking; boxes should be placed high on a tree trunk or under the eaves of a house; the hole should be < 1.5 inches in diameter to prevent house sparrows and starlings from entering and excluding house wrens; for specifics on nest box design and placement, visit your local Extension office or state wildlife agency website

Plant Shrubs: where lacking for cover while feeding and for nesting

Plant Trees: where trees are lacking for cover and nesting

Wildlife or Fish Survey: point counts are used to estimate trends in populations

Hummingbird

General information

- North America has 18 species
- Other than couple of exceptions, hummingbirds migrate into Central and South America during winter
- Use areas with flowering plants where they can feed on nectar
- Prefer areas with large trees and nearby flowering plants in urban areas
- Constructs nest in shape of a small cup and is built with lichen and other vegetation
- Require high energy foods

Habitat requirements

Diet

- Require high energy foods
- Nectar from flowers supplies needed energy because of high sugar content
- Insects important source of protein

Water

- Obtained from diet

Cover

- Trees, shrubs for nesting
- Flowers for feeding

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for ruby-throated hummingbirds

Plant Shrubs: flowering shrubs and vines that provide nectar may be planted where nesting sites and food resources are limited; favorites include hibiscus, trumpet vine, and lilac

Plant Trees: where potential nesting sites are limited; flowering dogwood and various fruit trees are favorites

Wildlife or Fish Survey: observation counts, especially visitation at feeders, are used to estimate trends in populations

Artificial Feeders: artificial feeders filled with sugar-water (1 part sugar to 4 parts boiled water) may be used where flowers are limited; multiple feeders may reduce problems with territoriality; never give honey-water to hummingbirds because honey

ferments faster than sugar and quickly develops a mold that can kill hummingbirds

Plant Flowers: preferred flowers include petunias, gladiolus, nasturtiums, begonias, morning glory, evening primrose, columbine, and cardinal flower

Rooftop/Balcony Gardens: can provide source of nectar if appropriate flowers are planted

Mallard

General information

- Migratory waterfowl with extensive breeding range- extending across northern one-third of U.S., up to Bering Sea
- Dabbling ducks (tip headfirst in water to reach bottom food; do not dive) feeding at or near the surface of the water by filtering food items
- Winter south of Canada, throughout U.S., and south to Central America
- Prefer to winter in wetlands that contain all 4 wetland stages, including Stage 1 (open water), Stage 4 (harvested grain crops), riparian areas with open water
- In wintering areas, mallards rest on open water bodies, such as streams, rivers, and warm-water sloughs

Habitat requirements

Diet

- Most food associated with wetlands, but mallards will readily dry feed in agricultural fields during winter
- Aquatic plants, insects, other invertebrates
- Hard mast (especially acorns), grains, other seed
- Ducklings eat mostly aquatic insects
- Feed at or near surface of water by filtering food items

Water

See cover requirements below

Cover

- Nest in tall grasses and forbs or in/under shrubby cover preferably within one-half mile of wetland
- Need open water (Stage 2 of wetland succession) with adjacent emergent aquatic vegetation
  (Stage 3) to raise young
- Ideally, wetlands have minimum of 50 percent open water and 10 percent to 20 percent emergent vegetation
- Brooding cover in open water with considerable emergent aquatic vegetation for protection from predators

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive species, such as purple loosestrife, water hyacinth, parrotfeather, hydrilla, and reed canarygrass, begin to reduce habitat quality for mallards

Delay Crop Harvest: (in some ecoregions) hay and crop harvest adjacent to wetlands should be conducted after nesting season

Forest Management: (in some ecoregions) Forest Stand Improvement can favor mast-producing species, especially oaks, in bottomland hardwoods that can be flooded to increase mast production

Leave Crop Unharvested: unharvested grains, such as corn, to provide a winter food source; this does not apply to hay forages or soybeans

Livestock Management: livestock should be excluded from nesting areas

Plant Food Plots: shallowly flooded grain plots can provide an important food source for migrating and wintering mallards

Plant Native Grasses and Forbs: (in some ecoregions) where nesting cover is limiting and planting is necessary to increase coverage of native grasses and forbs

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire should be used to rejuvenate dense vegetation in nesting areas and to increase or maintain proper water and vegetation interspersion in emergent wetlands that become dry in summer; Disking emergent wetlands and fields that will be flooded later will stimulate annual grasses and forbs that are important food plants; Herbicide Applications can be used to control unwanted woody species; Chainsawing can be used to create openings in bottomland forests that can be flooded

Tillage Management: eliminating fall tillage can provide waste grain in the winter

Water Control Structures: should be used to control water level in wetlands managed for mallards and other wildlife

Water Developments for Wildlife: shallow impoundments can be used to flood grain fields and bottomland hardwoods in winter to provide a valuable food source and loafing areas

Wildlife or Fish Survey: aerial surveys are commonly used to estimate trends in the mallard population

Mourning dove

General information

- May be found throughout much of lower 48 states
- Prefer areas of annual and perennial grasses and forbs for feeding with some nearby trees and shrubs for perching, nesting, and roosting
- Bare ground interspersion is important because they don't scratch litter to find seed; they also need grit (small gravel) to help digest food
- Nests are made of twigs and placed on branches of trees or shrubs; may also be placed on the ground where trees are generally lacking
- Often use agricultural areas for feeding- grass and forb seeds, and waste grain from cropland and livestock feedlots.

Habitat requirements

Diet

- Grasses, forb seeds, some agricultural grains
- Use agricultural areas for feeding
- Small areas of bare ground are beneficial for obtaining grit (small gravel) to help digest food
- Forage on waste grain from cropland, livestock feedlots

Water

- Free-standing water required daily
- Prefer shallowly sloping or flat shorelines without vegetation when drinking

Cover

- Nests made of twigs, placed on branches of shrubs or tree but also ground
- Prefer Stages 2, 3 for feeding with some shrubs and trees nearby for nesting, roosting

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for mourning dove; sod grasses, such as tall fescue and bermudagrass, are particularly problematic because they have no food value and their structure at ground level limits mobility of ground-feeding doves and their ability to search for seed

Delay Crop Harvest: (in some ecoregions) in spring to avoid nest destruction

Leave Crop Unharvested: for a variety of small grain crops, such as wheat, millets, grain sorghum, corn, and oats, to provide additional food resource

Livestock Management: should prevent overgrazing, which can eliminate preferred forbs that produce seed for mourning dove; in some cases, livestock can be used to

reduce vegetation height and increase bare ground; livestock should be excluded from food plots

Plant Food Plots: grain plots may be planted in areas where food is lacking and to facilitate recreational hunting

Plant Native Grasses and Forbs: where food may be limiting, especially to increase some of the many native forbs that are extremely important sources of seed for mourning dove

Plant Shrubs: (in some ecoregions) to provide nesting, roosting, and loafing sites in areas where shrub/tree cover is limiting

Plant Trees: (in some ecoregions) to provide nesting, roosting, and loafing sites in areas where shrub/tree cover is limiting

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Disking, Prescribed Fire, and Herbicide Applications can be used to maintain annual forbs and grasses and provide bare ground; Chaining, Drum-chopping, Root-plowing, Herbicide Applications, and Prescribed Fire may be used to reduce shrub cover; Chainsawing, Dozer-clearing, and Root-plowing may be used to remove trees and clear forests and promote early successional plant communities

Tillage Management: tillage may be eliminated in the fall to allow access to waste grain; tillage may be delayed in spring (in some ecoregions) to allow nesting in standing stubble (especially wheat)

Water Control Structures: should be installed if none are present in existing dams or levees to allow water level manipulation

Water Developments for Wildlife: where water is limiting, small ponds, shallow impoundments, guzzlers, and windmills may be created or installed to provide freestanding water

Wildlife or Fish Survey: point counts and observation counts are commonly conducted to estimate trends in populations

Northern bobwhite

General information

- Gamebird about 6-inches tall
- In some parts of country, savannas provide excellent habitat
- Savannahs have very few trees with an understory of grass, forbs, shrubs maintained by frequent fire (2 years to 4 years)
- Savannahs may be pine (as in southeast mixed and outer coastal plain forest) or oak (as in cross timbers portion of Great Plains, eastern deciduous forest)

Habitat requirements

Diet

- Young quail eat insects
- Adult quail eat variety of seeds, green vegetation (mostly forbs), insects, small grains, hard mast

Water

- Obtained through diet

Cover

- Perennial native grasses, like bluestems, for nesting
- Native forbs, insects for brood rearing (recently disturbed sites)
- Ideally scattered patches of shrubby cover with diversity of native grasses, forbs
- Require Stages 2, 3, 4, well interspersed
- Shrubs for escape, thermoregulatory cover throughout year
- Some agricultural crops provide seasonal food, but not substitute for diverse native plant communities

Wildlife Management Practices

Conservation Easement: can protect critical habitat for this declining species in some ecoregions

Control Nonnative Invasive Vegetation: nonnative sod grasses, such as tall fescue and bermudagrass, are especially problematic as they limit bobwhite mobility and provide poor cover and structure; there are many other nonnative invasive species that can degrade habitat quality for northern bobwhite across their range

Edge Feathering: to increase usable space and increase escape cover around row-crop fields

Field Borders: to increase usable space around row-crop fields

Forest Management: (in some ecoregions) in pine forests, Forest Regeneration, especially Clearcut

and Seed Tree, will enhance habitat for a few years until regenerating pines close canopy; Forest Stand Improvement can be used to reduce tree density in pine stands and mixed pine-hardwood stands down to 50 square feet of basal area and enhance habitat; see Set-back Succession for managing hardwood forests for bobwhite

Leave Crop Unharvested: to provide additional food through fall and winter; corn, soybeans, wheat, and grain sorghum are readily eaten

Livestock Management: grazing pressure should be managed so sufficient groundcover remains for nesting and brood rearing; grazing management should discourage a uniform structure of plants across the landscape; cattle grazing in combination with prescribed fire can mimic historic natural disturbance events; grazing management should maintain dense shrub cover in some areas; up to one-third of an area can be grazed more intensively to encourage annual forb production for brood rearing cover, assuming the same areas are not repeatedly grazed the same way; livestock should be excluded from food plots

Plant Food Plots: relatively small linear food plots (one-fourth acre) may be established adjacent to escape cover where food is a limiting factor (this is rare; shrubby cover for escape and forb cover with open structure underneath are more often limiting factors)

Plant Native Grasses and Forbs: where nesting and brood cover is limiting and planting is necessary to develop nesting and brooding cover (suitable nesting and brooding cover usually establishes naturally after undesirable plants are controlled and after tree cover is removed or thinned)

Plant Shrubs: where shrub cover is limiting; if shrub patches are within 50 to 75 yards of each other, additional shrub cover is not needed

Set-back Succession: Prescribed Fire is strongly recommended to maintain and rejuvenate early successional plant communities, shrublands, savanna, and woodlands; fire consumes dense litter, limits succession of woody species, and encourages herbaceous groundcover; Disking can be used to reduce litter build-up, encourage annual forbs and grasses, and provide open structure at ground level underneath forb cover; Chaining can be used to set-back shrub cover when it becomes too dense and tall; Chainsawing, Dozer-clearing, and Root-plowing may be used remove trees and convert hardwood forest to early succession or savanna; Herbicide Applications may be used to remove undesirable woody encroachment

Tillage Management: eliminate fall tillage to provide waste grain

Decrease Harvest: may be necessary if populations are declining in areas of good habitat and data suggest mortality from hunting is additive or limiting population growth

Wildlife or Fish Survey: covey counts, whistle counts, point counts, and hunter harvest and observation data are used to estimate trends in populations

Northern flicker

General information

- Occupy all North America
- Inhabit most of U.S. year-round
- Found in forests and woodlands interspersed with herbaceous openings
- Often found along riparian zones and urban areas
- Prefer older urban residential areas with large trees and parks
- Create cavities in trees for nesting which later become nesting and roosting sites for other species which makes them important for biological diversity
- Can cause issues in urban areas where they create holes in wood siding on houses or damage ornamental trees
- European starlings often take over their cavities

Habitat requirements

Diet

- Ants make up about 50 percent of diet
- Seeds, soft mast, earthworms
- Poison ivy fruit
- May use artificial feeders

Water

- Daily water requirements unknown; probably obtained from diet

Cover

- Tree cavities are used for nesting
- Prefer old, mature trees, softwood trees (yellow poplar, cottonwood, willow)
- Will nest in boxes, posts, holes in banks, holes in houses, structures where trees are unavailable
- Open areas in Stages 2, 3 interspersed with areas of Stages 5, 6
- Riparian, urban areas
- Prefer older urban residential areas with large trees, golf courses, parks

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative species begin to compete with native vegetation and degrade habitat for flickers

Create Snags: to enhance possible sites for cavities where snags are limiting, especially softwoods, but other species as well

Forest Management: Forest Regeneration will provide more open area and possibly snags for a short time; Forest Stand Improvement can open the structure of the forest and provide snags; snags should be retained during forest management activities

Plant Shrubs: several soft mast-bearing shrubs can provide additional food resource when limiting in open areas

Plant Trees: in large open areas without trees

Set-back Succession: Prescribed Fire will consume the litter layer and facilitate foraging on the ground; Chainsawing may be used to reduce overstory tree density to create woodland conditions and improve tree species composition; Mowing may be used to maintain foraging and loafing cover for northern flickers in Urban areas

Wildlife Damage Management: may be necessary to prevent damage from foraging, drumming, and excavating wooden buildings; exclusion practices can prevent access to buildings; harassment can repel flickers from an area

Wildlife or Fish Survey: point counts are used to estimate trends in populations

Artificial Feeders: may be used to attract flickers in urban areas; suet is preferred

Northern pintail

General information

- Dabbling duck that is 23-30 inches in length
- Both males and females have blue-gray bills and gray legs and feet
- Gray, brown, black patterning on its back
- Long central tail feathers give it its name
- Hens make a coarse quack; drakes make a flute-like whistle
- Prefer open wetlands
- Nest on ground and hide them in vegetation in a dry location
- Nest construction nis a simple shallow scrape in the ground lined with plant material and down

Habitat requirements

Diet

- Aquatic plant seeds and rhizomes
- Grain and other seeds found in fields
- Aquatic insects, mollusks, and crustaceans

Water

- Obtained from diet

Cover

- Open freshwater wetlands and intertidal marshes

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative aquatic weeds reduce or limit space for foraging or loafing, or when nonnative invasive plants degrade quality of nesting cover

Leave Crop Unharvested: to provide additional food for migrating and wintering pintails

Livestock Management: livestock should be excluded from nesting areas, from wetlands managed for waterfowl, and from food plots

Plant Food Plots: shallowly flooded grain food plots can provide a beneficial food source for migrating and wintering northern pintails

Plant Native Grasses and Forbs: where nesting cover is limiting, and planting is necessary

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire should be used to maintain and rejuvenate nesting cover and maintain proper water and vegetation interspersion in wetlands;

Chainsawing, Dozer-clearing, and Root-plowing may be used to clear trees where needed

Tillage Management: eliminating fall tillage can provide waste grain in the winter

Water Control Structures: should be installed if not present in managed wetlands to manipulate water levels

Water Developments for Wildlife: shallow impoundments can flood fields and provide important foraging and loafing areas for migrating and wintering

Wildlife or Fish Survey: observation counts and aerial surveys are used to estimate population trends

Prothonotary warbler

General information

- Songbird found primarily in southern U.S.
- Most often found in forested wetlands such as cypress swamps, other bottomland hardwoods
- Winter in Central and South America

Habitat requirements

Diet

- Feeds primarily in lower canopy of at ground level
- Insects such as ants, beetles, mayflies, aquatic larvae, snails
- Occasionally various seeds and fruit

Water

- Obtained from diet

Cover

- Cavity nesters so require dead standing timber, large overmature trees
- Nests in hardwood forests (Stage 6) near water
- Forested wetlands, other mature bottomland hardwood forests
- Complex vertical structure provides structure necessary for insect populations

Wildlife Management Practices

Control Nonnative Invasive Vegetation: where nonnative invasive vegetation is competing with native vegetation and reducing habitat quality for prothonotary warblers

Create Snags: where natural cavities are limiting to provide possible cavity sites

Forest Management: Forest Stand Improvement can stimulate vertical structure where absent

Livestock Management: should exclude livestock from bottomland hardwoods

Nesting Structures: nest boxes are readily used and will provide suitable nesting cover where natural cavities are limiting

Plant Trees: in large bottomland fields where forest cover is lacking and natural regeneration is not sufficient or of desirable composition

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if not present to manipulate water levels in wetlands managed for prothonotary warblers

Water Developments for Wildlife: shallow impoundments can be established in bottomland hardwoods for habitat enhancement

Wildlife or Fish Survey: point counts are used to estimate population trends

Red-eyed vireo

General information

- Common migratory songbird
- Occur throughout eastern North America, upper Midwest
- Found in mature deciduous forests as well as forested urban parks
- Nest made of twigs, bark, and grasses in the shape of a cup

Habitat requirements

Diet

- Insects, spiders, soft mast
- Usually found foraging in middle to upper layer of forest canopy

Water

- Obtained from diet

Cover

- Nest often in understory or midstory
- Nest usually placed on horizontal fork of slender branch
- Require overstory of stage 6 mixed deciduous forest

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when it begins to reduce habitat quality for red-eyed vireos; a common example in the South is kudzu, which can reduce forest cover by overtaking and killing trees

Forest Management: Forest Regeneration (Single-tree Selection and Group Selection) can encourage insect and soft mast availability; Forest Stand Improvement (light thinning) can also stimulate understory and midstory development to enhance nesting cover in relatively open woods and encourage additional soft mast availability

Plant Trees: in large open areas, trees may be planted to provide future habitat

Wildlife or Fish Survey: point counts are most often used to estimate population trends

Redhead

General information

- Diving ducks found across U.S. and Mexico
- Winter in southern areas of U.S. and into Mexico
- Use open-water wetlands and those with floating organic material and some emergent vegetation
- Do not build nests but rather use old nests of other ducks and birds that are above water or very near shore
- Chicks are feathered with down and can swim and forage upon hatching

Habitat requirements

Diet

- Young primarily eat aquatic invertebrates (mollusks, snails, crustaceans) during late spring and early summer
- During rest of year, prefer aquatic plants such as pondweeds, muskgrass, bulrush seeds, wild celery, water lily seeds, and coontail

Water

- Obtained from diet

Cover

- Dense emergent vegetation for nesting in spring and summer
- Open-water wetlands for loafing and foraging
- Wetlands with a mosaic of open water with submerged and emergent aquatic vegetation are used for foraging

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive aquatic vegetation begins to reduce habitat quality for redheads; this is most common when mats of nonnative species begin to form over the water surface and limit diving and foraging by redheads

Livestock Management: livestock should be excluded from wetlands managed for redheads during the nesting season to prevent deterioration of nesting cover

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire is recommended to rejuvenate vegetation when wetlands dry sufficiently to burn (most common in ephemeral wetlands or impoundments where water levels can be manipulated); Chainsawing may be used to clear trees where needed

Water Control Structures: should be installed in dams or levees if not present to enable water level manipulation and promote growth of tall emergent aquatic vegetation adjacent to wetlands with an abundance of floating and submerged aquatic vegetation (3 feet to 5 feet deep)

Water Developments for Wildlife: shallow impoundments may be constructed to temporarily flood areas dominated by tall emergent aquatic vegetation during the nesting season

Wildlife or Fish Survey: observation surveys and aerial surveys are most often used to estimate population trends

Rock dove

General information

- Commonly called pigeons
- Introduced species found year-round throughout urban and agricultural areas in U.S.
- Regularly found around large buildings, parks, and open areas
- Construct shallow nest of sticks, leaves, and other vegetation and nest aboveground or on buildings
- Considered pests because they damage buildings and other structures with accumulations of droppings
- Cause severe problems in agricultural areas by contaminating feed
- Carry and spread diseases such as salmonella, encephalitis, and Newcastle disease
- Droppings may also contain histoplasmosis, a fungal disease that causes respiratory problems in humans
- Wildlife damage management often needed to control overabundant populations

Habitat requirements

Diet

- Waste grain, weed seeds, crumbs, garbage
- Primarily feed on ground
- In urban areas, rock doves live mostly on human handouts

Water

- Require free-standing water in warm seasons

Cover

- Create shallow nest of sticks, leaves, other vegetation
- Nests above ground, on or around buildings
- Barn lofts, window ledges, roof tops, bridges, other structures

Wildlife Management Practices

Wildlife Damage Management: shooting (including pellet guns in urban areas), toxicants, and trapping are recommended direct control techniques; exclusion practices prevent access to livestock feed; food, water, and desirable cover should be removed when possible and when it does not impact desirable wildlife species; harassment practices may be effective; habitat management to attract rock pigeons should never occur

Wildlife or Fish Survey: observation counts and questionnaires related to wildlife damage management are used to estimate trends in populations

Song sparrow

General information

- Common and inhabit all of U.S.
- Migrate from extreme northern areas during colder months
- Use shrubby areas interspersed with herbaceous openings and forest, especially along riparian areas
- Nest along forest edges
- Nest made of grass and leaves in the shape of a cup is placed on the ground under a shrub or in thick herbaceous cover

Habitat requirements

Diet

- Weed seeds, insects, soft mast
- Primarily feed on ground

Water

- Require free-standing water frequently during warm seasons

Cover

- Thick shrubs and herbaceous cover for nesting, loafing, and escape
- Shrubby areas interspersed with Stages 2, 3, 5 and 6, especially along riparian areas

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat for song sparrows

Forest Management: Forest Stand Improvement practices can stimulate increased brushy cover where lacking

Plant Native Grasses and Forbs: where lacking and necessary to provide cover for nesting

Plant Shrubs: to provide soft mast where there is little soft mast available

Set-back Succession: Chainsawing can create additional brushy cover; Prescribed Fire can be used to maintain shrubby cover; Mowing may be used to maintain foraging and loafing cover for song sparrows in Urban areas

Water Development for Wildlife: drinking water may be provided in birdbaths or pans of water

Wildlife or Fish Survey: point counts are used to estimate trends in populations

Artificial Feeders: for use in Urban areas; millets and sunflower seeds are favorites

Wild turkey

General information

- Large gamebirds found across U.S.
- Adapted to use a variety of habitat types from deciduous forest to desert shrub to open grassland interspersed with tree-lined riparian areas
- Flock together during fall and winter
- Breeding occurs in spring when males gobble to attract females
- Nests are on ground usually next to a log or shrub or similar to conceal
- Nests are lined with leaves and other vegetation
- Young can walk around with hen and forage for themselves soon after hatching

Habitat requirements

Diet

- Hard mast, especially acorns and beechnuts in the fall and winter
- Soft mast such as blackberries, mulberries, and black cherry
- Insects and other invertebrates, including spiders and snails, are especially important for young poults and hens prior to nesting
- Miscellaneous seeds
- Leaves from forbs and grasses
- Grain from a variety of agricultural crops

Water

- Obtained from diet but will use freestanding water when available

Cover

- Herbaceous openings, especially those with a forb canopy and open ground structure, are preferred for brooding.
- Mature forest, young regenerating forest, brushy areas, old fields for nesting
- Mature forest, herbaceous openings, and grain fields for foraging
- Trees or tall shrubs for roosting

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for wild turkeys; common examples include sod grasses, such as tall fescue, orchardgrass, bermudagrass, bahiagrass, smooth brome, and others, such as cogongrass, which limit mobility for turkey poults and food availability; kudzu and shrub honeysuckle are other species that often degrade habitat in forested areas

Edge Feathering: can enhance nesting and brooding cover around fields

Field Borders: to increase usable space for nesting and brooding around row crop fields

Forest Management: (in some ecoregions) Forest Regeneration (Clearcut, Shelterwood, Group Selection, Seed-tree) can enhance nesting and brooding cover and stimulate increased soft mast and miscellaneous seed for a few years after harvest; Forest Stand Improvement can improve the structure of the understory for nesting and brood rearing, increase production of soft mast and miscellaneous seed, and enable crowns of desired trees to grow and produce additional mast; Forest Road Maintenance may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: especially corn, soybeans, and grain sorghum, to provide supplemental food source during fall and winter

Livestock Management: should prevent livestock from degrading habitat by overgrazing and damaging planted trees and shrubs and food plots

Plant Food Plots: to provide supplemental foods where food may be limiting; corn, soybeans, wheat, chufa, and clovers are often used

Plant Native Grasses and Forbs: where early successional vegetation is limiting and planting is necessary

Plant Shrubs: where additional soft mast or brushy cover is needed

Plant Trees: where additional hard mast production, especially acorns, is needed and where roosting sites are limited

Set-back Succession: Prescribed Fire is recommended to maintain herbaceous openings, rejuvenate shrubland, and improve understory structure and composition for foraging, brooding, and nesting in forests, woodlands, and savannas; Disking can be used to maintain herbaceous openings and reduce thatch build-up; Herbicide Applications, Chaining, Root-plowing, and Drum-chopping can be used to reduce shrub cover and stimulate more herbaceous groundcover; Chainsawing, Dozer-clearing, and Root-plowing can be used to remove trees and create herbaceous openings, especially where brooding cover may be limiting

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to tall shrub or forest cover

Water Developments for Wildlife: can be useful when there is little or no free-standing water

Decrease Harvest: may be necessary if populations are declining and data suggest mortality from hunting is additive or limiting population growth

Increase Harvest: where populations can sustain additional harvest pressure for hunting recreation and where populations need to be lowered

Wildlife Damage Management: may be necessary in rare instances when wild turkeys are depredating crops

Wildlife or Fish Survey: gobble surveys, poult surveys, and hunter success rates are used to estimate population trends

Wood duck

General information

- Found throughout most of the U.S.
- Mostly use forested and shrub-emergent wetlands and riparian systems (rivers and creeks)
- May also forage and loaf in flooded fields
- Nest in tree cavities within or adjacent to flooded timber, but possibly up to a mile from water
- Cavity availability is critical for sustainable population
- Artificial cavities (nest boxes) are used by wood ducks and have driven the increase in populations during the past 50 years

Habitat requirements

Diet

- Acorns are primary diet item in fall winter
- Other hard mast, various miscellaneous seeds, soft mast
- Waste grain (especially corn)
- Insects, other invertebrates important for wood duck chicks, hens prior to and during nesting season

Water

- From diet drink freestanding water regularly
- See cover requirements below

Cover

- Nest within tree cavities (state 6 hardwoods), artificial cavities
- Nests usually within or adjacent to flooded timber but have been found up to one mile from water
- Stage 3 wetlands, swamps
- Shallowly flooded bottomland hardwoods

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for wood ducks; this is applicable in wetlands as well as adjacent uplands where wood ducks may be foraging

Create Snags: where relatively large cavity nesting sites (trees >12 inches in diameter) may be limiting

Forest Management: Forest Regeneration (Shelterwood, Group Selection) in relatively large forested areas that can be flooded will create openings with emergent woody vegetation that will attract foraging and loafing wood ducks; Forest Stand Improvement in bottomland hardwoods that can be flooded can lead to larger crowns of favored trees

and increased mast production; woody stem density should increase following FSI and improve cover in stands that can be flooded

Leave Crop Unharvested: especially corn, to provide high-energy food source during fall and winter; this is especially important in fields that can be flooded and those adjacent to a water source used by wood ducks

Livestock Management: should prevent overgrazing in fields that are flooded for wood ducks; livestock should be excluded from bottomland hardwoods and areas where trees and shrubs have been planted, as well as food plots

Nesting Structures: nest boxes should be erected where a lack of natural cavities may be limiting the wood duck population; nest boxes for wood ducks should be at least 100 yards apart and should not be placed within sight of each other to prevent dump nesting (if a wood duck hen sees another hen entering a cavity or nest box, she may be stimulated to enter that cavity and "dump" her own eggs instead of laying in her own nest; thus, heat from incubation is not even over all the eggs and fewer eggs hatch overall)

Plant Food Plots: shallowly flooded grain plots, especially corn, can provide an important source of energy in fall/winter, especially during years of poor mast production

Plant Shrubs: where there is a lack of emergent woody vegetation in open areas that can be flooded

Plant Trees: mast trees planted adjacent to or within open areas suitable for flooding may provide future food and nesting cavities in areas where these trees may be limiting

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Chainsawing, Prescribed Fire, and Herbicide Applications can be used to reduce tree and shrub cover in woods that can be flooded and create openings where needed to stimulate more herbaceous cover and provide increased food availability

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially corn fields that can be shallowly flooded

Water Control Structures: should be installed in existing dikes if there are none present so water level can be manipulated

Water Developments for Wildlife: shallow impoundments should be created where topography allows, providing increased feeding and nesting space for wood ducks

Wildlife or Fish Survey: nest box usage rates, brood counts, and flush counts are used to estimate population trends

WHEP MAMMALS
for
Wildlife management purposes
Applicable to Activities II, III, IV, and V

American beaver

big brown bat

black bear

common muskrat

coyote

Eastern cottontail

Eastern gray squirrel

mink

Northern raccoon

river otter

white-tailed deer

wild pig

American Beaver

General information

- Occur throughout most of North America
- Build dams from tree branches, shrubs, mud to form ponds that stabilize water levels, slow water movement, and provide shelter beneath ice in winter
- Build lodges from sticks, mud, dig burrows in banks of streams, rivers
- Provide many ecological benefits
    - Create habitat for birds, mammals, reptiles, amphibians, fishes, invertebrates
    - Assist in distribution and abundance of many freshwater wetland-associated species
- Historically, trapped for valuable fur that led to extinction in many parts of former range
- Today have rebounded with help from wildlife agency regulations, lack of market
- Also known as nuisance as they cut down trees, dam ditches, streams in undesirable places
    - Causes cropland flooding, destabilization of road edges, damaged timber when stands are flooded for extended periods.
- When dams constructed in places that cause problems, removal is usually best solution. If dam destroyed but beavers remain, they will build again.

Habitat requirements

Diet

- Primarily inner bark from shrubs, trees
- Some forbs, grasses
- Store cuttings in caches (piles of branches) to use in winter

Water

- Prefer areas that can be dammed to provide still water with sufficient depth
- Prefer slow-moving or still water at least 5 feet deep (to allow movement under water) with constant level

Cover

- Bottomland riparian areas in Stages 4, 5 that can be dammed to provide still water with sufficient depth
- In wetlands that have permanent water with variety of shrubs, trees adjacent to water

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for American beaver

Livestock Management: should prevent livestock access to riparian areas and other wetlands where beaver is a focal species to prevent foraging on shrubs and young trees; this may include developing livestock watering facilities in upland areas beaver may use and maintain good water quality

Plant Shrubs: where beavers are desired, but not present, deciduous shrubs may be planted along riparian areas where there are few trees or shrubs to make the area more attractive to beavers

Plant Trees: where beavers are desired but not present, deciduous trees may be planted along riparian areas where there are few trees or shrubs to make the area more attractive to beavers

Water Control Structures: a Clemson Beaver Pond Leveler or similar device can be installed in beaver dams to maintain water levels

Decrease Harvest: may be necessary where an increased beaver population is desired and trapping pressure has limited growth

Increase Harvest: where populations can sustain additional trapping pressure for recreation and/or where populations need to be lowered

Wildlife Damage Management: should be implemented where beavers are causing problems for landowners, such as flooding timber, crops, roads, and other areas

Wildlife or Fish Survey: presence and extent of beaver activity (dams, evidence of cutting shrubs and trees) and trapper harvest data are used to estimate population trends over time

Big brown bat

General information

- One of 46 bat species in North America
- Nocturnal
- Inhabit nearly all U.S., except for south Florida, south-central Texas
- Males, females may roost individually or in small numbers
- Males usually roost separately from females
- Females may roost together in maternal colony when pups are born, nursing
- Females usually give birth to one or two pups, often in hollow tree or attic
- Only mammals capable of flying

Habitat requirements

Diet

- Insectivores
- Night-flying insects, especially beetles
- Lactating females eat their weight in insects daily

Water

- Free-standing required daily when active
- Will drink “on-the-wing” by dipping their lower jaw into water source

Cover

- Buildings, hollow trees are often for daytime roosts
- Bat houses may be used for daytime roosting
- Common in urban areas, including cities, parks, suburban neighborhoods
- Use variety of vegetation types, from farmland to mature deciduous forest
- Frequently use buildings, houses for daytime summer roosts
- Hibernate in winter in northern latitudes using caves, mines, buildings
- Rely on stored fat reserves during hibernation since they do not actively feed

Wildlife Management Practices

Create Snags: to provide roost sites (only in areas where they pose no danger to human structures or health when they fall) where roost sites may be limiting

Nesting Structures: may provide additional roost sites if natural roost sites are limiting

Plant Trees: in large open areas where few trees are present to promote future old trees that may provide roost sites

Set-back Succession: Chainsawing, Dozer-clearing, Root-plowing, Herbicide Applications, and Prescribed Fire (in rural areas) can be used to maintain more than 50 percent open areas for foraging; mowing may be used in Urban areas to maintain openings

Water Developments for Wildlife: where available open water is not available, small ponds and shallow impoundments may be constructed for drinking and to attract insects; water developments should be constructed with nothing above the water (such as fencing or bracing) so bats have an unobstructed flight path

Wildlife Damage Management: may be necessary when roosting or hibernating in areas occupied by humans

Wildlife or Fish Survey: observation counts and echolocation surveys are used to estimate population trends

Black bear

General information

- Large home ranges (several square miles) vary based on sex, age, and/or time of year (breeding season, fall foraging areas, denning habitat
- Adult male home ranges (up to 50 square miles) larger than female home ranges
- Solitary females, those with cubs, smaller (15 square miles) home ranges
- Primarily nocturnal but may be seen anytime during day
- Regulation of bear population densities influenced by public tolerance toward bear/human conflicts, property damage, livestock, agricultural damage, desire to see bears
- Generally secretive, avoid human contact
- Highly adaptable, may occur in, around human dwellings, becoming problematic, especially if food is available
- Hibernate in winter (even in warm climates like Florida, Louisiana)
- Liberalizing or restricting females in harvest influences population growth

Habitat requirements

Diet

- Omnivorous, but more than 90 percent of their diet consists of vegetative matter
- Spring
    - Typically, sources scarce
    - Consist of early developing plants like skunk cabbage, squaw root, grasses
    - small to medium-sized mammals like deer fawns, young livestock Insects
- Summer, early fall
    - Variety of soft mast like blackberry, blueberry, serviceberry, black cherry pokeweed
- Late fall
    - Acorns, beechnuts, hickory nuts, other hard mast
    - Field corn, soybeans
    - Help bears prepare for hibernation
- When natural foods are scarce, bears may wander near human residences, feed on bird seed, dog/cat food, other food scraps

Water

- Free-standing water for drinking
- Spring seeps, other shallow water sources are used to cool off, deter biting insects
- Seldom limiting factor since black bears have large home range

Cover

- Primarily use mature deciduous or mixed deciduous / coniferous forest interspersed with early successional openings containing soft mast
- Young regenerating stands, shrub thickets with dense brushy cover, riparian corridors for loafing, escape
- Early successional openings primarily for foraging, usually for soft mast
- Rock crevices, excavations, hollow trees, dense mountain laurel/rhododendron thickets for hibernation

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for black bear

Edge Feathering: can stimulate increased soft mast production around row-crop fields (especially corn, soybean, and wheat)

Forest Management: Forest Regeneration (Clearcut, Shelterwood, Group Selection) creates dense escape and loafing cover for bears; an abundance of soft mast (pokeweed, blackberry, huckleberry, blueberry) is usually available in recently regenerated stands; Forest Stand Improvement practices can stimulate increased hard mast production and can stimulate groundcover, which usually increases soft mast production; Forest Road Maintenance may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: strips of corn, wheat, grain sorghum, or soybeans should be left standing, especially where adjacent to escape cover, to provide food close to cover

Plant Food Plots: where food may be limiting, forage (especially chicory) and grain plots (especially corn) may be planted to provide additional nutrition

Plant Shrubs: crabapple, blueberry, hawthorn, wild plum, elderberry, and others can be planted within forest openings where soft mast is lacking

Plant Trees: apple, pear, cherry, persimmon, mulberry, and dogwood are good choices to provide additional soft mast where lacking

Set-back Succession: Prescribed Fire can stimulate groundcover and soft mast in early successional openings, maintain shrub cover when quality begins to decline, and

stimulate understory structure and soft mast availability in forests, especially where sufficient sunlight reaches the forest floor; Dozer-clearing and Root-plowing can be used to increase early succession

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to dense shrub or forest cover

Decrease Harvest: may be necessary when additional bears are desired and hunting pressure may be limiting population growth

Increase Harvest: where populations can sustain additional hunting pressure for recreation and where populations need to be lowered

Wildlife Damage Management: may be needed if bear-human conflicts occur in agricultural or urban settings

Wildlife or Fish Survey: scent stations, winter den surveys, camera surveys, and hunter harvest data are used to estimate population trends

Common muskrat

General information

- Found throughout U.S., especially in shallow marches with abundant cattails
- Mainly nocturnal
- Burrowing, denning activities can cause problems in flooded agricultural areas, such as rice fields, waterfowl management areas.

Habitat requirements

Diet

- Roots, tubers
- Green shoots of emergent aquatic vegetation such as cattails, bulrushes

Water

- From diet

Cover

- Primarily Stage 2 wetlands
- Den in lodges built with, located in, cattails, bulrushes (dense patches)
- Sometimes nest in bank burrow along waterway
- During summer, prefer water 1 - 2 feet deep, with about 20 percent of wetland open water free of emergent aquatic vegetation
- Loaf on floating logs or tops of lodges
- Water at least 4 feet deep or flowing that allows free movement under ice during winter
- Build lodges of cattails or other herbaceous vegetation, but do NOT use sticks or limbs

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive aquatic vegetation is competing with the native aquatic plant community and reduce habitat quality for common muskrat

Livestock Management: livestock should be restricted from riparian areas and other wetlands; this may require development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire is recommended to rejuvenate old, decadent wetland vegetation

Water Control Structures: should be installed if not present in levees or dams to control water levels and allow cattails and bulrushes to grow

Water Developments for Wildlife: small impoundments can be built in low-lying areas to provide habitat

Decrease Harvest: when trapping efforts have reduced population below desirable levels

Increase Harvest: when populations can sustain additional trapping or where populations need to be lowered

Wildlife Damage Management: may be necessary when muskrats damage dikes in agricultural areas and waterfowl management areas; populations are typically reduced by trapping

Wildlife or Fish Survey: observation surveys, track counts, and presence of lodges are used to estimate population trends

Coyote

General information

- Found throughout the continental U.S.
- Observed in large cities, urban areas
- Coyotes most active at night, early morning, sunset
- May be active during day
- Live in packs, alone or in mated pairs, depending on time of year

Habitat requirements

Diet

- Extremely varied diet that fluctuates with seasons
- Rodents, rabbits, other small mammals, insects, birds, eggs, deer, carrion, soft mast
- Livestock, wild ungulates (deer, elk, pronghorn) are usually represented in coyote stomachs as carrion; however, in some cases, prey heavily on deer, pronghorn fawns, limiting reproductive success

Water

- Requirements not well documented but probably obtained from diet

Cover

- Den (raising pups) in variety of places
- Brush-covered slopes, steep banks, rock ledges, thickets, hollow logs, rock ledges, brush piles crevices, burrows along riverbanks, holes under stumps, abandoned buildings
- Grasslands, shrubland, farmland provide optimal habitat
- Use Stages 5, 6 mature forests

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation reduces habitat quality for coyote prey species

Edge Feathering: (in some ecoregions) to increase cover and food availability for prey species around fields

Field Borders: to increase usable space for prey species around fields

Forest Management: (in some ecoregions) Forest Regeneration (Clearcutting, Shelterwood, Seed-tree, Group Selection) and Forest Stand Improvement can improve habitat for prey and lead to more abundant prey

Livestock Management: should maintain adequate cover for prey species

Plant Native Grasses and Forbs: where additional early successional cover is needed for prey and planting is necessary

Plant Shrubs: in areas where additional shrub cover is needed to attract prey and provide security cover for coyotes

Set-back Succession: Prescribed Fire, Disking, Chaining, and Herbicide Applications are recommended to maintain herbaceous openings; Prescribed Fire can be used to enhance forest understory structure and composition; Chainsawing can be used to create additional forest openings where necessary

Decrease Harvest: where hunting or trapping has limited population and additional coyotes are desired to control a prey species that is overburdened

Increase Harvest: through hunting or trapping where coyote populations need to be lowered

Wildlife Damage Management: may be necessary where livestock or pet depredation is a problem, and more rarely where they are suppressing or causing a decline in the population of some species that have been identified as focal species for management, such as white-tailed deer or wild turkey (see Wildlife Damage Management Techniques)

Wildlife or Fish Survey: track counts, trapper harvest data, and camera surveys are used to estimate population trends

NOTE: Situations in which landowners would manage for coyotes are exceptionally rare. However, the coyote is a native predator and plays an important role in many ecosystems. Although management is rarely, if ever, implemented to promote coyotes, management for their prey helps both prey populations and coyote populations and promotes a healthy ecosystem.

Eastern cottontail

General information

- Occur in eastern half of country
- Represent prey for majority of carnivorous predators within its range
- Prolific breeders, however, as female may have 7 litters per year, with 3 to 6 young per litter
  Required to perpetuate populations as 70 percent to 80 percent die each year

Habitat requirements

Diet

- Spring/Fall
  - Forbs, grasses (Stages 2, 3) browse, soft mast
- Winter
  - Bark of shrubs, trees, as well as buds, grain, browse

Water

- From diet

Cover

- Shrub cover, brush piles, native perennial warm- season grasses
- Forbs (Stage 3) for loafing, escape cover
- Burrows also used for denning, escape
- Prefer brushy cover interspersed with Stage 3

Wildlife Management Practices

Control Nonnative Invasive Vegetation: where nonnative invasive vegetation is competing with native vegetation and limiting habitat for cottontails; sod grasses, such as tall fescue and bermudagrass, can be especially problematic

Edge Feathering: to increase usable space around fields

Field Borders: to increase usable space around fields

Forest Management: Forest Regeneration (Clearcut), provides optimal brushy cover for a few years; Forest Road Maintenance may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: to provide additional food and cover, especially corn, alfalfa, and wheat

Livestock Management: should prevent overgrazing to allow sufficient herbaceous vegetation for nesting, cover, and forage in fields and other early successional areas; exclude livestock from food plots

Plant Food Plots: where additional forage is needed; linear plantings may be situated adjacent to dense cover

Plant Native Grasses and Forbs: where early successional cover is limiting and planting is required to promote additional grasses and forbs

Plant Shrubs: in relatively large openings with few shrubs; field borders, fencerows, and other idle land areas may be good places to plant but usually shrubs and brushy cover will develop naturally in most areas through succession

Set-back Succession: Prescribed Fire, Disking, and Herbicide Applications are recommended to maintain early successional areas, especially when litter accumulation or woody encroachment is excessive; Chaining, Prescribed Fire, and Herbicide Applications can be used to rejuvenate shrublands, especially where herbaceous groundcover is shaded out; Chainsawing, Dozer-clearing, and Root-plowing can be used to convert forest cover to early successional communities; Mowing can be used to maintain herbaceous openings in Urban areas

Tillage Management: fall tillage may be delayed until spring to allow use of standing stubble for cover and waste grain for food

Decrease Harvest: may be necessary when additional rabbits are desired and hunting or trapping efforts are limiting growth; low rabbit populations are almost always a result of inadequate habitat, not harvest levels

Increase Harvest: where populations can sustain additional hunting or trapping pressure for recreation or where populations need to be lowered

Wildlife Damage Management: shooting, trapping, and exclusion techniques can be used where there is damage to ornamental and garden plants

Wildlife or Fish Survey: observation counts, track counts, hunter harvest data, and transect flush counts can be used to estimate population trends

Eastern gray squirrel

General information

- Lives primarily in Stage 6 mature deciduous forests, woodlands

Habitat requirements

Diet

- Variety of hard, soft mast, miscellaneous seeds, grains, bark, buds, mushrooms
- May also eat eggs
- Forage both in trees, on ground, especially along edge of crop fields (harvested corn)

Water

- From diet, but free-standing water also used

Cover

- Build nests of leaves, twigs generally 30 plus feet above ground
- Den in cavities of mature trees
- Will use nest boxes but not necessary since nests built in absence of cavities
- Stage 6 forest, woodlands
- Adapted to suburban, urban areas with mature trees

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native species and reduce habitat quality for eastern gray squirrel; several nonnative trees, such as tree-of-heaven and royal paulownia, and nonnative groundcover and vines, such as Japanese stiltgrass, kudzu, and English ivy, can displace more valuable native species and make finding food difficult

Forest Management: Forest Regeneration (Group Selection, Single-tree Selection) can increase soft mast and availability of various seed-producing plants used by eastern gray squirrels; Forest Stand Improvement can encourage larger crowns of mast-producing trees and enable oaks, hickories, beech, and others to produce more mast; also can increase soft mast availability and provide snags for potential den sites

Leave Crop Unharvested: (corn) where crop is adjacent to woods or tree line where squirrels can clean grain; especially important during years of poor mast production

Livestock Management: should prevent overgrazing in woodlands and forests; livestock should be excluded from riparian areas in open landscapes where tree cover is largely limited to riparian areas; livestock should be excluded from food plots and from areas where trees have been planted to enhance habitat for eastern gray squirrels

Plant Food Plots: grain food plots, especially corn, can provide an important food source during winters with poor mast availability

Plant Trees: plant mast trees (especially oaks and hickories) where they are limiting; most appropriate for large open areas that do not represent habitat for gray squirrels; also may be appropriate where composition of wooded areas is lacking mast and limiting gray squirrel population

Decrease Harvest: may be necessary when additional gray squirrels are desired and hunting pressure is limiting population growth

Increase Harvest: where populations can sustain additional hunting pressure for recreation and where populations need to be lowered

Wildlife Damage Management: may be required if gray squirrels become a nuisance around houses

Wildlife or Fish Survey: observation counts are most often used to estimate population trends

Artificial Feeders: may be used in urban areas to increase viewing opportunities

Mink

General information

- Found in Alaska, Canada, across most of U.S.
- Mainly nocturnal

Habitat requirements

Diet

- Rabbits, mice, muskrats, frogs, crayfish, snakes, birds
- Strictly carnivorous
- Can eat significant numbers of upland nesting waterfowl or game birds, especially in areas where nesting habitat is limited
- Most food found in close association with dense vegetation along wetland edges, other riparian areas

Water

- Probably obtained through diet
- Necessary for habitat

Cover

- Availability of den site key factor in how many use an area
- Areas with many shrubs/trees, limited livestock grazing near riparian areas usually have more den sites
- Prefer habitat associated with streambanks, riverbanks, shores of variety of wetlands
- Riparian areas, dens under log jams, tree roots, old muskrat burrows, rockpiles

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for mink and their prey

Livestock Management: livestock should be excluded from wetlands and riparian areas where mink is a focal species; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire is recommended to rejuvenate old decadent wetland vegetation that can improve habitat for prey

Water Control Structures: are necessary to regulate water level and manipulate growth of emergent aquatic vegetation adjacent to an impoundment

Water Developments for Wildlife: shallow impoundments can be developed to increase habitat where needed

Decrease Harvest: may be necessary when trapping pressure is limiting population and an increase in population is desired

Increase Harvest: where populations can sustain additional trapping pressure, and when mink have been identified limiting upland nesting waterfowl or gamebirds

Wildlife Damage Management: mink may occasionally kill domestic poultry, but this is rare and localized. Trapping and exclusion are effective methods to reduce damage.

Wildlife or Fish Survey: track counts and trapper harvest data are often used to estimate population trends

Northern raccoon

General information

- Very common throughout most of U.S., except in certain parts of Rocky Mountains, Nevada, Utah, Arizona
- Potential pests in urban areas, in wetlands, where waterfowl nesting important
- Major predators on game bird nests, young game birds

Habitat requirements

Diet

- Omnivorous
- Varied diet
- Crayfish, frogs, birds, eggs, small mammals, insects, lizards, snakes, worms, fish, carrion
- Grains, seeds, hard, soft mast
- Foods prepared for human, pet consumption

Water

- Require water frequently during warm seasons

Cover

- Den in hollow trees, rocky cliffs, ledges, burrow under stumps or brush piles, in chimneys, junk piles, abandoned buildings, attics, crawl spaces of houses, buildings
- Natural tree cavities for daytime loafing
- Found in variety of vegetation types but usually most abundant near riparian areas, wetlands, bottomland hardwoods
- Found in urban areas

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for raccoon

Create Snags: where denning sites are limited

Edge Feathering: to increase usable space for prey around fields

Field Borders: to increase usable space for prey around fields

Forest Management: Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection, Single-tree Selection) and Forest Stand Improvement can stimulate soft mast production and cover for prey

Leave Crop Unharvested: especially cornfields adjacent to bottomland hardwoods and riparian areas

Livestock Management: livestock should be excluded from riparian areas and other wetlands; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

Plant Food Plots: annual grain food plots, especially corn, may be planted where food is limiting and where an increase in raccoon population is desired (this situation is exceptionally rare)

Plant Shrubs: where soft mast is lacking and to provide corridors across large open areas

Plant Trees: in riparian areas and adjacent to wetlands where few trees are present to maintain riparian corridors; maintain approximately 50 percent deciduous forest cover; also in large open areas where there are few trees

Repair Spillway/Levee: if not functioning properly

Set-back Succession: Prescribed Fire is recommended to rejuvenate old decadent wetland vegetation; Prescribed Fire and Disking can maintain herbaceous openings; Prescribed Fire, Herbicide Applications, and Chaining are recommended to rejuvenate decadent shrub cover

Tillage Management: eliminate fall tillage of grain crop residue adjacent to cover to make waste grain available as an additional food source

Water Control Structures: should be installed in existing dikes, dams, or levees if not present, and if needed, to control water levels and provide water less than 2 feet deep and stimulate emergent vegetation and enhance habitat for prey

Water Developments for Wildlife: shallow impoundments can provide a water source and additional habitat for various prey species

Decrease Harvest: if hunting pressure is limiting population growth where an increase is desired (this situation is rare)

Increase Harvest: where populations can sustain additional hunting or trapping pressure for recreation and where populations need to be lowered for various reasons

Wildlife Damage Management: is often necessary when raccoons get into garbage cans, occupy residences or buildings, or prey upon poultry; exclusion is cost-effective; cultural modification, such as using wildlife-proof trash cans, is effective; trap and kill is most effective for problem raccoons

Wildlife or Fish Survey: track counts, camera surveys, and trapper harvest data may be used to monitor population trends

River otter

General information

- Semi-aquatic mammal that is part of the weasel family
- Highly social
- Family group consists of adult female and her offspring
- Adult males form groups separate from the families except during breeding season
- Short fur, powerful legs, webbed toes, long tapered nails
- Excellent swimmers that can remain under water for several minutes
- Active year round but mostly nocturnal spring, summer, and fall
- Live in a holt, or den, constructed of burrows of other animals
- Also den in undercut riverbanks, hollow logs in or near water, rock formations, and flooded debris
- Their range has been negatively affected by urbanization and pollution

Habitat requirements

Diet

- Primarily fish but will also feed extensively on aquatic insects and crayfish
- Occasionally will eat small mammals and amphibians

Water

- Largely obtained from their diet
- Clean water is essential for fish populations

Cover

- Riparian areas along creeks and rivers
- Freshwater lakes
- Inland wetlands
- Coastal shorelines, marshes, and estuaries

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive aquatic vegetation begins to reduce habitat quality for prey

Livestock Management: livestock should be excluded from forests managed for river otter

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed in levees and dams if not present to manage water levels in impoundments and influence habitat for river otters and prey

Water Developments for Wildlife: impoundments may be created adjacent to riparian areas where additional habitat for river otters is desired

Decrease Harvest: may be necessary if trapping has been excessive and an increase in population is desired

Increase Harvest: may be required if predation is limiting populations of various prey species or when a reduction in population is desired

Wildlife Damage Management: is necessary when recreational or commercial fisheries are being threatened by river otters

Wildlife or Fish Survey: track surveys, latrine site surveys, bridge surveys (for latrines), trapper harvest data, and camera surveys can be used to monitor populations

White-tailed deer

General information

- Most important game animal in North America
- Occur throughout U.S., southern Canada, except for California, Nevada.
- Found in wide variety of areas including deciduous, coniferous forests, tropical evergreen forest, dry grasslands, shrub desert
- Extremely adaptable, even humans
- Exploit suburban areas very well
- Where overabundant, can cause significant damage
    - To ornamental plantings, row crops
    - Can be hazardous for motor vehicles

Habitat requirements

Diet

- Forbs, browse, acorns, beechnuts, grains, grasses, mushrooms
- Northern parts of range: coniferous browse important in winter
- Classified as browsers, but have distinct dietary preferences through seasons

Water

- From diet but will drink free-standing water when available

Cover

- Dense woody vegetation
- Relatively tall early successional cover including native grasses, forbs, shrubs
- Thrive in areas with fragmented habitat containing several well-interspersed vegetation types

Wildlife Management Practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for white-tailed deer; sod grasses and sericea lespedeza can be particularly problematic in fields and Japanese stiltgrass (japangrass) often reduces forage availability in forests; although white-tailed deer may eat many nonnative invasive plants in some seasons to some extent, control of many of those plants, such as kudzu, Japanese honeysuckle, and Chinese privet, can lead to increased plant species diversity and increased forage quality during various seasons

Edge Feathering: to increase forage availability around fields and enhance fawning cover

Field Borders: to increase forage availability (forbs and brambles) around crop fields

Forest Management: Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection) will provide increased browse, soft mast production, and dense escape cover; Forest Stand Improvement can provide increased browse and soft mast production and stimulate better cover in stands with a poorly developed understory; both methods are often used at the northern edge of their range to manage the quality and vigor of coniferous cover within a deer wintering area; Forest Road Maintenance may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: to provide additional food resource, especially near escape cover

Livestock Management: livestock should be excluded from forests managed for deer to avoid destruction of the forest understory; livestock should be excluded from riparian areas; should prevent overgrazing in woodlands and savannas; livestock should be excluded from food plots

Plant Food Plots: when naturally occurring food sources are limited, food plots may provide additional nutrition

Plant Native Grasses and Forbs: where early successional vegetation is limiting and planting is necessary for establishment

Plant Shrubs: where needed to provide additional soft mast, brushy cover, and browse; often useful in ravines, field borders, other idle land areas and across large open areas to provide travel corridors

Plant Trees: (in some ecoregions) in large open areas to maintain at least 30 to 40 percent forest cover; where mast producers are lacking, particularly oaks

Set-back Succession: Prescribed Fire and Disking is recommended to maintain herbaceous openings; Prescribed Fire is recommended to stimulate the forest understory for increased forage and soft mast; Chaining can be used to rejuvenate shrub cover; in areas dominated by mesquite, Root-plowing combined with seeding grasses and legumes may be the best way to increase herbaceous groundcover; Chainsawing, Dozer-clearing and Root-plowing when converting forest to early successional plant communities to increase forage and enhance fawning cover, and to kill or remove undesirable trees in woodlots and other areas

Tillage Management: eliminate fall tillage of grain crop residue adjacent to cover to make waste grain available as an additional food source

Water Developments for Wildlife: where lacking (within one-half mile), dugouts, ponds, and shallow impoundments can provide freestanding water

Decrease Harvest: if hunting pressure is limiting population growth where an increase is desired

Increase Harvest: when populations can sustain additional harvest pressure for hunting recreation

and when populations need to be lowered because of overpopulation and habitat degradation; in these cases, it is necessary to concentrate increased harvest on females

Wildlife Damage Management: fencing, repellents, and scare tactics may be helpful to keep deer from ornamental plantings, vegetable gardens, and crops; reducing the population through shooting females is recommended when widespread overabundance is causing crop depredation and increasing vehicle collisions

Wildlife or Fish Survey: camera surveys, browse surveys, aerial surveys (in open areas such as South Texas, Kansas, or Oklahoma, and northern portion of range during winter when there is extensive snow cover), pellet surveys, and hunter observation and harvest data are used to estimate population trends

Wild pig

General information

- Feral hogs that were introduced to the U.S. (Tampa Bay, FL) in 1539.
- Domesticated swine have also escaped and become feral.
- Non-native and invasive species
- Cause major ecological damage
    - Competition for food and space
    - Predatory behavior
    - Rooting and wallowing behavior
    - Agricultural damage to crops, pastures, and livestock
    - Environmental damage to riparian areas resulting in the degradation of water quality

Habitat requirements

Diet

- Omnivore with 85% of their diet vegetation, but also prey on small animals and scavenge animal carcasses
- Prefer crops like corn and peanuts
- Aggressively outcompete native wildlife species for hard and soft mast whenever they are available
- Preys on small birds, mammals, reptiles, and amphibians.

Water

- Need freestanding water for drinking and thermoregulation

Cover

- Dense cover such as thick shrubs and heavy understory
- Near riparian areas that reduce opportunity for human contact
- Pig family groups (sounders) often use rivers, streams, and creeks and associated wetlands as travel corridors when seeking food sources

Wildlife Management Practices

Increase Harvest: the wild pig is an invasive nonnative species that competes with native wildlife for food and, in some instances, preys directly upon many small vertebrate species, including birds, mammals, reptiles, and amphibians; whenever wild pigs are observed or their sign is documented, control methods, such as trapping, snaring, shooting, and dogging, should be used with a goal of eradication

Wildlife Damage Management: may be necessary if wild pigs negatively impact crops, forages, or livestock; fencing high-value crops and other areas may be used as a non-lethal method for reducing wild pig damage, but it does not decrease the population

Wildlife or Fish Survey: camera surveys, track counts, and evidence of rooting are used to estimate population trends

WHEP OTHER SPECIES
for
Wildlife management purposes
Applicable to Activities II, III, IV, and V

bluegill

bullfrog

butterfly

channel catfish

Eastern indigo snake

frog

gopher tortoise

largemouth bass

tiger salamander

Bluegill

General information

- One of most abundant sunfish species
- Thrives in variety of conditions, ranging from freshwater lakes, ponds, slow-moving streams to brackish waters of coastal areas
- Native range is eastern U.S. from southern Canada to Florida and Texas
- Successfully introduced throughout U.S.

Habitat requirements

Diet

- Variety of zooplankton (microscopic animal life) during first few months of life
- As they age they progress to insects and their larvae, eggs, earthworms, tadpoles, small minnows, crayfish

Water

- Basic requirements include dissolved oxygen
  - Minimum of four parts per million
- pH between 6.5 and 9.0
- Water temperature should reach at least 70 F during summer
  - Measured one foot below surface in shade

Cover

- Aquatic environments with submerged rocks, woody debris, and aquatic vegetation where small fish (food source) hide

Wildlife management practices

Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond; livestock watering facilities should be developed away from the fish pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present so water depth can be controlled

Decrease Harvest: refer to Wildlife Management Practices on page 240 for specifics on fish harvest

Increase Harvest: refer to Wildlife Management Practices on page 241 for specifics on fish harvest

Wildlife or Fish Survey: fishing records, seining, and electro-shocking are used to survey bluegill populations

Construct Fish Pond: where no suitable water source is present or where an existing fish pond needs extensive repair, especially to the dike or dam

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

Fertilize/Lime Fish Pond: fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface; add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm

Reduce Turbidity in Fish Pond: by reseeding watershed if soil is eroding into the pond and causing muddy water, by preventing livestock from entering pond, by eliminating bottom-feeding fish, or by reducing suspension of negatively charged clay particles

Restock Fish Pond: if the population is too far out of balance to correct via seining or fishing or if undesirable species are present

Bullfrog

General information

- Native range extends from Atlantic Coast to eastern Colorado and eastern Mexico, and from southern Colorado to northeastern Mexico
- Not native west of Rocky Mountains but successfully introduced in many areas
- Inhabit permanent bodies of standing or slow- moving water
- Tadpoles require two years to metamorphose
- All habitat requirements are often found in and around a single pond

Habitat requirements

Diet

- Insects, crayfish, other frogs, reptiles, snails, fish
- Occasionally small mammals, birds

Water

- Stable water levels necessary for hibernation, egg development
- Water levels should be maintained at a constant level

Cover

- Dense emergent aquatic and upland herbaceous vegetation adjacent to water for hiding and foraging
- Tadpoles prefer shorelines with dense vegetation (Stages 3 and 4 of wetland succession), adjacent to shallow open water (Stage 2) dominated by floating and submerged aquatic vegetation

Wildlife management practices

Livestock Management: livestock should be excluded from ponds managed for bullfrog; livestock watering facilities should be developed away from pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present in existing dams and levees so water depth can be managed as appropriate

Water Developments for Wildlife: ponds and shallow impoundments can be provided where habitat for bullfrogs is absent or insufficient for desired population

Decrease Harvest: if current hunting pressure is causing population to decline and population growth is desired

Increase Harvest: where populations can sustain additional harvest pressure for hunting recreation

Wildlife or Fish Survey: call counts are used to estimate population trends

Butterfly

General information

- Hundreds of species in America that occupy nearly every ecotype available
- In urban areas, butterflies found in gardens, yards and parks planted with shrubs, flowers that attract butterflies
- Often lay eggs on specific kind of plant

Habitat requirements

Diet

- Usually, sweet liquids such as nectar from flowers
- Leaves and twigs, forbs, grasses as caterpillars
- Eat food in liquid form

Water

- May collect on moist sand or mud around water puddles where they extract minerals

Cover

- Flowers, shrubs, trees where sheltered from wind

Wildlife management practices

Artificial feeders: can supplement food sources

Control Nonnative Invasive Vegetation: when nonnative vegetation inhibits native plant abundance and reduces abundance of native milkweeds; coverage of nonnative sod grasses on upland sites and frequent mowing are particularly problematic

Plant native grasses and forbs: where lacking to provide food and cover

Plant flowers: maintain specific plants on which butterflies lay eggs such as dogbanes, milkweeds, asters, goldenrods, wintercress, vetches, blackberries, sunflowers, ironweed, and verbenas

Rooftop and balcony gardens: may attract butterflies if the appropriate species are planted

Plant shrubs: that attract butterflies

Plant trees: where needed to establish a wind break; fruit trees can also provide nectar from flowers and fruit as a food source

Water developments for wildlife: birdbaths and backyard ponds can provide water where needed

Wildlife or Fish Survey: observation counts are used to estimate population trends

Note: Plant flowers should not be recommended to plant Rooftop/balcony gardens.

Channel catfish

General information

- Warmwater fish native to Gulf Coast states and the Mississippi River valley
- Introduced to most regions in the U.S.
- Most common farmed warmwater fish species in the U.S.
- Have smooth skin (no scales)
- Barbels (sometimes called whiskers) around the mouth
- Sharp dorsal (top) and pectoral (side) fins
- Average 2-3 pounds but can grow up to 50 pounds
- Largemouth bass and bluegill prey on their eggs and young
- Popular recreational fishing species

Habitat requirements

Diet

- Young feed mainly on aquatic insects
- Adults eat crawfish, aquatic insects, plant material such as algae, snails, small fish, and seeds
- Fish feed is used in fish farming and in farm ponds

Water

- Obtained from the aquatic environment and food
- Live in reservoirs, lakes, ponds, swift-flowing streams and rivers with gravel, sand, or muddy bottoms
- Rarely inhabit water with abundant submerged aquatic vegetation

Cover

- Lay eggs in dark holes or under logs and rocks

Wildlife management practices

Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond. Watering facilities for livestock should be away from the fish pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present so water depth can be controlled

Decrease Harvest: refer to Wildlife Management Practices section for specifics on fish harvest

Increase Harvest: refer to Wildlife Management Practices section for specifics on fish harvest

Wildlife or Fish Survey: fishing records, seining, and electrofishing are used to survey channel catfish populations

Construct Fish Pond: where no suitable water source is present or where an existing fish pond needs extensive repair, especially to the dike or dam

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

Fertilize/Lime Fish Pond: fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface; add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm

Reduce Turbidity in Fish Pond: by reseeding watershed if soil is eroding into the pond and causing muddy water, by preventing livestock from entering pond, by eliminating bottom-feeding fish, or by reducing suspension of negatively charged clay particles

Restock Fish Pond: if too few are present; channel catfish seldom spawn successfully in the presence of largemouth bass and bluegill because of predation upon eggs and fry--therefore periodic restocking is required when channel catfish numbers drop below desired levels

Eastern indigo snake

General information

- Found primarily in Florida, with some in southern Alabama and Georgia
- Listed as a federally endangered species since 1971
- Can grown to lengths of 60 to 84-inches
- Prefer wetland areas, but also found in pine and shrubby flatwoods, grasslands, agricultural fields, and coastal dunes
- Use abandoned gopher tortoise burrows and other burrows for reproduction and cover
- Docile and non-aggressive nature
- Important predators of rodents and venomous snakes

Habitat requirements

Diet

- Small mammals, frogs, lizards, fish, eggs, birds, and other snakes

Water

- Likely obtain water from diet

Cover

- Sandy soils with abundant animal burrows and stump holes
- Pine and hardwood forests, woodlands, and savanna
- Brushy areas near riparian areas and wetlands

Wildlife management practices

Conservation Easement: can protect longleaf pine systems for this declining species

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to decrease habitat quality for eastern indigo snakes

Forest Management: Forest Regeneration, especially Seedtree and Single-tree Selection, in pine forests and woodlands can enhance cover for prey and provide stump holes and down woody debris; Group Selection and Forest Stand Improvement can enhance understory cover for eastern indigo snakes and their prey in hardwood stands

Plant Native Grasses and Forbs: may be necessary in open areas with insufficient groundcover

Plant Trees: in large open areas where additional forest cover is needed

Set-back Succession: Prescribed Fire is recommended to maintain herbaceous groundcover in longleaf

pine savanna and woodland, and maintain an early successional stage in old-fields and grasslands

Water Developments for Wildlife: where lacking, small ponds and shallow impoundments can increase habitat suitability

Wildlife or Fish Survey: transect surveys and drift fences with snake traps may be used to estimate population trends

Frog

General information

- Many frog species inhabit wetland areas throughout U.S.
- Prefer aquatic vegetation on the edges of ponds, lakes, and slow-moving streams
- Hibernate in mud bottoms during winter
- Breed and lay their eggs in water

Habitat requirements

Diet

- Carnivorous
- Varied insects
- Aquatic plants, worms, eggs, frogs, snails

Water

- Needed for moisture and hiding
- Many will dry up and die if skin is not kept moist
- Typically breed and lay eggs in water

Cover

- Thick herbaceous vegetation on bank or shore of water body
- Floating vegetation in water next to shore
- Mud bottoms so frogs can bury themselves for hibernation during winter

Wildlife management practices

Plant native grasses and forbs: around water sources to provide cover

Water control structures: should be installed if none are present so water depth can be managed as needed

Water developments for wildlife: where needed to create aquatic habitat

Wildlife or fish survey: call counts are used to estimate population trends

Gopher tortoise

General information

- Occurs in southeastern Coastal Plain
- Inhabits uplands with relatively well-drained sandy soils
- Prefers longleaf pine and oak sandhills with open canopies
- Also occurs in dry prairie, coastal grasslands and dunes, and mixed hardwood-pine stands
- Dig burrows up to 20-feet long and 6-feet deep
- Burrows provide protection from temperature extremes, moisture loss, and predators
- Their burrows provide refuge for nearly 400 other species (including Eastern indigo snake)
- Feeding occurs mostly within 150-feet of their burrow entrance, so a diverse understory of plants is important

Habitat requirements

Diet

- Grasses, legumes, and fruits
- Need diverse understory of plants near their burrow entrance

Water

- Obtained from diet

Cover

- Burrows provide necessary cover

Wildlife management practices

Conservation Easement: can protect longleaf pine systems for this declining species

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for gopher tortoises, especially by limiting herbaceous diversity

Forest Management: Forest Regeneration (Single-tree Selection) is recommended to regenerate and maintain mature stands of longleaf pine; Forest Stand Improvement can remove undesirable species

Plant Native Grasses and Forbs: may be necessary in open areas with insufficient groundcover

Plant Trees: where additional forest cover is needed (maintain 20-60 percent canopy cover)

Set-back Succession: Prescribed Fire is recommended to maintain a diverse herbaceous understory; Chainsawing is recommended to maintain <60 percent canopy cover and to maintain a diverse herbaceous understory; Herbicide Applications may be used with fire; Forest Stand Improvement may be implemented to control undesirable species and help maintain diverse understory

Wildlife or Fish Survey: observations and use of gopher tortoise burrows are used to estimate population trends

Largemouth bass

General information

- Members of the Sunfish family
- Extremely popular freshwater sportfish species
- Found in freshwater lakes, rivers, large streams, farm ponds, brackish marshes
- Native to most of the eastern U.S., but have been introduced across most of the country

Habitat requirements

Diet

- Young eat insects and other invertebrates (worms, crayfish, and zooplankton)
- Adults eat small fish such as bluegill and variety of minnows, tadpoles, crayfish, ducklings

Cover

- Submerged rocks, woody debris and near aquatic vegetation where small fish (prey) hide

Water

- Dissolved oxygen should be a minimum of 4 ppm (parts per million)
- pH should be between 6.5 and 9.0
- Water temperature should reach at least 70 F during summer (measured one foot below surface in shade)

Wildlife management practices

Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond; livestock watering facilities should be developed away from the fish pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present so water depth can be controlled

Decrease Harvest: refer to Wildlife Management Practices for specifics on fish harvest

Increase Harvest: refer to Wildlife Management Practices for specifics on fish harvest

Wildlife or Fish Survey: fishing records, seining, and electro-shocking are used to survey largemouth bass populations

Construct Fish Pond: where no suitable water source is present or where an existing fish pond needs extensive repair, especially to the dike or dam

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

Fertilize/Lime Fish Pond: fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface; add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm

Reduce Turbidity in Fish Pond: by reseeding watershed if soil is eroding into the pond and causing muddy water, by preventing livestock from entering pond, by eliminating bottom-feeding fish, or by reducing suspension of negatively charged clay particles

Restock Fish Pond: if the population is too far out of balance to correct via seining or fishing or if undesirable species are present

Tiger salamander

General information

- Occurs throughout the Great Plains and much of the eastern U.S. (not found in the Appalachian Mountain regions)
- One of the largest terrestrial salamanders in North America
- Adults grow to larger than 1-foot in length
- Inhabit bottomland deciduous forests, conifer forests, woodlands, fallow fields, grasslands, meadows, brushy areas, semideserts, and deserts
- Adults are terrestrial, but make spring migrations every year to ephemeral (temporary) ponds to breed
- Short breeding season with rapidly developing eggs
- Its larvae are top predators in fishless ponds

Habitat requirements

Diet

- Adults eat worms, snails, insects, and slugs
- Larvae eat a variety of aquatic organism such as invertebrates and other amphibian eggs and larvae

Water

- Free-standing water must be present for breeding
- Ephemeral or semi-permanent ponds should be fishless if reproduction is to successfully occur

Cover

- Adults live underground in burrows for most of the year
- Deep leaf litter
- Large amounts of downed woody debris

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for tiger salamanders

Livestock Management: should prevent overgrazing where tiger salamander is a focal species; livestock should be excluded from ponds that may be used as breeding ponds for tiger salamanders; livestock watering facilities should be developed away from pond

Plant Native Grasses and Forbs: when converting fields that are currently in row-crop agriculture to tiger salamander habitat

Plant Shrubs: when converting fields that are currently in row-crop agriculture to tiger salamander habitat, or in relatively large open areas that need additional cover

Plant Trees: where additional forest cover is needed

Water Control Structures: should be installed if not present in ponds or impoundments with levees that are managed for tiger salamanders to enable the pond to be drained, especially if fish are present

Water Developments for Wildlife: small, fishless ponds or impoundments may be created if additional breeding ponds are needed

Wildlife or Fish Survey: cover boards and pitfall traps along drift fences are used to estimate population trends

Alabama WHEP State Contest Wildlife Management Practices

Wildlife Management Practices

As discussed in the introductory sections, the protection and management of habitat for wildlife species is important to both wildlife population survival and for maintaining healthy ecosystems for human health and the environment. In this section, we will detail the specific wildlife management practices that may be useful in particular ecoregions for improving the area's ability to supply the needed requirements for different species.

- Wildlife management practices for species vary from region to region, and not all the management practices listed for a species will be applicable in all regions.
- Our goal is typically to either increase or decrease the population of a particular species.
- Assess current conditions and determine if management practices need to be applied within the next year. However, keep in mind that the benefits of a management practice may not be seen for years. For example, planting trees to produce a food source for wood ducks is a sound practice, but those seedlings will not produce acorns for five to 20 or more years, depending on the species of oak planted.
- It is usually best to address the most lacking habitat requirement that is limiting the population first.
- It is always wise to learn as much as possible about any practice before recommending it. Additional reading and guidance from other wildlife resources and wildlife management professionals will help you better understand these practices and their effect on wildlife and habitat.

Figure 1. Wildlife management practices can be used to reduce unwanted species

- Sometimes the best recommendation is maintaining an area in its current condition. This can include protecting the area from development and applying

various management practices that will help maintain the area in the desired condition.

- In this manual, costs and budgets are not considered when recommending practices. However, in actual situations, wildlife managers must consider economics when planning and recommending management practices.
- Some of the management practices may seem contradictory. For example, deepening the edges of a pond discourages the growth of emergent aquatic vegetation, while water control structures could encourage growth. The management objectives of the landowner should determine which practices you select.

Wildlife Management Practices used in Alabama WHEP:

Habitat Management Practices
Conservation Easement
Control Non-Native Invasive Vegetation
Create Snags
Delay Crop Harvest
Edge Feathering
Field Borders
Forest Management
Leave Crop Unharvested
Livestock Management
Nesting Structures
Plant / Manage Food Plots
Plant Native Grasses and Forbs
Plant Shrubs
Plant Trees
Repair Spillway/Levee
Set-back Succession
Tillage Management
Water Control Structures
Water Developments for Wildlife

Population Management Practices
Decrease Harvest
Increase Harvest
Wildlife Damage Management
Wildlife or Fish Survey

Fish Pond Management Practices
Construct Fish Pond
Control Aquatic Vegetation
Fertilize / Lime Fish Pond
Reduce Turbidity in Fish Pond
Restock Fish Pond

Urban Area Additional Management Practices
Artificial Feeders
Plant Flowers
Rooftop/Balcony Gardens

We will now provide details about each wildlife management practice and its effect on habitat as it pertains to the program. It is important to read about and understand the purpose and use of each management practice. In the State WHEP Contest, you will have the opportunity to make management recommendations about particular sites using these practices.

Habitat Management Practices

Conservation Easement

A conservation easement is a legal agreement between a landowner and a government agency or conservation organization (e.g., The Nature Conservancy) that places permanent restrictions on what can be done on a property. Conservation easements do not transfer ownership of the property, but only place restrictions on what can be done on the property. Landowners use conservation easements to permanently protect property from various land-uses (most notably future real estate development) that may degrade or destroy its natural resources. Common restrictions include limited or no new structures or roads can be built on the property. Conservation easements are critically important in protecting property that contains or harbors rare vegetation types, habitat features, and endangered species. Examples include longleaf pine savanna, native grasslands, caves, and wetlands that provide habitat for species of conservation concern, such as red-cockaded woodpecker, gopher tortoise, grasshopper sparrow, Indiana bat, prairie-chickens, greater sage-grouse, marbled murrelet, and many others. Conservation easements also are a valuable tool in protecting land in areas where urban and suburban development is rapidly expanding.

Figure 2. The Graham Farm and Nature Center property in Jackson County, Alabama features a conservation easement to protect the wetland habitat.

However, conservation easements offer flexibility. For example, if existing farmland is entered into a conservation easement, continued farming may be allowed while various vegetation types or habitat features are protected. In addition to the satisfaction of protecting the property in perpetuity, landowners also benefit by receiving reduced property taxes. Thus, landowners are much better able to continue to keep their land in the face of increasing property tax rates. The property can be sold, but the restrictions are maintained from owner to owner, in perpetuity.

It is in these areas where property values are exceptionally high and the associated property tax rates often increase to the point landowners are no longer able to keep their property. The specific conservation purpose of the easement varies with the goals and objectives of the land trust or agency and the landowner. Common objectives include protection of a vegetation type or ecosystem, maintenance of a forested or riparian corridor, habitat for various wildlife species, wetland function, and water quality.

Effect of management practice— Conservation easements can benefit any wildlife species, according to the area protected. However, for purposes of this program, Conservation Easement should be considered when evaluating property that is under threat of real estate development or some other major land-use change, such as surface mining or wind farming with turbines, which would degrade or alter its current natural resource value. Further, this practice should be restricted to those species that are in serious decline or are associated with rare vegetation types that are in need of protection.

- Maintain land in a natural state and protect it from real estate development.
- Protect rare vegetation types and habitat features, such as grasslands, wetlands, caves, and large forested tracts.
- Protect habitat for declining, threatened, or endangered wildlife species.
- Maintain corridors for migrating wildlife.
- Protect water quality, especially if riparian areas are included or if watersheds are protected.

Control Non-Native Invasive Vegetation

Non-native plants have been brought to North America for centuries. Some were introduced accidentally, but most were brought intentionally to provide livestock forage or to be used as ornamentals. Unfortunately, many non-native plant species have become established and spread far beyond where they were initially introduced. This invasion has been detrimental to native plant communities because many nonnative plants out-compete native species for sunlight and nutrients and exclude them from a particular site or area. This, in turn, has been detrimental for several wildlife species. Many non-native invasive plant species do not provide suitable cover, structure, or food for wildlife. As usable space for wildlife decreases, so does the carrying capacity for that area. Thus, populations of certain wildlife species have declined because of non-native invasive species.

Examples of **non-native trees** that should be controlled include tree-of-heaven, mimosa, and paulownia. Examples of **non-native shrubs** that should be controlled include Russian olive, privets, bush honeysuckle, saltcedar, and multiflora rose. Examples of **non-native vines** that should be controlled include kudzu, Japanese honeysuckle, and Oriental bittersweet. Examples of **non-native grasses** that should be controlled include tall fescue, bermudagrass, johnsongrass, cogongrass, and cheatgrass. Examples of **non-native forbs** that should be controlled include sericea lespedeza, sicklepod, cocklebur, and spotted knapweed.

Figure 3. Bermudagrass is a non-native grass that should be controlled

Without management, non-native invasive species continue to spread, limit plant species diversity and degrade wildlife habitat. Most often, herbicide applications are necessary to control non-native invasive species. Some species can be controlled by hand-pulling or mechanical techniques. Of course, non-native invasive species should never be planted.

Few properties in the country do not contain any non-native species. When evaluating an area for this contest, consider the impact non-native species are having on the native plant community and associated wildlife.

Note: When recommending this practice specifically to control non-native invasive plant species, Manipulate Succession should not be selected unless succession needs to be altered as well. Then, both practices should be selected.

Effect on management practice— Killing non-native species (whether trees, shrubs, vines, grasses, or forbs) where they limit growth of native species can improve available cover and forage for many wildlife species. Controlling non-native invasive species often leads to increased plant species diversity. Eliminating non-native grasses that produce a dense structure at ground level will allow the seedbank to respond and result in better cover for nesting and brood rearing for several bird species. Killing non-native trees and shrubs can increase space for desirable tree and shrub species, which can lead to increased mast production.

Figure 4. Visiting wildlife areas is a great way to learn about management practices

Control Nonnative Invasive Vegetation includes both upland and aquatic plants and is applicable to terrestrial and wetland areas, but NOT fish ponds.

Create Snags

Snags are standing dead trees. They provide cavities used by many birds and mammals. In forested areas, snags and down woody material are usually available. If they are not, Forest Management (TSI) should be considered to create an appropriate number of snags and down woody debris. This practice is intended to provide or retain snags outside the forest. For example, if there is a snag(s) along a fencerow, or if snags are needed along a fencerow, this practice could be recommended. If a snag is present in a field or is needed where trees are growing in a field, then this practice could be recommended.

Figure 5. Standing dead and dying trees can provide cavities for birds

Effect of management practice— Snags provide roosting and perching sites for many bird species. Snags provide woodpeckers with sites for cavity construction. Later, other species (such as bluebirds, owls, and wood ducks) may use these cavities for nesting and roosting. Snags provide foraging sites for many species of wildlife.

Delay Crop Harvest

When landowners have an interest in wildlife, it may be beneficial to avoid harvesting crops or hay during nesting and fawning seasons to reduce nest destruction and mortality. It is important to note crop yield and quality are often reduced dramatically when harvest is delayed. This is especially true when hay harvest is delayed until seed heads form. Please note, this practice should be recommended only when a hay or row crop is present or is planned for the current growing season.

A much more important consideration than delaying crop harvest is making sure adequate usable space is available across the property for the focal wildlife species. This may mean reducing the acreage cropped or hayed to increase acreage available for wildlife.

Effect management practice— Delaying crop harvest destroys fewer nests and young at a specific time, such as May/June when fawns and initial nests of most songbirds are most vulnerable and can help maintain a sustainable population or population increase.

Figure 6. Delaying crop harvest can protect vulnerable songbird nests

Edge Feathering

Edge feathering involves reducing overstory tree density in woods adjacent to fields. Reducing the number of overstory trees allows more sunlight to enter the forest canopy and stimulates the understory, which provides a more diverse structure of cover from the field into the woods.

Trees are usually thinned 100-300 feet into the woods along at least one side, if not all sides, of the field where woods are adjacent.

- Trees are usually thinned more heavily in the 50-100 feet nearest the field (inner zone) by removing or killing at least 75 percent of the trees.
- Fewer trees (50 percent) are removed or killed 100-200 feet from the field (middle zone), and even fewer trees (25 percent) are removed or killed 200-300 feet from the field (outer zone).
- This gradation of tree density (few too many from field to forest) and sunlight availability (lots to little from field to forest) promotes an ecotone (an area with characteristics of two adjacent vegetation types) from field to forest.

Figure 7. This stand has been thinned to allow sunlight to reach the forest floor and encourage native forbs such as ragweed to grow

Edge feathering can be implemented around any field with adjacent woods that have not already been thinned sufficiently. Edge Feathering and Field Borders are excellent companion practices to enhance habitat for several wildlife species.

NOTE: Edge Feathering and Forest Management (Forest Stand Improvement) may be recommended in the same area (adjacent to an opening) if FSI involves thinning fewer trees than needed for Edge Feathering or if objectives of both are compatible.

Effect of management practice— Edge feathering provides nesting cover and escape cover for various wildlife species. Wildlife foods (especially forage, browse, seed, and soft mast) are increased for various wildlife species.

Field Borders

Field borders or buffers are strips of grasses and forbs around crop fields. These strips are designed to trap sedimentation and nutrient run-off. They can also provide excellent nesting, brooding, and escape cover for many wildlife species. Field buffers should be a minimum of 30 feet wide, but wider is better. Field borders up to 120 feet wide are highly desirable and recommended to provide adequate usable space for wildlife dependent upon early successional habitat.

Where wildlife is considered, field borders should be composed of native grasses and forbs, which may be planted or allowed to establish naturally from the seedbank. Scattered brambles and shrubs may also be used and are highly beneficial for several wildlife species.

Figure 8. Field buffers around row crops provide cover for wildlife

Please note, establishing native grasses or forbs and/or planting shrubs should not be recommended in order to establish field borders. However, if there are existing field buffers of undesirable non-native species, controlling non-native invasive vegetation should be recommended. Only recommend additional field borders if there are crop fields without borders or additional borders are needed around a field. This practice is recommended for row crops only (especially soybeans and grain crops). It should not be recommended around hay fields.

Effect of management practice— Establishing field borders can prevent sedimentation and nutrient runoff, increase usable space for many wildlife species, provide nesting and/or brooding cover for many songbirds, bobwhites, and wild turkeys, and provide increased forage and seed availability if desirable forbs are established.

Forest Management

Forests can be managed by harvesting stands and allowing a new stand to develop (**regenerating the stand**), or by manipulating the existing stand through partial cuts or thinning (**forest stand improvement**). Managing forests for the appropriate structure and species composition is crucial when managing wildlife that use forested habitat.

Forest Regeneration

Regenerating a forest stand involves harvesting the trees within the stand through various silvicultural methods, with the intention of **renewing** and **maintaining** that forest stand. Stand age and health, as well as landowner objectives determine when a stand should be regenerated.

- Harvesting the trees allows additional sunlight into the forest, which stimulates seedling germination and growth. This process sets the forest back to an earlier successional stage and changes the structure of the forest and the composition of plants growing in the forest understory.
- Some wildlife species benefit while others do not. For example, rabbits and bobwhites readily use the cover and food resources provided in a recently clearcut stand of mixed hardwoods, while Eastern gray squirrels that were using that stand prior to harvest would have to move to an adjacent stand. Other species such as wild turkeys and white-tailed deer, would use both the recently harvested stand as well as an adjacent mature stand of mixed hardwoods.
- When managing habitat for species that require young forest cover, it is crucial to regenerate stands over time and that regenerating stands be well dispersed across the area being managed.

Figure 9. Small hardwood stumps often sprout back quickly after a timber harvest

- Forest regeneration should be recommended as a silvicultural tool to regenerate stands and provide young forest cover— not to create “openings” or early successional habitat.
- Regenerated forests result in new forests, not openings. Where additional early successional habitat is needed, and the area is currently forested, Forest Regeneration should not be recommended automatically. Instead, ‘Manipulate Succession’ (i.e., chain sawing) and ‘Plant Native Grasses and Forbs’ should be recommended.
- The regeneration method recommended depends upon forest type & composition, site quality, and landowner objectives.

The **Clearcut** regeneration method harvests all the trees in the stand. More sunlight is allowed into the forest floor with this method than with any other. Clearcutting generally releases shade intolerant species such as yellow poplar, black cherry, and basswood when present.

Figure 10. Clearcutting a forest removes all trees and allows for regeneration
Source: Choctaw Land and Timber

The **Shelterwood** regeneration method removes a pre-determined number of trees from the stand to allow development of seedlings (regeneration) from beneath. Later (usually 6 to 8 years), the remaining overstory (shelterwood) is removed as the regeneration becomes developed.
The **Seed-tree** regeneration method leaves a few, good seed-producing stems per acre to regenerate a new stand. This method is often used in pines and other species with lightweight, wind-carried seed. The seed trees are usually harvested after the crop of new trees becomes established.

The **Group selection** regeneration method harvests small groups of trees (no more than 2 acres) within a stand. This method creates more diverse structure within the stand. Because it generally does not allow as much light into the stand, it allows both shade-tolerant and shade intolerant trees to regenerate.

Figure 11. Group selection removes small groups of mature trees and allows for regeneration

The **Single-tree** selection regeneration method harvests only select individual trees out of the stand, not groups of trees. This method can create a diverse structure with small gaps in the forest canopy. This method generally regenerates shade-tolerant species in closed-canopy forests and is not applicable in all regions.

Figure 12. When a single tree is removed from a stand, understory seedlings can grow in its place

Pines are often planted after harvest to establish a new stand. Hardwood stands are usually regenerated naturally and not planted.

- Regardless of regeneration method used, it is important to make sure food, cover, and water for certain wildlife species are always in proximity.
- Typically, regenerated stands should be adjacent to more developed stands to provide travel corridors and space for wildlife that do not use young stands.
- Likewise, when stands are harvested, it is important that standing dead trees (snags) are left remaining for wildlife that might use them. Where snags are not available and when managing for species that use snags and down woody material, it may be desirable to create some snags when the stand is harvested by killing some trees and leaving them standing. Trees can be killed and left standing by girdling the tree with a chainsaw or hatchet and applying herbicide to the wound.

Effect of management practice— Harvesting timber generally sets back succession and produces new forest growth with greater stem density, which provides nesting and escape cover for several wildlife species. Clearcut, shelterwood, and seed-tree reverts Stage 6 to Stage 5 with an abundance of herbaceous plants persisting until 5 or 6 years post-harvest when they are shaded out by the developing trees. During this time, forage and soft mast may be increased considerably.

Group selection and single-tree selection maintains the structure of Stage 6, but an increase in understory growth will enhance nesting structure for some species and provide additional forage and soft mast. It also enhances cover for many prey species,

which provides food for predators. Retaining snags and cavity trees when harvesting trees provides nesting, roosting, denning, and perching sites.

The tops and slash of harvested trees remaining on the site provide what is called down woody debris. This material is very important for several reasons. As the material rots, nutrients from the organic material are returned to the soil for additional plants and animals to use. Not removing these nutrients from the site is critical for ecological function. From a wildlife perspective, several reptiles and amphibians live in and under the decaying logs. Many small mammals also nest and den in and under decaying logs. Birds such as wild turkeys and ruffed grouse commonly nest adjacent to the brushy material and logs left behind, which simulate a tree knocked over during a storm. Male ruffed grouse also use down logs as platforms to “drum” on and attract females. The brushy debris left behind after a logging operation also provides important cover for various species and helps forest regeneration as newly emerging seedlings are protected from deer browsing.

Forest Stand Improvement (FSI)

Forest stand improvement involves techniques used to improve the quality and composition of forest stands by shifting resources (sunlight and nutrients) toward production of desired products, which include timber and/or wildlife. FSI most often involves some type of thinning, which reduces stand density to influence stand growth.

- Thinnings may be pre-commercial or commercial.
- Pre-commercial thinnings are conducted before the trees have sale value.
- Commercial thinnings involve removing at least part of the trees for a useful product.
- Removing trees increases the amount of sunlight entering the forest canopy and is used to promote increased growth of the remaining trees through changes in stand composition and structure (cover) in the understory and midstory to favor food-producing plants, both woody and herbaceous.

Whenever FSI is implemented, it is important to leave standing dead trees (snags) for wildlife that might use them. Where snags are not available and when managing for species that use snags and down woody material, it may be desirable to create some snags by killing some trees and leaving them standing. Trees can be killed and left standing by girdling the tree with a chainsaw or hatchet and applying herbicide to the wound.

Effect of management practice— Increased herbaceous growth in the understory enhances brooding cover and provides additional forage, browse and soft mast. Increased woody stem density in the midstory improves cover for some species such as ruffed grouse. When adjacent competing trees are removed, trees retained following FSI can grow larger crowns and produce additional mast. Down logs and other woody

debris left following FSI provide sites for feeding, denning, drumming, reproducing, hiding, and resting for several species.

Figure 13. FSI can help hardwood trees develop larger crowns and provide more mast for wildlife species

Leave Crop Unharvested

Strips or blocks of grain or other crops (such as, soybeans) can be left unharvested. This is especially valuable if the strips are left adjacent to cover. This practice should be recommended only if there is an unharvested crop present. It is not applicable to grain food plots.

Figure 14. Crops such as soybean can be left unharvested to provide additional food for wildlife

Effect of management practice— Provides additional food resource, which can be particularly important when naturally occurring foods are in low supply and/or in years with poor acorn production.

Livestock Management

Livestock grazing must be managed to enhance wildlife habitat. This practice should be recommended when evidence of livestock is present or information on livestock use is given. Grazing management may be used to exclude livestock from sensitive areas or to manipulate successional stages to benefit wildlife by adjusting stocking rate, season of use, or grazing system.

- Livestock may be used to manipulate the height and structure of native warm-season grasses to enhance wildlife habitat.
- Grazing should not be used to manipulate non-native forage pasture (such as tall fescue, orchard grass, bermudagrass, etc.) for wildlife because these grasses are detrimental to wildlife, displacing otherwise suitable habitat.
- Livestock distribution can be controlled with fencing, herding or fire. Regardless of pasture type, proper stocking rate must be practiced preventing improper grazing. The term improper grazing is used to describe livestock grazing that fails to meet land objectives such as soil conservation, plant species diversity, maintenance of wildlife habitat and adequate livestock nutrition.

Figure 15. Grazing pastures are often on the edge of forests and wildlife habitat

Effect of management practice— Stocking rate, which is the amount of land allotted to each animal for the entire grazable portion of the year, is the most important consideration concerning livestock grazing management.

Proper stocking rate and/or rotational grazing can be used to alter the vegetation structure and composition to favor wildlife.

Restricting livestock from riparian areas may improve habitat structure and composition for many wildlife species. Fencing can help reduce siltation, turbidity, and stream bank erosion, while reducing stream and pond pollution from livestock wastes.

Figure 16. Livestock fencing can help protect habitat and reduce pollution from wastes

Nesting Structures

Some species den, nest and/or roost in cavities they don't excavate themselves (such as bluebirds, wood ducks and screech owls). If natural cavities are not available, artificial cavities (nest boxes) can be used.

- Many species need a certain kind of cavity (certain diameter of hole, depth, area, etc.) in a certain location (field, woods, or water) and at a certain distance above ground (height in feet).
- The particular design and placement of nest boxes often determines which wildlife species use the structures.
- Nest boxes should be monitored to ensure use by targeted species.
- Nesting structures for Canada geese are not recommended because resident Canada geese have become too numerous and are a nuisance. In addition, nesting structures are not normally recommended for mallards. Instead, creation of high-quality nesting habitat (native, warm-season grasses) is required to impact population recruitment.

Effect of management practice— In open areas (Stages 2, 3 and 4) nest boxes are useful for bluebirds unless an abundance of nesting cavities in trees or fence posts are available. Nest boxes for bluebirds should not be placed any closer than 80 yards apart to prevent territorial fighting between males. Near water sources, nesting structures provide secure nesting sites for wood ducks where trees with cavities suitable for nesting are absent. Nest boxes for wood ducks should not be placed any closer than 100 yards apart and ideally, should not be visible from one box to another, to prevent dump nesting by females not incubating a particular nest.

Figure 17. Design and placement of nest boxes determines which species will use them

Plant / Manage Food Plots

Planting grain and forage food plots can be beneficial for many wildlife species (game and non-game, birds, and mammals) primarily by providing supplemental food, but also by providing additional cover in some circumstances.

- Grain food plots are annual warm-season plantings that include corn, grain sorghum, and millet, as well as other seed such as buckwheat, sunflowers, soybeans, and cowpeas.
- Forage food plots may be annual or perennial, warm or cool-season plots. Popular forage plantings include clovers, wheat, oats, rapeseed, chicory, winter peas, soybeans, cowpeas, and lablab.
- Some plantings may provide both forage and grain/ seed, such as wheat, soybeans, buckwheat, and cowpeas.
- In most circumstances, food plots should be well dispersed throughout the property being managed.

Figure 18. Clovers, winter peas, and winter wheat provide both forage and grain/seed for wildlife species

- Generally, 1 to 5 percent of a property being managed for wildlife may be in food plots.
- Food plots may be long and narrow (300 to 400 feet long and 15 to 20 feet wide) or blocky in shape (depending on the focal wildlife species and the type of food

plot planted), preferably located where two or more vegetation types meet (such as between a woodlot and an old field, perhaps near a creek) and well distributed across the area being managed.

- If possible, food plots should be located adjacent to natural cover (such as brushy fencerows, hedgerows, and other thicket-type areas).
- Exclusion cages should be erected in all forage plots to monitor for planting success and amount of grazing pressure.
- Food plots are not planted for upland wildlife only (such as rabbits, quail, turkeys, and deer), but also for waterfowl. Canada geese often feed in warm-season grain food plots and in winter wheat. Plots of millets, corn, rice, or grain sorghum may be flooded a few inches deep in the fall to provide an additional food source for ducks through winter.
- It is important to note, food plots should be considered supplemental to existing natural habitat.
- The primary objective for food plots should be to provide nutrition for various wildlife species during periods when naturally occurring foods are limited (such as late summer and winter). In addition, food plots are often used to facilitate harvest of some wildlife species, such as white-tailed deer.
- Plots should not be placed within view of property lines or public roads.

Figure 19. Exclusion cages help you to monitor how much grazing is occurring on the food plot

Before planting, the seedbed should be prepared by conventional tillage or with herbicide applications prior to planting seed with a drill or planter. Tillage and herbicide applications, however, should not be recommended as separate practices to plant a food plot. The plot should be amended with lime and/ or fertilizers as recommended by a soil test, obtained by sending samples of the soil to the Extension office for testing at a soils lab. This is an important step and helps ensure the correct amendments at the correct rate are applied for optimum plant growth.

Figure 20. The seedbed can be prepared by applying herbicides

Perennial forage food plots (such as perennial clovers, alfalfa, and chicory) do not have to be planted each year. However, maintaining perennial forage plots requires as much effort as replanting annual plots. Perennial forage plots must be mowed periodically and sprayed with the appropriate herbicides and/or pesticides to control weed competition and/or problem insect pests. This is critical in order to get 4 years to 6 years production from the perennial plot without replanting.

Effect of management practice— In areas where row-cropping (corn, grain sorghum, soybeans, etc.) is scarce, grain food plots can supply high-energy foods through fall and into late winter. This can be especially important during years with low mast (acorn) production. In areas where little herbaceous vegetation is present (such as large areas of Stages 4, 5 and/or 6) and or where herbaceous vegetation is of no value to wildlife (such as fields of tall fescue, orchard grass, bermudagrass, etc.), forage plots can supply high-protein foods, especially during late summer and through winter and spring.

Plant Native Grasses and Forbs

Native grasses and forbs are recommended primarily to increase or enhance early successional habitat for a number of wildlife species. Non-native grasses (such as tall fescue and bermudagrass) are not recommended for wildlife because they do not provide suitable habitat structure for most wildlife, and their competitive nature often prevents native grasses and forbs from becoming established. Warm-season grasses and forbs grow primarily during late spring and summer. Cool-season grasses and forbs make primary growth in the spring and fall and often go dormant during the summer depending on weather conditions. Native grasses and forbs can be planted, or they can be established by killing existing non-native cover with selective herbicides and allowing native seed lying dormant in the seedbank to germinate.

Please note, if native grasses and forbs are planted, it is imperative to eradicate undesirable non-native grasses and forbs prior to planting. This will require herbicide applications. In this situation, you should also recommend controlling non-native vegetation.

Figure 21. Forests with diverse understories of native grasses and forbs support a variety of wildlife species

Early successional habitat is required by many wildlife species that do not use woods such as Northern bobwhite, grasshopper sparrow, and dickcissel. Additional early successional habitat is particularly needed for those species and others in areas that are predominately forested and where the majority of existing early successional habitat is dominated by non-native species. The amount of early successional habitat required is dependent on the focal species. Some species such as Eastern cottontails, will use and thrive in relatively small areas of early successional habitat, while other species such as greater prairie chicken require several square mile of contiguous native grasses and forbs.

- Desirable native warm-season grasses are bluestems, switchgrass, sideoats grama, & Indiangrass.
- Desirable native cool-season grasses are wildryes and low panicgrasses.
- Desirable native forbs and brambles are ragweed, pokeweed, blackberry, dewberry, native lespedezas, beggar's- lice, old-field aster, partridge pea, perennial sunflowers, and crotons.
- Undesirable non-native warm-season grasses are bermudagrass, cogongrass, johnsongrass, crabgrass, dallisgrass, and goosegrass.
- Undesirable non-native cool-season grasses include tall fescue, orchardgrass, bromegrasses, and timothy.
- Undesirable non-native forbs include sericea lespedeza, curly dock, spotted knapweed, sicklepod, and cocklebur.

Effect of management practice— Native grasses and forbs provide nesting, bedding, roosting, and/or escape cover for several songbird species, bobwhites, wild turkeys, cottontails and other small mammals as well as white-tailed deer. These are also important for predators such as hawks, owls, coyotes and others.

Ground-nesting birds usually build their nests at the base of a native grass bunch/clump. Although some wildlife such as elk readily eat native grasses, forbs provide a greater food source for more species. Not only is the foliage of forbs eaten, but also the seed produced by many forbs such as native lespedezas, ragweed, sunflowers, and pokeweed is a very important food source for many birds and mammals. Forbs also provide optimal cover for brooding quail and wild turkeys.

Plant Shrubs

When properly located, shrubs can provide a tremendous source of cover and soft mast that will benefit many wildlife species.

- In large open areas, planting blocks or multiple rows of shrubs is beneficial for those species requiring additional shrub cover for nesting, loafing or escape.
- Fruiting shrubs are beneficial for many species and can be planted in fencerows, hedgerows, field/woods borders, odd areas (such as field corners and gullies), riparian areas and any other areas where soft mast may be lacking.
- Establishing hedgerows of shrubs to break-up fields is very beneficial, especially when planted adjacent to high-quality early successional cover and/or a good food source (such as grain field).

Figure 22. Fruiting shrubs can be planted in rows, borders, and areas where soft mast may be lacking

- Shrubs should be planted in winter while they are still dormant.
- Shrubs should not be planted in the woods where there is not adequate sunlight for growth and development. Where additional shrub cover is needed in forested areas, Forest Management (e.g., FSI) should be recommended.
- Shrub plantings may be useful in some urban settings where desirable cover and/or soft mast are lacking.
- Shrubs are an important component of travel corridors, which allow wildlife to move safely across open fields between two areas of cover.

- Shrubs can be planted to develop a riparian buffer along creeks, rivers, lakes, and other wetland areas. Riparian buffers are important for protecting water quality and can provide excellent cover and travel corridors for wildlife as well. The recommended width is 100 feet, but width may vary with size and order of the stream, as well as topography and landowner objectives.

Effect of management practice— Planting shrubs can provide additional food and cover for many wildlife species in areas where specific species of shrubs are lacking. Establishing hedgerows with shrubs may be used to increase interspersion of cover types and create smaller fields in proximity that can be managed differently to meet the various food and cover requirements for different wildlife species.

Plant Trees

Trees are planted to provide food (hard or soft mast) and/or cover for many wildlife species.

- Trees should be planted in winter while they are dormant.
- Planting a mixture of species is usually recommended when mast production is the objective. This reduces the chances of a mast failure in any given year.
- Region, site, and landowner objectives help determine which species are planted.
- Examples of hard mast producers that are important for wildlife include oaks, hickories, American beech, and pecan.
- Examples of soft mast producers that are important for wildlife include persimmon, mulberry, apple, and pear.

Effect of management practice— Large areas of trees can be planted for reforestation. In addition to soft and hard mast, trees can provide nesting, perching, denning and roosting sites. Trees can be planted to develop a riparian buffer along creeks, rivers, lakes, and other wetland areas. Riparian buffers are important for protecting water quality and can provide excellent cover and travel corridors for wildlife as well. The recommended width is 100 feet, but width may vary with size and order of the stream, as well as topography and landowner objectives.

Figure 23. Planting trees along a waterway can provide nesting, perching, and roosting sites while protecting water quality

Repair Spillway/Levee

Repairs are needed if the spillway in an existing dam or dike is eroding or otherwise damaged which keeps the pond level too low and increases the chance of the dam eroding during heavy rains. In special cases, leaks around the spillway or levee structure can be stopped with the addition of special clays or plastic liners.

Effect of management practice— Repairing the spillway/levee enables pond to fill to appropriate level and precludes vegetation from establishing around the inside perimeter of the pond.

Figure 24. Functioning spillways enable ponds to fill to the appropriate level

Set-back Succession

Succession is the orderly and predictable series of changes in plant species composition through time and occurs in all natural communities. Wildlife habitat is most often managed by setting back succession to retain the successional stage(s) beneficial for the focal wildlife species. There are essentially four general methods for manipulating succession: **herbicide** applications, **mechanical methods**, and **fire**. Each of these may be applicable for manipulating succession in any region for various species, but they may not produce the same effect.

Figure 25. Herbicides help control competing vegetation and can be used in conjunction with prescribed fire

Herbicide applications can be used to set-back succession and kill selected plants. Applications can be made to individual plants or broadcast over an area. There are many different types of herbicides available. The herbicides used in natural resources management are environmentally safe. Many herbicides are “selective” in that they only kill specific plants, not all plants. Thus, in many cases, selective herbicides can be used to remove specific undesirable plants from an area (such as small trees in a field) and leave desirable plants. Herbicide applications thus can be used to adjust plant species composition in an area (such as a field or thinned pines) and improve habitat for many wildlife species. This practice is intended to set-back succession, not specifically to control nonnative species. Although herbicide applications are often used to control

nonnative species, Control Nonnative Invasive Species should be recommended for that purpose.

Mechanical method: Disking

Disking sets back succession by mixing the upper soil layer and incorporating organic material into the soil, facilitating decomposition and stimulating the seedbank.

- Disking is a relatively inexpensive and effective practice for reducing grass coverage, encouraging germination and growth of forbs, and exposing bare ground.
- Areas in Stages 2, 3 and 4 (depending on size and height of shrub cover) can be disked to maintain/promote growth of annual and perennial forbs and grasses.
- Disking should be performed on a rotational basis, usually in winter.
- In planted pines, disking can be used in Stages 5 and 6 to reduce unwanted woody stems and encourage herbaceous growth.
- Similar to controlled burning, timing of disking and disking intensity influence vegetation composition and structure.
- Disking should be used instead of mowing when and where possible and should be used where burning is not possible.
- While disking is often used to create firebreaks to facilitate controlled burning, it should not be recommended in order to burn.
- Disking should not be prescribed for an area dominated by perennial nonnative grasses (such as tall fescue and bermudagrass). Instead, Control Non-native Invasive Vegetation should be recommended for those areas.

Figure 26. Disking can expose bare ground and encourage germination and growth of forbs. Source: USDA NRCS *Virginia Conservation Practice Job Sheet 647 (a)*

Effect of management practice— In Stages 2 and 3, maintains herbaceous vegetation. Promotes fresh herbaceous growth and enhances forage availability for many wildlife species. In Stages 3 and 4, reverts succession to Stage 2.

Mechanical method: Chainsawing / Feller-bunchering
A chainsaw or feller-buncher may be used to kill and/or remove trees in forests, savannahs and woodlands where trees are not needed or where additional areas of early succession are needed for the focal wildlife species.

- Implementing this practice implies that once the trees are removed, the area is to be managed in something other than trees such as native forbs and grasses and forbs or food plots.
- Do not recommend Forest Management to achieve this management goal. If an additional practice is intended, such as Plant Native Grasses and Forbs or Plant/Manage Food Plots, it should be recommended as well.

Effect of management practice— Reduces tree density and encourages early successional plant communities.


Figure 27. Chainsawing is used to kill and/or remove trees in forests

Mechanical method: Chaining / Roller Beating
Chaining involves pulling a very large chain strung between two bulldozers running parallel to each other (50 to 100 feet apart) to knock down shrubs and small trees. Roller beating involves bulldozers pulling a roller with large, sharp metal blades to knock down and chop large shrubs and small trees.

- Roller beating is an alternative to chaining and has almost the same effect on vegetation.

- Both techniques are used where rugged terrain, rocks or large shrubs prevent the use of a mower.
- This practice is not used to manipulate understory vegetation in woodlands or savannas.
- Soil compaction is a concern and can be a problem when using bulldozers in certain regions.

- Prescribed fire is the preferred method to set back succession and maintain the desired vegetative composition and structure.

Figure 28. Chaining can be used on rugged terrain to knock down shrubs and small trees

Effect of management practice— Helps remove competition of some kinds of shrubs, allowing grasses and forbs to grow better. Woody growth however, usually readily re-sprouts following chaining or roller beating. Helps maintain succession in Stage 4; encourages resprouting. In Stage 5, reverts succession to Stage 4.

Mechanical method: Mowing / Mulching

Mowing is most often accomplished with a large rotary mower mounted behind a tractor. Sometimes, a mulching machine is used to mow large shrubs and small trees.

- To avoid disrupting nesting birds and destroying reproductive cover or winter cover, mowing should not be conducted until late winter/early spring.
- When used to manage fields or other early succession habitat, mowing should be conducted only when it is apparent that undesirable woody species are encroaching in the field. In other words, mowing grassy fields is unnecessary.
- Mowing and mulching machines are often not desirable because they create a deep thatch layer that creates undesirable conditions at ground level for young

game birds and ground-feeding songbirds. A thatch layer also limits germination of the seedbank and can reduce plant diversity.
- When possible, prescribed burning and disking should be implemented instead of mowing or mulching.

Mowing with a lawnmower can maintain lawns and park-like settings in urban areas. Mowing is usually the only possible practice for maintaining openings in urban areas. Mowing is well suited to maintain low-growing grasses and forbs. Many wildlife species inhabiting urban areas are attracted to yard-like settings, especially when interspersed with shrub and forest for cover and travel corridors.

Effect of management practice— Mowing helps maintain Stage 3 or 4. It removes competition from some kinds of shrubs, allowing grasses and forbs to grow better. It maintains low shrub growth with certain species of shrubs by encouraging resprouting. In Stage 3 and 4, moving helps rejuvenate grasses, forbs and shrubs, which improves nesting cover for some bird species. It also causes thatch build-up, which reduces availability of invertebrates and seed to young quail, grouse, turkeys, and other ground-feeding birds. Thatch build-up also reduces the ability of these animals to move through the field and suppresses the seedbank.

Mechanical method: Prescribed Fire
Prescribed fire can be the most effective and efficient method for managing succession. Prescribed fire is recommended to maintain Stages 2 through 4 and to influence understory composition and structure within Stages 5 and 6 of the Southeast Mixed and Outer Coastal Plain and Eastern Deciduous Forests. Prescribed fire should be used to manage early successional habitat instead of mowing or mulching wherever burning is possible. Timing, intensity, and frequency of fire strongly influence vegetation composition and structure.

- Burning in late summer/early fall tends to reduce woody composition more than burning in winter/ spring.
- Low-intensity fire is recommended to prevent damaging trees when burning a forest understory.
- Like other methods, fire only sets back succession temporarily. Except for intense fire, more frequent burning over time will change vegetation composition more so than less frequent burning. For example, if an area is burned every 1 year to 2 years, it will eventually be dominated by annual and perennial herbaceous vegetation. Where there is adequate rainfall, if that same area is burned every 3 years to 5 years, considerable woody cover will be present. If burned every 5 years to 10 years, the site will be dominated by woody species. Intensity and timing of fire will dictate whether woody species are killed or if only the leaf litter is consumed.

Although a very beneficial practice, prescribed burning may not be possible in all locations. Sites near urban areas, hospitals or busy roadways may not be suitable for burning because of safety and smoke management concerns.

Burning should be conducted only when danger of wildfire is low (when the wind, temperature, and humidity allow a controlled burn) and should be conducted under the close supervision of forestry or wildlife professionals experienced with prescribed fire.

Figure 29. Prescribed fire should be used to manage early successional habitat instead of mowing and mulching whenever burning is possible

Grazing livestock also arrest or set-back succession. However, wildlife managers do not typically use livestock to set-back succession, but may recommend a stocking rate to livestock producers who are interested in wildlife. For the purposes of this program, Livestock Management is included as a separate WMP because livestock often need to be excluded from an area when managing for many wildlife species. Thus, there are just as many applications for Livestock Management to advance succession as there are to set-back succession.

Early successional habitat must be maintained. Prescribed fire, disking and grazing are recommended to prevent deterioration of the vegetative structure through litter buildup and excessive woody plant succession. It is good to burn, disk, or graze a different area

each year to provide a diversity of plant structure and composition across the property to serve the different needs of wildlife dependent upon early successional habitat. Usually burning and disking are conducted just prior to spring green-up or in late summer/early fall, so nests and young wildlife are not disturbed. Ideally, early successional habitat should not be mowed.

Figure 30. Prescribed burning helps to provide a diversity of plant structure

Areas burned or disked during the previous year provide an open structure at ground level, which is desirable for young quail and turkeys as they can walk about easily between the bunches of grasses and under the canopy of forbs, eating insects and other invertebrates and gleaning seed of various forbs off the ground.

Areas burned or disked at least two years previously provide dead, dry vegetative material that birds use for building nests. Native grasses and forbs can be used to develop a riparian buffer. Riparian buffers are important for protecting water quality and can provide excellent cover and travel corridors for wildlife as well. The recommended width is 100 feet, but width may vary with size and order of the stream, as well as topography and landowner objectives.

Tillage Management

Tilling cropland can be delayed in spring to allow wildlife to use standing stubble for nesting. Tillage may be eliminated in the fall to allow wildlife access to waste grain. When fall tillage is necessary, avoid inversion tillage (soil is turned over and covers up crop residue) such as moldboard plowing or disking. Instead, implements such as chisel plows that do not turn the soil over should be used.

Note: This practice should be recommended only if a grain crop is present.

Effect of management practice— Increases supply of waste grain, which is eaten by many wildlife species, and may increase nesting success.

Figure 31. Leaving waste gain the fall for wildlife is helpful for nesting success

Water Control Structures

Various structures made of concrete, metal, or wood are used to control the water level in ponds and wetlands. They are usually placed within a dam or dike. This practice should be recommended when inadequate or no structure is present on an existing dam or dike. This practice can also be used to control the water level of beaver ponds. A Clemson Beaver Pond Leveler can be placed through the beaver dam, restricting the pond level from exceeding a desired height and helping prevent flooding into undesirable areas, such as crop fields, roads, woods, etc.

Effect of management practice— Allows ponds to be drained for managing water quality and control of unwanted fish.

- Allows management of water levels to increase or decrease the amount and type of aquatic vegetation in ponds and wetlands.
- Useful for creating a desirable mix (interspersion of open water and emergent aquatic vegetation in wetlands.
- Can be used to create shallow water areas.
- Can be used to control water levels in flooded timber, drawing water down to prevent tree mortality.

Water Developments for Wildlife

Water is a critical habitat component. Some wildlife species obtain necessary water from their diet, while others need a free-standing source of drinking water. Many species require a water source for obtaining food, reproduction, loafing, or escaping predators. Developing a source of water is a critical consideration for many wildlife species when little or no water is available. There are several ways to make water available to wildlife.

Small ponds can be created with backhoes, bulldozers, or loaders. They are usually designed to collect water from runoff and/or precipitation but may be created where there is an existing spring or seep, which facilitates water collection and helps ensure a reliable water supply. Side slopes for these ponds should be gentle to provide easy access for wildlife.

Note: these ponds are designed for various wildlife species, not fish.

Shallow impoundments may be established by constructing earthen dikes to retain water (usually run-off water from precipitation) in natural drainage areas. Placement of the dike is critical to avoid damage from floods and to collect sufficient water. When recommending shallow impoundments for waterfowl, bottomland areas (including grain fields and Stage 6 bottomland hardwoods), and existing wetlands should be considered for flooding. A water-control device in the dike allows the water level to be manipulated. Water can be removed from the field or woods prior to spring (similar to letting the water out of a bathtub) so the field can be planted again or so the trees will not die.

Note: When this practice is recommended, it is assumed an adequate water control structure will be included & should not be an additional recommendation.

Guzzlers and **windmills** are also used to provide water. Guzzlers are built by covering an area with an apron of fiberglass or some other material that sheds rain. Water is collected in a storage tank and slowly released into a trough from which wildlife can drink.

Small backyard ponds can be constructed in suburban backyards to provide water for a variety of wildlife. **Birdbaths** are also useful for providing water in urban settings.

Effect of management practice— Can provide drinking water and wetland habitat
Flooded grain fields or Stage 6 bottomland hardwoods in fall/winter can provide important migrating and wintering areas with abundant food resources for waterfowl.
Temporary flooding can improve existing wetlands for nesting and brooding for some waterfowl such as redheads and can improve existing forested areas for nesting and brooding wood ducks.
Can provide a source of prey for many predators.

Population Management Practices

Decrease Harvest

It is the responsibility of state and federal wildlife agencies to set hunting and fishing seasons and bag and creel limits. However, landowners can choose to take the maximum allowed or less than that, depending on personal management objectives. Regulated hunting is a primary tool used to keep some game species within the carrying capacity of available habitat.

Figure 32. White-tailed deer are a popular managed species in Alabama

This is obviously true for species that have relatively few natural predators in a given area or region such as white-tailed deer. However, it may be necessary to decrease harvest levels for other species such as Northern bobwhite and wild turkey, or when harvest data and/or observation data indicate species populations are declining in areas with good habitat and where hunting pressure has been excessive. It is important to realize decreasing regulated hunting opportunities and harvest levels are seldom the reason for declining wildlife populations. Relatively low or declining wildlife populations are usually a result of poor habitat from the existing site quality or degradation and/or destruction of habitat quality in the surrounding area.

This management practice is necessary for bass when seine samples and fishing records of a pond reveal no recent bluegill hatch, many medium-sized bluegill in poor condition, and bass are few in number but large and in good condition.

It is necessary for bluegill when seine samples and fishing records of a pond reveal many recently hatched bluegill, very few medium-sized bluegill, bass less than one pound and in poor condition, and no young bass.

A decrease in harvest is necessary for trout when seine samples and fishing records reveal that they are in good condition, there are few medium and large-sized fish, and many small fish.

Gamebirds and mammals

Decreasing harvest may be necessary when data indicate populations are declining, especially in areas with good habitat. However, harvest through hunting and trapping is seldom the reason for declining wildlife populations. Rather, habitat quality is usually the reason for widespread low or declining populations. If food, cover, water, or space is limiting, populations may remain low or decline. Appropriate habitat management practices should enhance habitat and allow populations to stabilize or increase.

Disease and, less often, unsustainable mortality from predation are other reasons for low or declining populations. If populations are low or declining because of predation, it is likely related to habitat (poor-quality cover) or possibly an abnormally high predator population. In this scenario, habitat management and possibly a reduction in the predator population can address low or declining gamebird or mammal populations. Possible examples, though relatively rare, include abnormally high predation rates on deer fawns by coyotes or abnormally high predation rates on wild turkey eggs and poults from raccoons.

NOTE: Decrease Harvest is not an option for migratory species, such as waterfowl and mourning dove, because the U.S. Fish and Wildlife Service sets bag limits and individual landowners cannot influence population levels of migratory species.

Largemouth bass/bluegill

Balanced bass/bluegill populations can be documented via:

- Seine sampling: Young largemouth bass present. Many newly hatched bluegills and some intermediate (3-5 inches) bluegill present.
- Angler sampling: Proportional Size Distributions (PSDs) – Between 40 percent and 70 percent of 8 inch or larger largemouth bass caught are at least 12 inches long and 40 percent to 60 percent of 3 inch or larger bluegill caught are at least 6 inches long.

Decrease bass harvest

- seine sampling reveals young bass may or may not be present, many intermediate-sized bluegills in poor condition but no recent hatch of bluegills.
- If angling reveals few bass present but > 60 percent of the bass caught are at least 12 inches long while < 50 percent of bluegill are at least 6 inches long, return all bass.
- The lack of bluegill reproduction and poor condition of intermediate bluegill suggests the bluegill population may be too high and food is a limiting factor. Reduce bass harvest (catch and release is ok) to increase predation pressure on intermediate-sized bluegills.

Decrease bluegill harvest

- Seine sampling reveals no young bass present and many recently hatched bluegills but few intermediate bluegills present.
- If angling reveals < 20 percent of bass caught are at least 12 inches long and > 80 percent of bluegill are at least 6 inches long, return all bluegill.
- Assess if other species of fish (such as green sunfish) may be competing with bluegill and if so, consider draining or renovating pond and restocking.

Channel catfish

As angler catch rates of channel catfish decline, impoundments are usually restocked with additional fingerlings (rather than reduce harvest) in order to maintain angling opportunities.

Increase Harvest

Regulated hunting, trapping, and fishing regulations are primary tools used to manage many wildlife and fish species. It is the responsibility of state and federal wildlife agencies to set hunting and fishing seasons with bag and creel limits. Within that limit, landowners can choose to take the maximum allowed if necessary to meet management objectives.

Game birds and mammals

Increased harvest is needed when animals show signs of stress and overpopulation such as destruction of habitat by overgrazing or overbrowsing, poor body condition and weight loss, low reproductive rate, and increase in prevalence of parasites and diseases.

- Regulated hunting is the most effective and efficient practice to remove surplus animals and keep wildlife populations in balance with available habitat. When scientific data indicate animals are above carrying capacity, it is often necessary to increase harvest.
- Increased harvest through regulated hunting or trapping also can be used to reduce numbers of a particular game species if that species is causing damage to another species.
    - increased harvest of raccoon if they are limiting wild turkey recruitment
    - increased harvest of coyotes if they are limiting white-tailed deer recruitment
    - increased harvest of white-tailed deer if they are degrading habitat for various forest songbirds

NOTE: Increase Harvest is not an option for migratory species, such as waterfowl and mourning dove, because bag limits are set by the U.S. Fish and Wildlife Service and individual landowners cannot influence population levels of migratory species.

Largemouth bass/bluegill

Balanced bass/bluegill populations can be documented via:

- Seine sampling: Young largemouth bass present. Many newly-hatched bluegills and some intermediate (3-5 inches) bluegill present.
- Angler sampling: Proportional Size Distributions (PSDs) – Between 40 percent and 70 percent of 8 inch or larger largemouth bass caught are at least 12 inches long and 40 percent to 60 percent of 3 inch or larger bluegill caught are at least 6 inches long.

Increase bass harvest

- Seine sampling reveals young bass may or may not be present, but there are many recently hatched bluegills and few or no intermediate-size bluegills.
- If angling reveals < 20 percent of the bass caught are at least 12 inches long and in poor condition, and > 50 percent of bluegill are at least 6 inches long, increase harvest of bass < 12 inches beginning with 10-20 per surface acre per year.
- The increase in bass harvest will reduce competition for food among small bass and allow the remaining small bass to grow more quickly making more of the forage resource available to them (bass can only swallow bluegill about one-third of their length, for example, a 12-inch-long bass can only consume bluegill < 4 inches long).

NOTE: This existing pond scenario is desirable if the pond owner is willing to sacrifice bass size for a primary goal of producing large bluegill.

Increase bluegill harvest

- Seine sampling reveals no recently hatched bluegills but many intermediate bluegills in poor condition.
- If angling reveals 20- to 60 percent of bass caught are at least 12 inches long but < 50 percent of bluegill are at least 6 inches long, increase intermediate bluegill harvest by angling, seining, and/or shoreline rotenone application.
- Increased bluegill harvest should decrease competition for food among intermediate bluegill.
- Make sure excessive turbidity (visibility < 15 inches) or weed growth (> 50 percent coverage of the pond) is not limiting largemouth bass access to bluegill.

Channel catfish

Increase channel catfish harvest when angler-caught catfish are extremely thin (underweight), which is indicative of a population exceeding carrying capacity of the impoundment. Also, increase harvest whenever the total weight of channel catfish nears or exceeds 1,000 pounds per surface acre during the summer months.

Wildlife Damage Management

Wildlife managers often must manage wildlife to control damage. Wildlife damage management is most common in urban and suburban areas where wildlife and humans frequently interact.

- Woodpeckers hammering on the side of the house
- bats or squirrels in the attic
- snakes in the house
- deer eating ornamental plants in the yard or feeding in soybean crops
- bobcats/ coyotes/ owls preying on livestock or pets
- rabbits/ raccoons eating vegetable gardens
- beavers killing trees or flooding crops and roads
- red-winged blackbirds eating crops
- bird strikes at airports
- rock doves defecating on buildings
- starlings roosting in urban trees and defecating on sidewalks
- Canada geese loitering on lawns and golf courses

To control these problems, wildlife managers use both lethal and nonlethal methods.

- Fencing and other exclusion devices, habitat modifications, harassment techniques (such as predator decoys), scare tactics (such as propane cannons, dogs) and taste and odor repellents are examples of nonlethal methods.
- Changing human activity can also be effective. For example, removing the dog food or bird feeder from the deck is the easiest way to keep raccoons, rodents and other wildlife off the deck.
- Often, nonlethal methods do not work and lethal methods are required. Lethal methods are intended to kill wildlife quickly without suffering and include body-gripping traps, trap-and-euthanize (put to death without pain or suffering), shooting, and poisoning.

There are advantages and disadvantages to both lethal and nonlethal management methods. One advantage of lethal methods is they can immediately decrease the numbers of animals in a population that are causing damage or health hazards, thereby immediately reducing the damage or hazard. In some cases, only one or a few animals are causing the problem, and lethal methods can then eliminate the damage once the individual(s) causing the damage are eliminated.

Nonlethal methods typically cause the animals causing the problem to move to another location. Although nonlethal methods may reduce or eliminate the problem at one location, the animal(s) causing the problem may relocate and cause the same problem at a different location. An advantage of nonlethal methods is they are generally more accepted by the public than lethal methods and can be used in areas with high human density. Education can help the public understand the efficacy and sensibility of many lethal methods.

Regardless of the method used, there are some general guidelines that can increase the success of a wildlife damage management program.

- It is important to correctly identify the species causing the damage.
- An integrated wildlife damage management program that employs two or more methods is strongly recommended especially when using nonlethal methods.
- It is imperative to know all the local, state and federal laws related to the species causing the problem and the wildlife damage management method(s).

Note: For the purposes of this contest, it sometimes can be confusing when deciding whether to recommend **Increase Harvest** or **Wildlife Damage Management**. If the problem is related to human structures, livestock or human health, **Wildlife Damage Management** should be recommended. If the problem is related to competition or mortality among wildlife species, **Increase Harvest** should be recommended if the species can be harvested legally. For example, if white-tailed deer are over-browsing a forest understory and destroying habitat for various songbirds, **Increase Harvest** should be recommended. Likewise, if raccoons have been found to limit wild turkey recruitment, or coyotes have been found to limit fawn survival, **Increase Harvest** should be recommended for raccoons or coyotes. For non-native species that are often problematic such as house sparrows, European starlings or rock doves, **Wildlife Damage Management** should be recommended to control associated damage as they are not considered game species.

Wildlife or Fish Survey

Monitoring wildlife for trends of increasing or decreasing populations or body weights is important for wildlife managers. Data on white-tailed deer, black bear, wild turkeys, ruffed grouse, bobwhite quail, mourning doves and many songbirds are routinely collected by wildlife biologists using infrared cameras, roadside counts, call counts, check stations, transects, and questionnaires. These data are used to prescribe future harvest or land management strategies.

Wildlife Survey Techniques

Observation counts: species and number of animals are recorded as they are seen. Counts may be made while conducting other activities or during official observations, such as counting ducks on a wetland

Roadside counts: usually involve driving a predetermined route and counting the number of individuals of a species while driving the route

Call counts: recording the number of individuals or groups (such as a northern bobwhite covey) of a species while waiting and listening at a specific location

Point counts: recording the numbers of a species observed or heard at specific, predetermined points along a transect

Check-in station: data are collected from game animals when hunters bring the animals to an official check-in station, which may be at various places, such as a Wildlife Management Area or local country store

Infrared-triggered cameras: “trail” cameras are placed in areas where animals frequent and the pictures are used to estimate population density, sex ratio, age structure, etc.

Transects: predetermined routes are used to collect observation data, point counts, dropping (“pellet”) counts, call counts, etc.

Questionnaires: groups of people, such as hunters or school bus drivers, are asked about their observations of animals

Harvest Trends: if hunting/trapping efforts remain relatively constant, trends in annual harvest rates can be used to estimate trends in populations.

Fish surveys

Pond balance should be checked during early summer by seining at intervals around the pond. Balance is determined by comparing age groups, condition, and numbers of bass and bluegill caught in the seine during the summer months, and from year-round angler catch records.

- Recent young-of-the-year fingerlings of both bass and bluegill collected in the seine indicate the fish population is balanced (see Decrease Harvest and Increase Harvest sections under WMPs for more information).
- Angler catch records should be used to record the numbers, total lengths, and weights (fish caught in the fall only) of all bass and bluegill harvested.
- Fish caught by hook-and-line can be evaluated on body condition or Relative Weight (fat, skinny, size of head in relation to body) and population size structures based on Proportional Size Distributions.
- Trotlines, rod and reel, and gill nets can be used to sample channel catfish.
- Seining is usually not effective for collecting fish in streams. Fish in streams are usually collected by electro-shocking or by fishing. Electro-shocking involves running a small electrical current between two conducting rods, which are moved up and down the stream. Stunned fish float to the surface and the age, condition, and numbers are recorded to determine stream balance. The fish are then returned to the stream.

NOTE: Although information from wildlife and fish surveys is always important, surveys should not be recommended if information is provided by contest organizers that indicate a survey is ongoing or has been completed recently.

Fish Pond Management Practices

Construct Fish Pond

A properly managed pond can provide excellent fishing and can benefit many species of wildlife.

- The basics of a well-managed pond are properly stocking the right species, a balanced harvest, proper fertilization, a stable water level, and aquatic weed control.
- Pond balance occurs when a balance between prey and predator fish is established and maintained.
- In most warm-water ponds, bluegill is the prey species and largemouth bass is the predator species.
- In cold-water ponds, a trout species is usually the predator, and insects and small fish are prey.
- Balance between predator and prey is achieved by establishing an adequate food chain for the prey species and controlling the prey and predator species numbers through fishing.
- Low water levels can cause significant problems also. Improperly constructed or damaged spillways can lead to excessive dam erosion.
- Low water levels, resulting from damaged spillways or improperly sloped banks, can lead to excessive aquatic vegetation along pond margins.

Phytoplankton (microscopic algae) are the base of the pond food chain. Zooplankton and aquatic insects feed on phytoplankton, which are eaten by small fish. Small fish are eaten by larger fish. Managing phytoplankton through fertilizing and liming (if necessary) is the key to producing abundant and healthy fish populations. Suspended mud in ponds blocks sunlight, and algae cannot bloom. Excessive water exchange through the pond prevents adequate phytoplankton blooms because fertilization is diluted.

Ponds can be created using dams, dikes, and levees to provide relatively permanent water for fish and wildlife. Although wildlife may use them, ponds are typically managed for fish. Pond design varies, depending on the purpose for constructing the pond and the region where it is constructed. The local Extension office or Natural Resource Conservation Service office can provide design details.

This practice should be recommended when creating new ponds with relatively permanent water and for reconstructing existing ponds that need major renovation. This includes ponds with major erosion of the dam, dike, or levee, as well as ponds that are nearly filled in with siltation or have problems resulting from trees growing on the dam, dike, or levee.

Artificial reefs can be included for additional cover when constructing or renovating ponds. These structures are usually constructed of rock piles, sections of plastic or

cement pipe (a minimum of 6 inches in diameter and 18 inches long) and brushpiles. Artificial reefs are normally recommended only for ponds larger than 10 surface acres.

Effect of management practice— Ponds can provide suitable habitat for some fish and wildlife species. Note: Although many wildlife species may use ponds for various reasons, this practice is intended primarily for fish habitat. For the purposes of this contest, when additional water or wetland habitat is needed for wildlife species, Water Developments for Wildlife should be recommended. This avoids management conflicts when both fish and wildlife species are being managed on the same property. For example, steep sloping sides benefit fish, while gentle sloping banks with abundant emergent vegetation benefit many wildlife species.

Figure 33. Ponds can provide relatively permanent water for fish and wildlife

Control Aquatic Vegetation

Aquatic vegetation should be controlled when it begins to limit use of a fish pond for recreation or interferes with access. As surface area coverage by vegetation exceeds 33 percent, the ability of predator species (such as largemouth bass) to access forage species (such as bluegill) may become reduced and therefore negatively impact the balance of the fish populations.

Prevention of rooted aquatic vegetation growth can be accomplished two ways:

1) deepening the edges of the pond to a minimum of two to three feet with steep side slopes, which minimizes shallow water areas exposed to sunlight. Pond edges can be deepened in drained ponds with a bulldozer or tractor with rear blade or in existing ponds with a backhoe. The soil removed can be piled on the bank or levee and smoothed for planting with native grasses and forbs

2) initiating a spring-throughfall fertility program, which reduces light transmission and prevents rooted submerged plants from becoming established (see Fertilize/Lime Fish Pond for more information).

Existing aquatic vegetation can be controlled chemically, biologically, or mechanically. Chemical control is accomplished by applying a labeled aquatic herbicide following identification of the targeted plant species.

Biological control also is plant species specific. Potential biological control agents for aquatic vegetation include fish species (such as white amur/grass carp, tilapia) and insects (such as salvinia weevil).

Regulations as to which biological control agents may be used vary from state to state. Mechanical control includes physically removing existing vegetation by seining, dragging with chains or ropes, cutting, raking and pulling up rooted vegetation.

NOTE: ***Control Aquatic Vegetation*** includes nonnative vegetation. Thus ***Control Nonnative Invasive Vegetation*** is not applicable for fish ponds.

Effect of management practice—Reduces aquatic vegetation within and around the edge of a pond, making prey more easily available to predator fish.

Fertilize / Lime Fish Pond

Ponds can be fertilized to increase available natural food organisms and prevent rooted aquatic weeds from becoming established. However, not every pond should be fertilized.

- Fertilization should not be used in ponds infested with weeds, ponds with excessive water flow, turbid (muddy) ponds, or ponds that will not be fished heavily.
- Fertilization is needed in fishponds with water clear enough that you can see clearly to 18 inches below the water surface.
- Before beginning a fertilization program, total alkalinity and pH of the pond water should be tested. Ponds below 20 mg/l total alkalinity will need liming in order for fertilizers to be effective.

Fishponds should be fertilized in the spring when the water temperature reaches 60 F. For ponds with moderate hardness (50 mg/l to 100 mg/l calcium hardness), apply 15 pounds of 12- 52-4 (or its equivalent) powder, or one gallon of 11-37-0 liquid fertilizer, or 15 pounds of granular (0-46-0) per acre at two-week intervals, or until a good green color (phytoplankton bloom) develops in the pond.

Make additional fertilizer applications (at the same rate per surface acre) every three to four weeks, or when the water clears (becomes less green). Fertilization may be continued until water temperatures drop below 60 F in the fall.

Methods for applying fertilizer vary with the type of fertilizer used. Granular fertilizer must be distributed from a fertilizer platform. Liquid fertilizer should be mixed with pond water and broadcast from a boat for large ponds or from the bank of small ponds. Water soluble powdered fertilizers can be broadcast from a boat or from the bank.

Effect of management practice— Pond fertilization stimulates phytoplankton production, which is the first step in the food chain of a fishpond.

Reduce Turbidity in Fish Pond

Turbid or muddy water limits fish production because natural food organisms need sunlight to grow. Turbidity can be caused by sediment being washed in from the pond banks or watershed, cattle using the pond, feeding activities of bottom-dwelling fish such as carp or buffalo fish, or negatively charged clay particles suspended in the water column.

Most events of turbidity are caused by sedimentation (erosion) from the watershed or the pond bottom (cattle or fish) and will usually clear in a relatively short period. Reducing erosion in the watershed is best accomplished by reseeding the watershed immediately around the watershed where there is evidence of erosion. Turbidity due to pond sediments can be controlled by restricting cattle to a small area of the pond and eliminating bottom-dwelling fish.

Turbidity from suspension of negatively charged clay particles is a more difficult problem. The addition of positively charged compounds such as limestone, gypsum or alum crystals can cause the clay particles to settle. However, the choice of which product and how much to use must be based on effectiveness, availability, cost and the ability of the pond owner to apply the product correctly.

Effect of management practice— Improves water quality by removing or settling silt. Allows sunlight to stimulate phytoplankton. May enhance cover for some wildlife, depending on how and where the watershed is reseeded.

Restock Fish Pond
Restocking a fish pond is a drastic measure and should only be considered after other management approaches have been attempted. Ponds containing wild fish species, such as carp, shad, green sunfish, or bullhead catfish, should be restocked with a balanced predator-prey combination.

- Restocking should be done only after all fish in the pond have been removed, either by draining or applying a fish toxicant
- In warm-water ponds, bluegill fingerlings should be stocked in late fall and bass fingerlings are stocked the following June
- A stocking rate of 1,000 bluegill and 100 largemouth bass per surface acre is recommended if the pond is to be fertilized
- A stocking rate of 500 bluegill and 50 largemouth bass per surface acre is recommended if the pond will not be fertilized
- Channel catfish stocking rates vary from 100 to 300 per surface acre depending on whether the pond is unfertilized or fertilized

Effect of management practice— Draining ponds and using fish toxicants remove unbalanced fish populations and allow establishment of desirable balanced fish populations.

Additional Urban Area Management Practices

Artificial Feeders

Artificial feeders are used primarily to feed songbirds and butterflies for viewing purposes. A wide variety of feeder designs, methods and foods are available. Most bird species prefer black-oil sunflower seeds and white proso millet. Species such as hairy woodpecker prefer to eat suet (fat) rather than seeds. Some species such as mourning dove and song sparrow, prefer to eat on the ground than on an elevated feeder.

It must be noted that artificial feeders can be hazardous to birds. Because feeders draw birds close together, disease transmission becomes problematic. Salmonellosis, aspergillosis and mycoplasmal conjunctivitis are fatal diseases among songbirds and are readily transmitted at heavily used bird feeders. It is imperative to clean feeders regularly with hot soapy water and a mild bleach solution. In addition, feeders pose danger via non-native predators, specifically house cats. Although house cats may be fed, they still hunt and kill millions of birds and small mammals each year. It is irresponsible to own a cat and leave it outside because of the unnatural pressure they put on native wildlife. Feral cats should be reported to local animal control officials, removed from the area, and euthanized.

Effect of management practice—Provides supplemental food source, primarily for viewing purposes.

Plant Flowers

Annual and perennial forbs can be planted to attract several wildlife species. A variety of species will flower over a longer period. Species and varieties should be selected to provide food and cover through the year where possible. Forbs should be planted in proximity to other cover sources to make them readily available.

Effect of management practice— Provides a supplemental source of food and cover.

Rooftop/Balcony Gardens

In urban areas, residential green space may be limited. Urbanites can create rooftop or balcony gardens to provide additional food, water and viewing opportunities. Although limited in space, the goal of rooftop or balcony gardens is to create habitat; thus, rooftop or balcony gardens should provide food, water, and cover. Moving water, such as a small waterfall will attract more wildlife than stationary water.

Effect of management practice— Provides food, cover, and water, through in small amounts, for wildlife in urban areas.

Food Groups

The food group categories below are listed in Southeast Mixed & Outer Coastal Plain Forest, Urban Areas, and Wetlands Areas Food Group Charts along with the wildlife species that consume them as part of their diet

Aquatic Plants: plants that grow partly or wholly in water, whether rooted in the mud, or floating without anchorage- plants that require constantly moist conditions without standing water are included in this group.

For the purpose of WHEP, only examples from the following genera will be considered:

- algae of various genera
- American lotus, *Nelumbo*
- arrowhead/ duck potato, *Saggitaria*
- big duckweed, *Spirodela*
- bladderworts, *Utricularia*
- bulrushes, *Scirpus*
- burreeds, *Sparganium*
- cattails, *Typha*
- coontail *Cerratophylum*
- cordgrass, *Spartina*
- duckweed, *Lemna*
- floating hearts, *Nymphoides*
- naiads, *Najas*
- pondweed, *Potomageton*
- rushes, *Juncus*
- sedges, *Carex*
- smartweed, *Polygonum*
- spikerush, *Eleocharis*
- waterlily, *Nymphaea*
- watermeals, *Wolffia*
- watermilfoil, *Myriophyllum*
- waterprimrose, *Ludwigia*
- waterweed, *Elodea*

Bark: tough outer covering of trees and shrubs

Birds: may be represented by feathers, bones, skulls, feet, or any part that distinguishes the class

Buds: a small protuberance on a stem or branch, sometimes enclosed in protective scales and containing an undeveloped shoot, leaf or flower; the bud may be represented on the branch or stem, or removed from the branch or stem

Carrion: stinking, rotting flesh; to be considered in this group, the item must have a definite odor of decomposition, be presented in a plastic bag or have the words “this stinks” on the display; a dry bone, a dry skin, or other body part does not represent carrion, but will represent other food groups; maggots are a natural occurrence with decomposition and may be present on the carrion, but they should not be considered in grouping the specimen as carrion

Crayfish: small freshwater decapod crustacean that resembles a lobster. Regionally, they have many names including crawdads and crawdaddys

Earthworms: terrestrial worm that burrows into and helps aerate soil; often surfaces when the ground is cool or wet; used as bait by those who fish

Eggs: only the eggs of vertebrate species (mammals, birds, reptiles, amphibians, fish) are considered in this category; invertebrate eggs (insect and spider) represent the group of the adult invertebrate

Fish: a poikilothermic (cold-blooded) water dwelling vertebrate with gills

Forbs: broad-leaved herbaceous plant, not including grasses, sedges, rushes or ferns; forbs may be represented by a single leaf or by the entire plant including the flower

Frogs and Salamanders: may be represented by the organism in any life stage except the egg

Fungi: kingdom of plantlike spore-forming organisms that grow in irregular masses without roots, stems, leaves and that lack chlorophyll

Grains: will include only wheat, oats, rye, barley, rice and corn; may be represented by the seed, seed head, or entire plant including the seedhead

Grass: leaves of grasses are usually tall and thin with a mid-rib and parallel veins; grasses may be represented by the entire plant including the seedhead, or by a single leaf or group of leaves

Hard mast: includes nuts from walnut, hickory, oak, beech, pecan, almond, and common hazel; may be shown with or without the husk

Insects and Spiders: insects are small invertebrate (without a backbone) animals, except for spiders, centipedes and millipedes, which are segmented. Spiders are an arachnid that usually has silk-spinning organs at the back end of the body; they spin silk to make cocoons for eggs or traps for prey.

Leaves and Twigs: this food group is represented by leaves and/or twigs of woody species only; not forbs, grasses or other herbaceous plants

Lizards: lizards are reptiles of the order Squamata, which they share with the snakes (Ophidians); they are usually four-legged, with external ear openings and movable eyelids

Mammals: any mammal regardless of size fits in this category; may be represented by a photograph, live animal, museum mount or any part of the mammal representative of the class, such as teeth or hair

Mussels: freshwater mollusks that may be represented by the whole organism or just a single shell or group of shells

Nectar: represented by the flower with no other plant parts present

Seeds: a fertilized ovule containing an embryo, which forms a new plant upon germination

Snails: applies to most members of the molluscan class Gastropoda that have coiled shells

Snakes: cold-blooded legless reptiles, which share the order Squamata with lizards

Soft Mast: fleshy fruits, such as but not limited to blackberry, blueberry, pokeweed, persimmon, cherry, mulberry, blackgum, apple, pear, elderberry, and grape

Tubers: represented by either the nutlet of the yellow nutsedge (chufa) or by potato

Turtles: animals with a special bony shell developed from their ribs; “turtle” is often used for aquatic species, but aquatic freshwater turtles also are often called “terrapins;” in North America, “turtle” is usually used to refer to all members of the Order, including tortoises, which are predominantly land-based

Glossary

aerate: to supply or expose water with air to increase

annual: when referring to plants, those that complete their life cycle from seed to mature seed-bearing plant in one growing season

arid: dry, receives little precipitation basal area: space or area represented by tree stems at 4.5 feet above ground; for example, a basal area of 60 square feet per acre means that of 43,560 square feet of available space (1 acre), tree trunks represent 60 square feet of that space 4.5 feet above ground

broadleaf: a plant with wide blade leaves such as an oak or cottonwood. Seeds are born from flowering parts in contrast to conifers which bear seeds in cones

browse (noun) leaves and ends of twigs of woody species; browse (verb) to eat

butte: a hill that rises abruptly from the surroundings; sides are steeply sloped or with cliffs, and the top is nearly flat.

cacti: plants adapted to dry conditions; often store water in leaves and other parts of the plant; usually have small leaves and thorns.

canopy cover: the amount of ground covered by the branches, leaves and stems of plants; can specify as herbaceous, shrub, tree or all canopy cover; expressed as a percentage

carnivore: a meat-eating animal

carrying capacity: the maximum population that an area can sustain without causing some type of damage; usually related to food, cover, water, or space for a particular species (biological carrying capacity), but the term is sometimes applicable to cultural limitations for humans

coastal plain: large, nearly level areas of land near ocean shores

conifer: usually refers to needleleaf trees that bear seeds in cones; examples include spruces, pines and firs

corridor: a strip or block of cover that connects otherwise isolated areas for a particular wildlife species

cover: vegetation and other land features that provide areas for wildlife to hide, sleep, feed and reproduce

decadent: declining in health and/or productivity

deciduous: plants that shed their leaves annually

decomposition: the natural break-down and decay of dead plant and animal material

defecating: elimination of solid body waste by animals

detrimental: having harmful effects

dominant: the plant or animal species that is the most common in an area

drought: lack of normal precipitation for an extended period; long period with little or no rain endangered species: a species in danger of becoming extinct

ecosystem: the plant community along with the animal community together with soil, air, water, and sunlight

edge: where two vegetation types or seral stages meet

endangered species: a species in danger of becoming extinct

environment: the surroundings that affect the growth and development of an organism including other plants and animals, climate, and location

evergreen: plants that do not lose all their leaves at one time, including some conifers, but also many broadleaf trees and shrubs such as live oak and American holly

excavate: to make a cavity or hole

exclusion: keeping something out of an area

fertile: usually referring to soil high in available nutrients

fingerling: a small fish, especially up to one year of age

fluctuate: to vary, or rise and fall irregularly

food chain: step by step passage of energy and nutrients through an ecosystem; for example, clover—deer—mountain lion

food web: a complex network of food chains

forage: n. refers to the vegetation eaten by animals; v. to search for food

forb: broad-leaved herbaceous plant

forest stand: a contiguous area of trees of similar species composition, age and structure that can managed as a unit

fragmentation: most often used in natural resources management to describe disruption of continuity of a vegetation or type community; for example, an

glean: to gather food in a systematic manner

ground litter: dead and decaying organic matter found on the ground such as leaves, branches and dead plants

habitat: the physical and biological resources (food, cover, water) required by a species within an area of sufficient size (space) for that species

hardwoods: an ambiguous and often inaccurate term given to non-coniferous trees

herbaceous plants: grasses, forbs, sedges, rushes and ferns; plants having soft rather than woody stems

herbicide: chemicals used to kill or control the growth of undesirable plant

herbivore: a plant-eating animal

home range: the area used by an animal; usually described as the area that encompasses the daily, seasonal, and annual movements of an animal

insecticide: chemicals used to control insects

insectivore: an insect-eating animal

intermittent: occurring at irregular intervals

interspersion: the mixing of vegetation types or successional stages; high interspersion represents a lot of mixing; low interspersion represents little mixing

invertebrates: animals lacking a backbone; examples include insects, spiders, mollusks and crustaceans

irrigate: to water through diversion ditches and pipes

keystone species: plant or animal species with a disproportionate influence in its community relative to its abundance

landscape: an area that represents several interacting ecosystems; usually regional in reference

latrine: site where various mammal species, such as raccoon or river otter, habitually defecate or urinate

legume: plants that bear seeds in a pod; examples include lespedezas, clovers, soybeans, peas and black locust

mast: collective term for fruits, trees, shrubs and vines, both hard and soft (fleshy), such as acorns, hickory nuts, persimmon, mulberry, blackberry, and grape

migration: usually used to describe the periodic movement to and from a breeding area; may also be used to explain other seasonal movements, such as altitudinal migration in elevation in response to snow cover and food availability

mortality: (compensatory and additive) – death of individuals

native: plant and animal species originating historically or migrating naturally to a particular region

nutrients: chemicals required for plants and animals to grow and exist

omnivore: an animal that eats both plant and animal material

perennial: plant species that grow from a root system that remains alive more than two years

phytoplankton: microscopic floating and suspended aquatic plants

plateau: an elevated, relatively level expanse of land; sometimes called tableland population: a group of individuals of the same species living in each area that interact with each other

point count: a census method commonly used to monitor relative abundance of songbirds

population: a group of individuals of the same species living in a given area that interact with each other

reforestation: usually refers to planting trees in an areathat was previously forested and recently harvested

regenerate: to replace lost or damaged parts with new tissue

rejuvenate: to stimulate and return to good health and vigor

riparian: the area adjacent to and influenced by a water source such as a creek, stream, river, pond, lake, swamp, or other wetland

savannah: an area with scattered trees maintained by fire and/or grazing

scarifies: breaking down the protective coating on various species of seed allowing the seed to germinate; often facilitated by fire or digestion

secluded: occurring in a remote or other area where visibility is obstructed or reduced

sedge: grass-like plant, often associated with moist areas and usually with triangular stems

seedbank: seed occurring naturally in the top few inches of soil

senescent: the growth stage in a plant or plant part (like a leaf) from full maturity to death; old age

sere: a series of successional stages at a particular site, leading to a mature, climax community

seral stage: a successional stage in a sere

silviculture: the process of tending and managing a forest

slash: residue left on the ground after trees are harvested

softwood: usually refers to coniferous trees, though some deciduous trees such as red maple and aspen also have relatively soft wood

species: a type of organism whose members can freely interbreed with each other and genetically are very similar; do not necessarily interact or located together

stagnant: sluggish; not producing to potential

stocking rate: amount of land allotted to each animal for the entire grazeable portion of the year

subclimax: successional stage occurring prior to climax stage, but further development is inhibited by some factor(s) other than climate

succession: replacement of one vegetation type or seral stage by another

succulent: having thick fleshy leaves that conserve moisture

terrain: referring to topography

thatch: accumulation of dead grass and leaves on the ground

transitional: the process of changing from one form to another

turbidity: a measure of water clarity (or cloudiness) as influenced by suspension of sediment or other materials, but most often soil particles (usually silt or clay)

vegetation type: a community or assemblage of plantscommonly found in association with each other

woody: referring to trees and shrubs

zooplankton: microscopic animals that float/swim in water

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