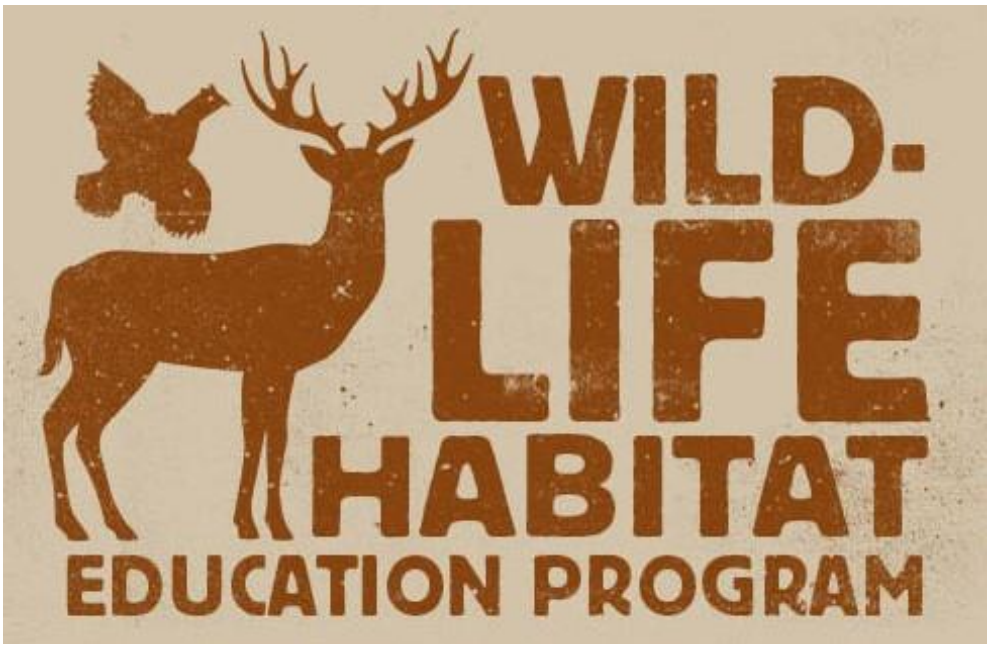
Alabama
Wildlife Habitat Education Program

State Manual & Study Guide



Alabama Cooperative Extension System *August 2017*

Jim Armstrong, Ph.D., Professor and Extension Wildlife Specialist, Auburn University
Emily Nichols, Extension Natural Resources and Environmental Education Specialist, Auburn University

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History of the National Wildlife Habitat Education Program

The Wildlife Habitat Education Program 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 undergone three major revisions (the latest in 2009), each incorporating 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.

Introduction

The Wildlife Habitat Education Program (WHEP) is designed to teach youth about the fundamentals of wildlife and fisheries science and management. The National WHEP Contest is open only to senior division 4-H and FFA members. Junior Division (ages 9-13) and Senior Division (ages 14-18) 4-H and FFA members are eligible to compete at county, regional, and state events. Natural resources management is learned through participation in the event and the associated educational programs. Additional benefits are the development of life skills and meeting other young people and professionals who have interests in natural resources.

About the State Manual

In this program, youth learn different perspectives of managing for wildlife such as habitat management and managing for populations. The information in this manual may be used to teach concepts of wildlife management and to prepare participants for natural resources competitive events. This guide is focused on increasing citizen knowledge and skills in the wildlife management field and their applications to everyday decision making and problem solving.

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. The **Concepts** and **Terms**, **Regions**, **Wildlife Species**, **Wildlife Management Practices**, and **Wildlife Management** sections of this manual provide basic information related to wildlife ecology and the life requirements of various wildlife species.

Wildlife managers must be able to inventory and evaluate the present condition of habitat and explain the condition to landowners and other interested individuals. Once the inventory is complete, a decision must be made as to which wildlife management practices should be applied to improve habitat for certain wildlife species. The **on-site management recommendation** activity provides experience with this decision-making process. Finally, the **written management plan** activities enable an explanation to illustrate decisions so others can understand and carry out recommendations. The manual is divided into the following major sections.

Wildlife Management Concepts & Terms introduces basic wildlife management principles. These concepts and terms are the basis for the remainder of the manual. Participants should be prepared to use the wildlife management concepts and terms in their written plan oral presentation as appropriate.

Regions identifies areas of the United States with distinctly different vegetation communities and wildlife species. This section gives a brief description of the vegetation and land use found in the regions, explains typical stage of plant succession, lists wildlife species that will be considered, and summarizes habitat wildlife management practices that can be used in each region. A chart identifying the major food items for each species in the region is also included.

Wildlife Species provides information about habitat requirements and wildlife management practices used for the various species.

Wildlife Management Practices explains each of the wildlife management practices discussed in the Wildlife Species section.

Aerial Photography explains how to evaluate wildlife habitat using aerial photographs. Examples on how to rank photographs and identify features are included.

Activities refers to the competitive component of WHEP and provides resources to help contestants and coaches prepare for a WHEP contest. This section also contains information on how the contest will be scored. All of the activities and scorecards that will be used for each region are provided. Practice/study tools are also provided, such as blank score sheets for the WMP's portion of the contest and a written management plan work sheet. Scoring the Contest explains the scoring procedure used for the contest.

Glossary and Appendix defines some of the technical words used in the manual and explains the various food categories included on the foods charts for each region.

How to Use the State Manual

Leaders and participants should first learn the concepts and terms. Then locate and mark materials pertinent for a particular region. Maps and region descriptions found in the Regions section should be used when making this decision. The wetlands and urban descriptions are applicable to all regions.

Determine which wildlife species will be used.
A list of recommended species accompanies each region. Many field guides and websites provide photos of the applicable wildlife species.

Locate and mark the selected species in the wildlife species section.
It is important to learn to identify species from different sources and be able to identify the male, female, adult, and juvenile of a species. Learning life history information about a species is critical to make appropriate management decisions.

Locate and mark the appropriate Wildlife Management Practices in the Wildlife Management Practices section.
For Junior Division participants, the possible management practices will be displayed on the score sheet and they will be instructed to circle the appropriate practices. For Senior Division participants, the score sheet will be blank and they will be instructed to mark the appropriate practices. Learning how various wildlife management practices affect wildlife species is critical. Not all wildlife management practices listed in the manual are used in every region.

Information from various portions of the manual may be incorporated in the general wildlife knowledge and wildlife identification test.
The general wildlife knowledge portion of the test may ask questions related to concepts and terms, wildlife management practices, wildlife food groups, aerial photos, and the species descriptions for species included in the region of the contest and the urban and wetlands regions. The wildlife identification component may include species included in the region of the contest, as well as urban and wetlands regions.

Preparing for State WHEP Contest

Participants should first read and understand the **concepts** and **terms** section of the manual. Leaders should explain the concepts and provide local examples to clarify any misunderstanding. This section is important because the activities require understanding of these concepts and terms. Students should use these terms and concepts in their presentations at the contest.

Once the concepts are understood, leaders should review the appropriate regional information with participants. Leaders have the flexibility to use any of the information about regions they feel is appropriate. Leaders and participants should review plant succession processes, common plants, wildlife species, and wildlife management practices. Specific information about habitat requirements and recommended wildlife management practices are found in the wildlife species section. Many teams/participants find it helpful to mark those species included in the region they are judging so the information is more easily found when studying. Some find making note/flash cards helpful. Whenever possible, participants should go to the field and find examples of the principles and practices found in these sections. Leaders should use quiz bowls and question/answer sessions to measure learning.

By following the above exercises, leaders can introduce participants to various activities. Conducting practice sessions using outdoor sites and aerial photographs are helpful. It is helpful to start with only one or two wildlife species and add more as participants become more knowledgeable. Aerial photographs (available online) should be evaluated and their features discussed and considered as to how they are important to wildlife. Habitat requirements available for the species selected should be identified as well as what features are missing. Collecting pictures of the species from several different sources will help with the identification portion of the test.

Videos, field guides, and other teaching materials may be used to further learning. State wildlife agencies, state Extension wildlife specialists, and county Extension offices have information regarding the availability of learning materials. Local and state events may use different wildlife species and activities from those recommended in the manual. However, in the state event, all contest content will come solely from the state manual.

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 a chartered Alabama 4-H Club that has experiential learning in regularly scheduled and planned meetings. Participation is limited to those members who are actively participating in the 4-H program and have been a member for a minimum of 90 days.

The Alabama 4-H Club year begins August 1 and ends 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 determine the divisions of 4-H membership.

Counties and clubs may bring as many individual competitors and teams as they choose for the junior and senior divisions as long as the teams are coached by different coaches and at different times and locations.

Note: An individual or team may win the State 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

The four-member team for each county or club may or may not be designated before the state event. Coaches will have the choice of determining who is on the official team from a club or a county or allowing scores to determine who is on the official team. If coaches choose to let the scores determine who is on the official team, they will be notified before the Written Management Plan event. It is the responsibility of the coach to notify the 4-H'ers.

Scores will be tabulated at the end of the first day. For undesignated teams, the top four overall scoring individuals from each county or club will be determined, and these four individuals will comprise the official team. The Written Management Plan team event will be conducted the second day with the official teams. Others may participate in this event; however, each county/club will have only one official team.

Code of Conduct

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

Day of Contest

1. All contestants must provide their own pen or pencil and clipboard.
2. No electronic devices of any kind are allowed at the contest site.
3. Absolutely no talking by contestants will be allowed during the contest, except when working on the designated team activity.
4. Anyone caught cheating may be disqualified at the discretion of the State WHEP Committee.
5. All adults, except contest officials, will be separated from contestants at all times while the contest is in progress.
6. Contestants will work independently on Activity I, II, III, and IV; Activity V is a team event.
7. Scorecards will be submitted to an official committee member immediately after each event.
    a. Official committee members will score the contest and analyze results. Their decision is final.
    b. The team score will be the sum of the three highest scores in Activities I, II, III, and IV, plus the team score for Activity V.
    c. After the event, individual and team score sheets may be made available to participants.
8. Distribution of awards is determined by the Alabama WHEP Committee. Junior and Senior Division 4-H and FFA participants will be recognized:
    a. Team: First, Second, and Third Places
    b. High Individual: First, Second, and Third Places
    c. All participants will receive participation ribbons.

Wildlife Management Concepts and Terms

Before you can evaluate wildlife habitat and make management recommendations, some basic concepts about habitat and how different wildlife species relate to habitat should be understood. In this section, some of the basic concepts are described. Since most of the contest will be based on these concepts, it is important you study and understand them.

Wildlife management is both an art and a science that deals with complex interactions in the environment. For the purposes of this program, a number of assumptions and simplifications have been made to make the materials more understandable. In actual management cases, trained, experienced professionals should assist you in making the proper decisions.
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.

Concepts and Terms

Communities and Ecosystems
Habitat Requirements
Focal Species
Species Richness and Diversity
Plant Succession and Its Effect on Wildlife
Vertical Structure
Arrangement and Interspersion
Edge Area Sensitive Species
Home Range, Movements and Migration
Carrying Capacity
Pond Dynamics and Balance
Stream Habitat
Food Webs

Communities and Ecosystems

A biotic (living) community includes all the plant and animal populations living in a defined area. The composition of a community changes over time in response to plant succession (see Plant Succession and Its Effect on Wildlife) and climate (rainfall and temperature). Communities interact with the nonliving, or abiotic, resources (soil, air, water, and sunlight). The biotic community and the abiotic environment form as a system, called an ecosystem. The size of the area involved when defining communities or ecosystems can vary. For example, there are populations of organisms associated with a decaying log or within an ephemeral pond that form communities. Likewise, this can be expanded to include all the communities associated with a forest.

Habitat Requirements

Habitat represents the physical and biological resources (food, cover, water, space) required by wildlife for survival and reproduction. Habitat requirements are species specific. That is, not all species require the same resources in the same

amount. Differences in habitat requirements among some species are subtle, while differences in habitat requirements among other species are dramatic. For example, habitat requirements for northern bobwhites and eastern cottontails are somewhat similar. They both require early successional cover, share some food resources, obtain water from plants, and require relatively little area when food and cover resources are abundant. However, habitat requirements for eastern gray squirrels and mourning dove are dramatically different as they use different vegetation types and foods and have different space requirements. It is important not to confuse habitat with habitat components. 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 early successional cover; but while bobwhites primarily eat various plants, seed, 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.

Another example is from white-tailed deer. Whitetails thrive in areas with considerable interspersion. Thus, habitat for white-tailed deer usually includes several vegetation (or cover) types. These vegetation types might include mature oak-hickory forest, old fields undergoing succession, regenerating pine forest, brushy thickets, and agricultural fields. Although some people may use the term *habitat type* interchangeably with *vegetation type,* this is confusing and should be avoided. Habitat requirements for wildlife often change through the year. Food and cover resources needed during one season may be much different from what is required or available during another. For example, wild turkey hens and their broods spend the night on the ground where there is adequate groundcover until the poults are able to fly. During summer, wild turkey broods use early successional areas with abundant forbs where they feed upon insects and are hidden from overhead predators. As young wild turkeys reach 2 to 3 weeks of age, they roost above ground. As mast becomes available in the fall, wild turkeys are frequently found in mature hardwood forests when available.

Focal Species

There are two basic goals in wildlife habitat management. One is to provide the habitat requirements for a particular, or focal, wildlife species. The other, which is explained later in this manual under Species Richness and Diversity, is to provide habitat requirements for multiple wildlife species in the same area. When evaluating habitat, you must first determine the focal species. Landowners or the general public may have specific objectives or concerns about a particular species. Once the species is decided, determine the habitat requirements for the focal species and evaluate the capability of the area to provide those requirements. If one or more habitat requirements is in short supply or lacking, then various habitat wildlife management practices may be used to improve the area's ability to supply the needed requirements. Occasionally, the focal species may be totally incompatible with the available habitat and management goals must be changed. It is usually best to select wildlife management practices that provide the habitat requirements most lacking and, thus, are limiting the population (limiting factors). For instance, if a species requires trees for cover with water nearby, and the area you 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. When determining which wildlife management practices to apply, remember that wildlife management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage an area for any one species or group of species that require similar habitat without influencing other species in some manner. For example, if you plan a clear-cut in a deciduous forest to benefit ruffed grouse, you may also benefit wild turkeys, white-tailed deer, and eastern cottontails. Species such as ovenbird, wood thrush, and eastern gray squirrel, which prefer unbroken mature deciduous forest, will be forced to use another area.

Species Richness and Diversity

A species is a type of organism whose members can freely interbreed with each other and are genetically very similar. Species richness refers to the number of different species present in an area. Species richness differs from diversity in that diversity involves the number of species present as well as the distribution and abundance of those species. One goal in wildlife management may be to provide habitat for as many different species as possible, as contrasted to managing for a maximum number of individuals within a

species. Generally, habitat requirements are provided for more wildlife species when a variety of vegetation types and successional stages are present.

Plant Succession and Its Effect on Wildlife

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 wind storms, lightning, and flooding, continually set back succession and the process starts over.

Succession occurs rapidly in areas with warm temperatures and abundant rainfall. For example, in the Eastern Deciduous Forest, grasses and forbs germinate from the seedbank after a field is disked. Within 20 years, without continued disturbance, trees will be growing on the site and a young forest will be established. In other areas where precipitation is considerably less, succession still occurs but more slowly. Also, the structural change in vegetation through succession is much less than where grasses and forbs give way to shrubs and tall trees. For example, in the Great Plains Shortgrass Prairie, a lack of precipitation may prevent succession from proceeding beyond perennial grasses and forbs. Thus, wildlife species found there do not require trees.

Plant succession is an important concept for wildlife managers because all wildlife species are associated with one or more successional stage. Some species such as wild turkey, white-tailed deer, and coyote may use several successional stages to meet various life requirements. Others, such as grasshopper sparrow, sage-grouse, and ovenbird may only be found in one or two successional stages. This highlights the need to manage a particular successional stage for some species, and highlights the importance of having a diversity of vegetation types and successional stages, if a diversity of wildlife species is a goal or consideration.

Although succession is set back through natural disturbance, many natural disturbance events have been altered by man. For example, levees have been built to prevent natural flooding, and great effort is expended to suppress and control fire. Also, extensive plantings of nonnative 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. Descriptions of a typical successional stage found in different regions of the United States can be found in the regions section of this manual. A description of the typical successional stage occurring in relation to water can be found in the wetland region description. Throughout this manual, successional stages have been numbered to help define plant communities and the structure they represent. In general, stages of plant succession that occur on land can be defined as:

Stage 1: Bare Ground

Stage 2: Annual grasses and forbs

Stage 3: Perennial grasses and forbs

Stage 4: Brushy cover, composed primarily of shrubs

Stage 5: Young forest

Stage 6: Mature forest

Although successional stages have been defined and numbered here for simplicity, successional stage sometimes can be difficult to distinguish. That is because succession is continual, and one successional stage gradually develops into the next. When using the designations above, consider the dominant plants in the area you are considering. 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. In general, 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), and a grassland has less than 5 square feet of basal area (very few, if any, trees).

When evaluating a woodland or savanna, do not worry about 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.

Vertical Structure

In a forest or woodland, there may be three distinct layers of vegetation. The understory is composed of those plants growing near the ground, up to 4.5 feet tall. The understory may be very diverse and include grasses, forbs, ferns, sedges, shrubs, and young trees. The midstory is represented primarily by shrubs and trees more than 4.5 feet tall, yet below the overhead canopy. The overstory is made up of those 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, some birds may require a herbaceous understory for feeding but nest in the overstory. The forest structure may vary dramatically from site to site, even within a given forest type. For example, one mature oak-hickory forest might 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.

Arrangement and Interspersion

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 (see the 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.

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. Managing areas of different successional stages within a landscape is called interspersion. Usually, more interspersion supports a greater diversity of wildlife. A way to estimate the amount of interspersion is explained in the activities section. However, as discussed in Edge, increased interspersion is not necessarily beneficial to all species. As interspersion increases, so does the amount of edge.

Edge

An edge is formed where two or more vegetation types or successional stages meet. Where a field meets a forest represents where two vegetation types meet. Where a young mixed-hardwood stand meets an older mixed hardwood stand represents where two successional stages meet.

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.

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 present provide some habitat requirement; the arrangement of the types or stages is suitable and within the home range (see home range) of the focal species (see arrangement and interspersion); or 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.

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, looking at an aerial photo and counting the number of times two vegetation types or successional stages meet is not necessarily 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, 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 the field 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 for quail and turkeys, 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 (see biological carrying capacity). The edge is not what is necessarily important, but rather the composition and structure of the vegetation.

Area Sensitive Species Fragmentation is the disruption of vegetation types either human-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 need large, unfragmented areas in a certain successional stage to provide some or all of their habitat requirements. Such species are referred to as area sensitive. 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. Some species, such as 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.

Home Range, Movements, and Migration

A home range is the area in which an animal lives. For every species, home range size is related to habitat quality. Daily movements include those for normal day-to-day activities. In higher quality habitat, home ranges tend to be smaller than in poor habitat because movements necessary to obtain habitat requirements are reduced. A seasonal home range can be defined if an animal uses a different area during different seasons. A seasonal movement, or migration, is made when an animal moves from one seasonal home range to another. Migration for many species, such as waterfowl and songbirds, involves movements to and from wintering and nesting areas, but this is not true for all species.

For example, elk and some species of grouse migrate from high elevations to lower elevations each spring and fall, as food availability varies with the seasons.

Migration distances may be short or very long, depending on the species. Long migrations require available habitat along the route. Thus, wildlife managers must consider this in landscape planning for various species. This means habitat conditions might have to be considered among countries, or even continents.

Carrying Capacity

There are only so many animals that can live in an area. The concept of carrying capacity is related to the number of animals that can exist in an area. Biological carrying capacity refers to the maximum number of animals, within a given species, an area can support before that species or another species is negatively affected. The quantity and quality of food, cover, water and space determines the carrying capacity. The requirement that is in shortest supply, called the limiting factor, determines carrying

capacity. By increasing the requirement in shortest supply, a manager can 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.

In suburban areas, the biological carrying capacity may be able to support a given number of animals. However, humans may demand the density of certain wildlife be lower because of wildlife damage issues.

For example, white-tailed deer populations can thrive in suburban areas where the biological carrying capacity is relatively high because deer have adapted to feed successfully on ornamental plants. However, homeowners have low tolerance for deer feeding on expensive landscape plants. Thus, the deer population must be reduced to limit damage. In this case, the cultural carrying capacity is lower than the biological carrying capacity.

Pond Dynamics, Pond Balance & Stream Habitat

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.

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.

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.

A stream can be defined as a body of water moving in a definite pattern and following the course of least resistance to a lower elevation. Because water volume and rate of land erosion fluctuate along the course of the stream, the bottom and shoreline 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 stream course. When water flow is restricted to a narrow area, the stream can create more erosion, resulting in deeper areas or pools. As the stream 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 streams. 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 stream. While some species can complete their life cycle within a small portion of the stream, other species, such as salmon, must migrate to the ocean and return to the stream to spawn.

Food Webs

A food web is a network of interconnected food chains, which are the systematic passage of material and energy (food) through an ecosystem. Plants are

primary producers in a good chain because they supply food at the lowest level of the food chain. It takes an enormous number of individual plants to support the other parts of a food web. At the next level of a food chain are primary consumers, plant-eating animals or herbivores.

Primary consumers include rabbits, mice, deer, and certain other mammals; some insects and fish; and dabbling ducks, geese, and certain other birds. Secondary consumers or carnivores (meat-eaters) eat primary consumers. This group includes predators such as birds of prey, snakes, foxes, wild cats, and people. Secondary consumers are eaten by tertiary consumers, which may be predators or scavengers such as turkey vultures, crabs, and sometimes people. Note these categories are very broad and general. Many animals fit into more than one group, and there are more complex levels of the web. An example of this is an omnivore, which is an animal that eats both plant and animal matter. Any of the food web components mentioned above can be broken down by decomposers—organisms such as bacteria and fungi that reduce dead plant or animal matter into smaller particles. A decaying plant, for example, will be broken down into nutrients that enrich the soil. This process supports the growth of more plants.

Regions

Areas of the country can be separated into regions having similar climate, vegetation, and wildlife. They are described in very general terms. The wetland and urban regions may be used in any of the regions where they occur.

At the end of each region's description is a list of wildlife species recommended to use when evaluating an area in that region. You can use any or all of the listed species as well as additional species when applicable. However, only those listed will be used in the Alabama event. Some of the species listed are considered a nuisance in some areas and circumstances. Contest organizers may exclude such species from local activities or center the activities on why the species are pests and what can be done to decrease problems.

Each region's description is followed by a table that identifies wildlife management practices for the species listed. Specific information on recommended wildlife management practices can be found in the wildlife species section. A food chart is also included that indicates major food items for the species listed.

Index to Alabama Regions

- Southeast Mixed & Outer Coastal Plain Forest
- Urban
- Wetlands

Southeast Mixed and Outer Coastal Plain Forest

Physical Description

This region's terrain varies from rolling hills to mostly flatlands. Marshes, lakes, and swamps are numerous along the coastal plain. The average annual precipitation ranges from 40 inches to 60 inches. Precipitation is received throughout the year. Summers are hot and winters are mild.

Dominant Vegetation

The final stage of succession usually consists of deciduous trees such as oaks, hickories, American beech, blackgum, red maple, redbay, Southern magnolia, laurel oak, American holly and winged elm. However, on upland sites where prescribed fire is still used, longleaf and/or shortleaf pine may be the principal overstory species. Fire suppression has decimated the longleaf pine community to a fraction of its former range throughout the region. Planted loblolly pine is widespread over much of the region, but without fire and judicious thinning, the value of loblolly plantings for wildlife is decreased. Gum and cypress are dominant on moist areas along the Atlantic and Gulf coasts and along major river drainages. Midstory trees throughout much of the region include dogwoods, American hornbeam,

redbud, sweetbay, titi, and shadbush. Native forbs and grasses commonly found in Stage 2 and Stage 3 include lespedezas, partridge pea, ragweed, pokeweed, bluestems, paspalums, wiregrass, povertygrass, and many others. Vines such as Virginia creeper, trumpet creeper, grapes, yellow jessamine, and greenbriar are common. Shrubs include sumacs, viburnums, elderberry, wild plum, blueberry, blackberry, hawthorns, and wax myrtle.

Farming and Ranching

Many wetlands along major rivers have been drained and forests cleared to grow crops such as cotton, tobacco, soybeans, corn, and other grain crops. Large areas of forests have also been cleared and planted to nonnative grasses and legumes as forage for livestock. Unfortunately, most of these are not beneficial for wildlife.

Plant Succession Stage

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

Species Recommended for Judging

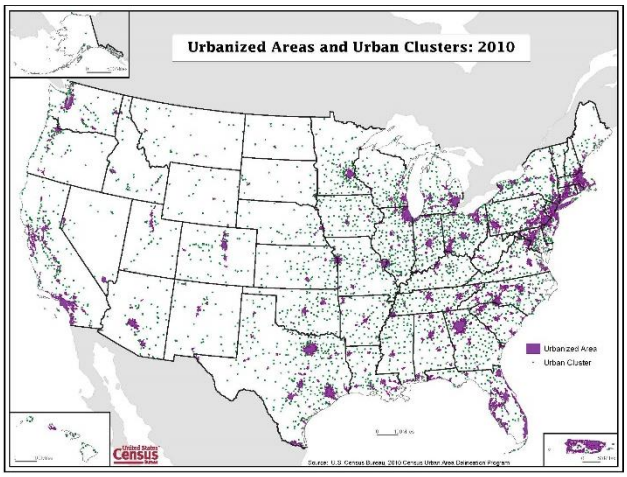
American kestrel
black bear
bluegill
coyote
Eastern bluebird
Eastern cottontail
Eastern gray squirrel
great horned owl
hairy woodpecker
largemouth bass
mallard
mourning dove
Northern bobwhite
prothonotary warbler
Northern raccoon
red-eyed vireo
white-tailed deer
wild turkey
wood duck

Southeast Mixed & Outer Coastal Plain Forest Food Groups Table

	American kestrel	black bear	bluegill	coyote	Eastern bluebird	Eastern cottontail	Eastern gray squirrel	great horned owl	hairy woodpecker	largemouth bass	mallard	mourning dove	Northern bobwhite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild turkey	wood duck
Aquatic Plant											X								X
Bark						X	X												
Birds	X			X				X		X				X					
Buds		X				X	X						X				X	X	
Carrion		X		X										X					
Crayfish		X	X							X	X			X					
Earthworms			X							X				X					
Eggs			X	X			X							X					
Fish		X	X							X				X					
Forbs		X				X							X				X	X	X
Frogs & Salamanders			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	
Hard mast		X					X		X				X	X			X	X	X
Insects & Spiders	X	X	X	X	X		X	X	X	X	X		X	X	X	X		X	X
Leaves & Twigs		X				X	X										X	X	
Lizards				X				X						X					
Mammals	X	X		X				X						X					
Mussels														X					
Seeds		X					X		X		X	X	X	X				X	X
Snails											X	X	X	X	X			X	X
Snakes								X		X				X					
Soft Mast		X		X	X	X	X		X				X	X	X	X	X	X	X
Tubers														X				X	

Southeast Mixed & Outer Coastal Plain Forest Wildlife Management Practices Table	American kestrel	black bear	bluegill	coyote	Eastern bluebird	Eastern cottontail	Eastern gray squirrel	great horned owl	hairy woodpecker	largemouth bass	mallard	mourning dove	Northern bobwhite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild turkey	wood duck
Control Nonnative Invasive Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Decrease Harvest		X	X	X		X	X			X			X	X			X	X	
Delay Crop Harvest																	X		
Establish Field Buffers	X			X	X	X		X					X	X			X	X	
Establish Native Grasses and Forbs	X			X	X	X		X				X	X				X	X	
Fish or Wildlife Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Forest Management Techniques	X	X		X	X		X	X					X	X	X	X	X	X	X
Increase Harvest		X	X	X		X	X			X				X			X	X	
Leave Grain Unharvested		X				X	X				X	X	X	X			X	X	X
Manipulate Succession	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
Nesting Structures	X				X						X				X				X
Plant/Manage Food Plots		X				X	X				X	X	X	X			X	X	X
Plant Shrubs	X	X		X	X	X	X	X	X			X	X	X			X	X	X
Plant Trees	X	X			X		X	X	X			X	X	X	X	X	X	X	X
Ponds: Construction / Reconstruction			X							X									
Ponds: Deepen Edges			X							X									
Ponds: Fertilize / Lime			X							X									
Ponds: Reduce Turbidity			X							X									
Ponds: Repair Spillway			X							X									
Ponds: Restock			X							X									
Create Snags	X				X			X	X					X					X
Tillage Management	X	X				X	X	X			X	X	X	X			X	X	X
Water Control Structures			X							X	X			X					X
Water Developments for Wildlife											X	X		X	X		X	X	X
Wildlife Damage Management		X		X		X	X	X	X					X			X	X	

Urban



Physical Description

According to the U.S. Census Bureau in 2010, 80 percent of the American population lived in or near an urban area. The Census Bureau defines an urban area as either an "urbanized area" or large central place with a total population of at least 50,000; or an "urban cluster" or large central place with a total population of at least 2,500 people but less than 50,000. In addition to a sizable human population, urban areas are characterized by residential and commercial development connected and crisscrossed by infrastructure such as roads, train tracks, and utilities. Areas such as neighborhood parks offer the best example of contiguous wildlife habitat within an urban environment.

Dominant Vegetation

Because urban areas are found in all regions of the United States, it is difficult to identify dominant vegetation common across all regions. However, urban regions 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 as it is a native species. Additionally, vegetated areas are typically manipulated in a landscaped manner versus "letting nature take over" as in rural areas. Interspersion is an important concept to understand in urban areas because of the fragmented landscape from residential and commercial development.

Considerations for Urban Wildlife Management Practices

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). If you care about small wildlife, **keep your cat indoors!** While there are several active management practices that can be implemented such as artificial feeders, mowing, planting flowers, and rooftop/balcony gardens, there are also some common-sense considerations that should always be given. For example, 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.

Farming and Ranching

Many wetlands along major rivers have been drained and forests cleared to grow crops such as cotton, tobacco, soybeans, corn, and other grain crops. Large areas of forests have also been cleared and planted to nonnative grasses and legumes as forage for livestock. Unfortunately, most of these are not beneficial for wildlife.

Plant Succession Stage

Stage 1: Bare ground
Stage 2: Annual
Stage 3: Perennial grasses and forbs
Stage 4: Shrubs
Stage 5: Young forest
Stage 6: Mature forest

Species Recommended for Judging

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

Urban areas can provide habitat features that many species need such as roosting, nesting, and foraging sites.

Urban Food Groups Table

	American robin	big brown bat	Eastern bluebird	butterfly	common nighthawk	Eastern cottontail	Eastern gray squirrel	European starling	frog	house finch	house sparrow	house wren	hummingbird	Northern flicker	Northern raccoon	rock dove	song sparrow
Bark						X	X										
Birds															X		
Buds						X	X			X	X						
Carrion															X		
Crayfish									X						X		
Earthworms	X							X	X		X	X			X		
Eggs									X						X		
Fish															X		
Forbs				X		X											
Frogs & 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 & 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		

Urban Wildlife Management Practices Table	American robin	big brown bat	Eastern bluebird	butterfly	common nighthawk	Eastern cottontail	Eastern gray squirrel	European starling	frog	house finch	house sparrow	house wren	hummingbird	Northern flicker	Northern raccoon	rock dove	song sparrow
Control Nonnative Invasive Vegetation	X	X	X	X	X	X	X		X	X		X	X	X	X		X
Establish Native Grasses and Forbs			X	X		X			X	X							X
Fish or Wildlife Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nesting Structures	X	X	X				X					X					
Plant Shrubs	X		X	X		X	X			X		X	X	X	X		X
Plant Trees	X	X	X	X			X			X		X	X	X	X		
Steams: Dams, Boulders, or Logs									X								
Water Control Structures									X						X		
Water Developments for Wildlife		X		X					X						X		X
Wildlife Damage Management		X				X	X	X			X			X	X	X	
Artificial Feeders				X			X			X			X	X			
Mowing	X		X		X	X				X				X			
Plant Flowers				X									X				
Rooftop / Balcony Gardens				X									X				

Wetlands

Physical Description

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, human-made ponds, small lakes, marshes, rivers, streams, and swamps. They are found in all of the previously mentioned regions.

Dominant Vegetation

To describe wetland vegetation, aquatic vegetation must be distinguished from upland vegetation. 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).

Wetlands with deep, permanent water typically have less emergent (above the water surface) aquatic vegetation and more floating or submerged (below the water surface) aquatic vegetation. As the water depth decreases, emergent aquatic vegetation becomes more dominant. Less vegetation is found on rock and gravel bottoms than on bottoms that are more characteristic of soil such as the presence of silt, clay, and organic (dead plants and animals that are decomposed) matter. Emergent aquatic vegetation includes trees, shrubs, grasses, and grass-like plants.

Examples of 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.

The amount of open water and vegetation is important in determining how suitable the wetland is for different wildlife species. For instance, young ducks need open water and emergent vegetation for hiding. Floating and submerged vegetation supports large amounts of food high in protein such as snails, mollusks, and crustaceans that young ducks need for fast growth.

Emergent vegetation may supply nesting areas such as trees for wood ducks, grass for mallards, and cattails for red-winged blackbirds and muskrats. Wetlands with stable, nonflowing 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 amount of open water and vegetation is important in determining how suitable the wetland is for different wildlife species. For instance, young ducks need open water and emergent vegetation for hiding. Floating and submerged vegetation supports large amounts of food high in protein such as snails, mollusks, and crustaceans that young ducks need for fast growth.

Plant Succession Stage

Stage 1: Deep water with little vegetation
Stage 2: Shallow water dominated by submerged and floating aquatic vegetation
Stage 3: Very shallow water or wet ground dominated by any variety of emergent aquatic vegetation
Stage 4: Ground becomes drier and upland vegetation similar to the surrounding area becomes dominant

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. Management of water levels is an important tool in managing wetlands for wildlife habitat. The succession process described above is often not applicable to wetlands with constantly moving water such as rivers, streams, and tidal areas.

Species Recommended for Judging

American beaver
bluegill
bullfrog
Canada goose
largemouth bass
mallard
mink
common muskrat
Northern raccoon
redhead
red-winged blackbird
wood duck

Wetlands Food Groups Table

	American beaver	bluegill	bullfrog	Canada goose	common muskrat	largemouth bass	mallard	mink	Northern raccoon	redhead	red-winged blackbird	wood duck
Aquatic Plant	X		X	X	X		X			X		X
Bark	X											
Birds						X		X	X			
Buds	X											
Carrion									X			
Crayfish		X	X			X		X	X			
Earthworms		X	X			X		X	X			
Eggs		X	X					X	X			
Fish		X	X			X		X	X			
Forbs	X			X	X							X
Frogs/Salamanders		X	X			X		X	X			
Grain				X			X		X		X	X
Grass				X								
Hard mast							X		X			X
Insects and Spiders		X	X	X		X	X		X	X	X	X
Leaves & Twigs	X											
Lizards								X	X			
Mammals						X		X	X			
Mussels								X	X	X		
Seeds				X			X		X	X	X	X
Snails				X			X		X			X
Snakes						X		X	X			
Soft Mast									X		X	X
Tubers					X				X			
Turtles						X						

Wetlands Wildlife Management Practices Table	American beaver	bluegill	bullfrog	Canada goose	common muskrat	largemouth bass	mallard	mink	Northern raccoon	redhead	red-winged blackbird	wood duck
Control Nonnative Invasive Vegetation	X	X	X	X	X	X	X	X	X	X	X	X
Decrease Harvest	X	X	X		X	X		X	X			
Delay Crop Harvest							X					
Establish Native Grasses and Forbs				X			X					
Fish or Wildlife Survey	X	X	X	X	X	X	X	X	X	X	X	X
Forest Management Techniques									X			X
Increase Harvest	X	X	X		X	X		X	X			
Leave Grain Unharvested				X			X		X			X
Manipulate Succession	X			X	X		X	X	X	X	X	X
Nesting Structures				X			X					X
Plant Shrubs	X								X		X	X
Plant Trees	X								X		X	X
Ponds: Construction / Reconstruction		X				X						
Ponds: Deepen Edges		X				X						
Ponds: Fertilize / Lime		X				X						
Ponds: Reduce Turbidity		X				X						
Ponds: Repair Spillway		X	X			X						
Ponds: Restock		X				X						
Create Snags									X			X
Water Control Structures	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
Wildlife Damage Management	X			X	X				X		X	

Wildlife Species

This chapter contains information on species featured in each of the sixteen regions. There are three sections: birds, mammals, and other species. Species are listed alphabetically in each section. Each species has specific information on habitat requirements, including diet, water, and cover. Key wildlife management practices used in some regions also are discussed. Wildlife management practices for species vary from region to region, and not all the wildlife management practices listed for a species will be applicable in all regions. Refer to charts within a particular region to determine which practices and foods are appropriate for that region.

The species descriptions contain all the information you need about a particular species for the WHEP contest. However, additional reading and research can add depth to your understanding and help you give detail to your plans and oral presentations. Field guides to North American birds and mammals are good sources for information and pictures of the species listed. There also are many good websites available for further study.

The information in this section is the basis for the test at the National Invitational. It is critical that participants have the background that mastery of this section will provide. Without knowing specific details of each of the featured species, it will be difficult, if not impossible, to succeed in the other portions of the test.

Note: While fish or wildlife surveys are always important for every species, they should not be recommended if it is stated or the field condition sheet indicates a survey has recently been completed. Refer to Fish or Wildlife Survey for more information.

Another point to consider is the impact nonnative invasive plants can have on our native wildlife populations. While not listed under the species descriptions, controlling nonnative invasive vegetation should be an important consideration for all species in all regions. Refer to Controlling Nonnative Invasive Vegetation for more information.

Birds	Mammals	Other Species
American kestrel	American beaver	bluegill
American robin	big brown bat	box turtle
blue-winged teal	black bear	bullfrog
broad-winged hawk	bobcat	butterfly
brown thrasher	common muskrat	frog
Canada goose	coyote	largemouth bass
common nighthawk	Eastern cottontail	rainbow trout
dickcissel	Eastern fox squirrel	
Eastern bluebird	Eastern gray squirrel	
European starling	mink	
grasshopper sparrow	Northern raccoon	
great horned owl	white-tailed deer	
hairy woodpecker		
house finch		
house sparrow		
house wren		
hummingbird		
mallard		
mourning dove		
Northern bobwhite		
Northern flicker		
Northern harrier		
ovenbird		
prothonotary warbler		
red-eyed vireo		
redhead		
red-tailed hawk		
red-winged blackbird		
rock dove		
ruffed grouse		
song sparrow		
white-winged dove		
wild turkey		
wood duck		
yellow-rumped warbler		

Birds

American kestrel

General information

American kestrels are found year-round throughout the United States. Kestrels use Stages 2 and 3 for feeding, and Stages 4, 5, and 6 for roosting and nesting. Kestrels use both natural and artificial cavities for nesting. They eat small mammals, other birds, and insects.

Habitat requirements

Diet: primarily insects and small mammals associated with open areas
Water: obtain necessary water from diet and do not need water for drinking
Cover: nest in tree cavities and other sites including holes in cliffs, canyon walls, and artificial nestboxes

Wildlife management practices

Create Snags: for perches, nest cavities, and a food source (insects)
Establish Field Buffers: to increase cover for prey around row crop fields
Establish Native Grasses and Forbs: where necessary to provide increased early successional habitat for prey; Stages 2 and 3 should be interspersed with Stages 5 and 6
Forest Management Techniques:
Forest regeneration will provide open areas for hunting for a couple of years
Manipulate Succession: prescribed fire, chaining, and herbicide applications are recommended to maintain Stage 4 and stimulate Stages 2 and 3; grazing management should leave enough herbaceous canopy to support insects and small rodents; grazing management should maintain trees in riparian areas
Nesting Structures: where adequate nesting cavities are lacking; boxes can be placed on fence posts in open areas
Plant Shrubs: in large open areas on idle lands for cover for hunting prey
Plant Trees: for future perching sites and cavities for nesting.
Tillage Management: will facilitate hunting prey when waste grain is available

American robin

General information

American robins use a wide assortment of vegetation types, from mowed grassy areas to forested areas. In urban areas, robins use large open areas and nearby trees and shrubs. Parks, golf courses, and lawns in residential areas are attractive to robins. They are found throughout North America, though they may migrate out of northern latitudes during winters with sustained cold and snow. Robins build a nest of grass and mud on a tree or shrub limb, but will occasionally nest on building ledges. Robins spend considerable time on the ground feeding on earthworms, but also will perch on branches to eat berries, fruit, and insects.

Habitat requirements

Diet: insects and worms in warm seasons; soft mast from shrubs and trees in winter; seldom use artificial feeders
Water: require water daily in warm seasons; obtain water from low-lying areas, ponds, even yard irrigation 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

Manipulate Succession: prescribed fire, disking, grazing, and mowing can be used to set back succession and improve structure for robins
Mowing: can be used to maintain suitable structure for robins in urban areas
Plant Shrubs: for soft mast; examples might include dogwoods, hollies, golden currant, and winterberry
Plant Trees: both deciduous and evergreen; where nesting sites may be limiting
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; cats should be removed.

Blue-winged teal

General information

Blue-winged teal prefer calm water in association with ephemeral wetlands, inland marshes, lakes, and ponds. They inhabit shorelines more than open water and primarily nest within a few hundred feet of wetlands in the prairie pothole region of the Northern Great Plains. Nests are found primarily in dense grassland cover. Hayfields will sometimes be used for nesting, assuming adequate grass stubble remains. Blue-winged teal are surface feeders and prefer to feed on mud flats or shallow water where floating and shallowly submerged vegetation is available, along with abundant small aquatic animal life. Shallow wetlands with both emergent vegetation and open water are required for brood habitat. During spring and fall migration, shallow wetlands and flooded fields are used for loafing and feeding. These ducks are the first in North America to begin fall migration on their way to Central and South America.

Habitat requirements

Diet: aquatic vegetation, seeds, and aquatic insects; feeding primarily confined to wetlands
Water: relatively shallow wetlands required for brood rearing, feeding, and loafing
Cover: dense native grass cover used for nesting; brood habitat consists of a mix of open water and emergent vegetation

Wildlife management practices

Establish Native Grasses and Forbs: for nesting cover where suitable cover is lacking
Leave Grain Unharvested: can be beneficial if flooded
Manipulate Succession: prescribed fire, disking, and herbicide applications can be used to keep wetlands and associated upland nestinghabitat in the desired structure; grazing management should prevent livestock access to nesting vegetation adjacent to wetlands
Plant/Manage Food Plots: planting native wetland food plants and some agricultural crops can provide additional food resources during migration and winter if the area is shallowly flooded when the ducks arrive
Tillage Management: delaying cropland tillage in spring may allow nesting in standing stubble
Water Control Structures: allow managers to manipulate water levels to enhance habitat
Water Developments for Wildlife: flooded fields provide important areas for teal during migration; constructing small dikes for temporary flooding provides shallow sheet water teal prefer for feeding and loafing

Broad-winged hawk

General information

Broad-winged hawks use Stages 5 and 6 of mixed upland hardwood forest (oaks, hickories, maples, beech) and mixed coniferous hardwoods.
Broad-winged hawks are normally solitary and inconspicuous. They hunt within the forest near small openings in the canopy.

Habitat requirements

Diet: rodents and other small mammals (such as mice, chipmunks, squirrels, shrews, moles) but also snakes, frogs, lizards, caterpillars, grasshoppers, beetles, crickets, crawdads, and some small birds
Water: obtain necessary water from diet
Cover: nest among tall trees in Stage 6 with openings and water nearby; will sometimes nest in old crow, hawk, or squirrel nests; they hunt throughout the forest, especially where small canopy gaps occur

Wildlife management practices

Forest Management: timber stand improvement should encourage understory development and enhance habitat for a variety of prey species
Manipulate Succession: grazing management should exclude cattle from forested areas to retain an understory that provides cover for a variety of small prey mammals
Plant Shrubs: in areas where tree cover is lacking such as large open fields
Plant Trees: to provide nest sites
Water Developments for Wildlife: will enhance habitat for a variety of prey species

Brown thrasher

General information

Brown thrashers occur in the eastern two-thirds of the country. They require Stages 3 and 4 and are normally found in shrub thickets, hedgerows, shelterbelts, young forests, forest edges, and brushy riparian areas. Brown thrashers forage primarily on the ground, using their beaks to turn over leaves and debris looking for food. More food is available when there is substantial ground litter (leaves and debris). Nests are usually found in bushes or small trees 1 foot to 10 feet above the ground.

Habitat requirements

Diet: invertebrates and plant seeds are main items in diet, but soft and hard mast are also eaten

Water: water requirements are not known

Cover: dense shrubs interspersed with some trees are used for nesting and escape cover; will use areas that have only shrubs; need a minimum of 2.5 acres of suitable habitat to support a breeding population

Wildlife management practices

Forest Management: forest regeneration will improve vegetation structure for nesting and foraging and stimulate additional Stage 4; timber stand improvement in Stages 5 and 6 can improve habitat by stimulating understory development

Manipulate Succession: prescribed fire, chaining, and/or herbicide applications can be used to maintain and rejuvenate Stage 4 when habitat quality begins to decline; grazing management should exclude livestock from riparian areas and other woody areas to allow shrubs and trees to regenerate

Plant Shrubs: to promote Stage 4 and create additional cover for nesting/foraging

Canada goose

General information

The breeding range of the Canada goose extends across the northern half of the United States across Canada and Alaska. Although an increasing number of Canada geese choose to winter in Canada, the majority fly south to southern areas of the United States and Mexico. Many southern areas of the United States have year-round resident populations of Canada geese. Canada geese nest and rear young in or near Stage 2 wetlands interspersed with some Stage 3 wetlands. Riparian areas and wetlands containing 20 percent tall emergent aquatic vegetation and 80 percent open water are usually preferred areas for Canada geese.

Habitat requirements

Diet: variety of forbs and grasses, grains, and some aquatic insects

Water: relatively open water wetlands, ponds, and lakes are used for brood rearing, feeding and loafing

Cover: nest in a 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

Wildlife management practices

Establish Native Grasses and Forbs: where forage for geese is lacking

Manipulate Succession: prescribed fire sets back succession in cattail-choked wetlands and stimulates lush green vegetation in uplands where geese may feed; grazing management can maintain lush vegetation for feeding

Nesting Structures: in some areas or regions, elevated artificial nesting platforms may be established, preferably on islands and/or peninsulas surrounded by open water, to help increase nesting success

Water Control Structures: can be used to manipulate water levels and 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

Common nighthawk

General information

Common nighthawks use bare ground (Stage 1) for nesting, while Stages 2 and 3 are used for foraging. Common nighthawks are found throughout the United States during the breeding season, but migrate to South America during winter. Common nighthawks are common visitors to grasslands, open woodlands, cities, and towns. In cities and towns, they are often seen flying over city parks and other open areas in late evening and early morning. Common nighthawks nest on the ground on gravel and bare soil areas common in fields or on rooftops. They are nocturnal and feed "on-the-wing" on flying insects.

Habitat requirements

Diet: flying insects, including flying ants, mosquitoes, moths, and June bugs

Water: obtain ample water from diet, but water sources attract insects, which provide food for nighthawks

Cover: riparian areas, ridge tops, flat rooftops, and other places with numerous sand and gravel areas are favorite nesting locations

Wildlife management practices

Manipulate Succession: prescribed fire, disking, and mowing can maintain early succession to forage for insects; disking and herbicide treatment can encourage bare areas for nesting; leave areas with no vegetation for nesting

Mowing: can be used to maintain open areas in urban environments

Dickcissel

General information

Dickcissels occur primarily in native grasslands and savannah in the central one-third of the United States Stages 2, 3, and 4 are used by dickcissels for nesting. Dickcissels use agricultural areas heavily during winter in Central America.

Habitat requirements

Diet: insects and grass seeds are eaten year-round; agricultural crops are eaten more during migration and on wintering grounds

Water: water obtained from food

Cover: early successional habitat with a mixture of grasses and forbs; grain fields frequented during winter

Wildlife management practices

Delay Crop Harvest: delayed hay harvest in areas with insufficient native grassland will allow nests to hatch and hatchlings to leave nests before harvest

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: where early successional habitat is limiting; forb component is important

Leave Grain Unharvested: will provide additional food during migration

Manipulate Succession: prescribed fire and herbicide applications should be used to manage early successional habitat

Tillage Management: may provide additional food during migration

Eastern bluebird

General information

Bluebirds are found in early successional habitat (Stages 2 and 3) interspersed with woods and shrubs (Stages 4, 5, and 6), which are used for perching and nesting (where cavities are available). Large open areas without interspersion of hedgerows, fencerows, and woodlots may not receive as much use by bluebirds as those areas with more structural diversity. Bluebirds forage in open areas, but typically near trees, shrubs or a fence that provide perches.

Habitat requirements

Diet: insects, spiders, and small amounts of soft mast

Water: ***Water:*** obtain necessary water from diet but may use other water sources when available

Cover: ***Cover:*** nest in cavities of trees and fence posts; old woodpecker cavities are especially important; readily nest in nesting boxes, which have had a major impact in restoring bluebird populations in some areas.

Wildlife management practices

Create Snags: to provide potential nest sites and perching sites in open areas

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: when less than 75 percent of the area is composed of Stages 2 or 3

Forest Management Techniques: in large areas of Stage 6 where regeneration is needed, forest regeneration will create foraging habitat 1 year to 3 years postharvest; retaining some mature trees and snags may provide cavities for bluebirds

Manipulate Succession: prescribed fire, disking, herbicide application, mowing, chaining, and roller beating can be used to maintain and rejuvenate areas of Stages 2 through 4 when habitat quality begins to decline; grazing management should prevent livestock from damaging trees and shrubs planted to benefit bluebirds

Mowing: can be used to maintain open areas in urban environments

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 Shrubs: where needed to provide perches; hedgerows may be established across open fields larger than four acres

Plant Trees: to create potential nest sites where young trees are lacking

European starling

General information

European starlings are found throughout N. America. They were introduced to the United States from Europe and are considered pests. They commonly cause damage to crops and in urban areas. They exclude native species from cavities and deplete food resources for native wildlife. Consequently, wildlife damage management is necessary to reduce populations and exclude them from areas where they are causing damage. They prefer older suburban and urban residential areas with large trees and shrubs interspersed with open areas but are also abundant in agricultural areas. Starlings are cavity nesters and nest in large trees or old buildings. Starlings feed on the ground and eat a variety of insects, seeds, grain, and soft mast.

Habitat requirements

Diet: insects, soft mast, seeds, earthworms, grain, human garbage, and even dog and cat food

Water: require water during warm seasons

Cover: nest in tree cavities, old buildings

Wildlife management practices

Habitat management: to attract or benefit starlings should not occur in any situation.

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

Grasshopper sparrow

General information

In the grasslands of the Great Plains, the grasshopper sparrow prefers open grasslands with some shrubs (Stage 4) and bare ground (Stage 1) interspersed throughout the area. Areas with greater than 35 percent shrubby cover constitute poor habitat for grasshopper sparrows. Native bunchgrasses are important for nesting structure.

Habitat requirements

Diet: primarily insects and seeds, but diet shifts dramatically through the year; in spring and summer (breeding season), grasshopper sparrows rely heavily on insects, comprising 60 percent of the diet; not surprisingly, given the bird's name, grasshoppers can account for 30 percent to 40 percent of the diet during this time; during fall and winter, diet shifts to 70 percent seeds.

Water: water requirements are unknown but probably obtained through diet

Cover: Stage 3 for escape and nesting cover; nest on the ground, usually in overhanging native warm-season grasses

Wildlife management practices

Delay Crop Harvest: delay mowing/harvesting hay in spring to ensure successful nesting

Establish Native Grasses and Forbs: where quality nesting habitat is limited

Manipulate Succession: prescribed fire can enhance habitat by rejuvenating grasslands, controlling shrubs, and creating patches of bare ground; grazing management is crucial to protect grassland habitat from livestock

Great horned owl

General information

The great horned owl is found throughout North America in a wide variety of vegetation types including open Stage 6, interspersed with areas of Stages 2, 3, and 4, including orchards, farm woodlots, and city parks. They also are occasionally found in rocky canyons away from forest cover. The great horned owl is nocturnal and roosts during the day in trees or on sheltered rocky ledges.

Habitat requirements

Diet: great horned owls forage at night; diet is extremely varied but commonly includes small- to medium-sized

mammals such as rabbits, skunks, and squirrels as well as reptiles, amphibians, large insects, and fish

Water: water obtained from diet

Cover: nest in abandoned nests of hawks, crows or herons, and in large tree cavities, crotches, stumps, caves, and ledges

Wildlife management practices

Create Snags: where perching sites are limited

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: when less than 25 percent of the area is comprised of early successional habitat (Stages 2 through 4)

Forest Management Techniques: forest regeneration in large areas of Stage 6 may provide additional cover for a variety of prey species; timber stand improvement will encourage understory development and enhance habitat for a variety of prey species

Manipulate Succession: mowing, chaining, roller beating, controlled burning, disking, herbicide application, and grazing should be used to maintain and rejuvenate areas of Stages 2 through 4 when habitat quality begins to decline for a number of prey species

Plant Shrubs: where needed to enhance habitat for rabbits and other prey

Plant Trees: where perching sites are limited and where nesting cover does not exist

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

Wildlife Damage Management: may be necessary where an owl is killing poultry

Hairy woodpecker

General information

Stages 4, 5, and 6 provide primary habitat for hairy woodpeckers. They forage on a variety of places such as tree trunks, stumps, snags, downed logs and the ground. Where adequate cover exists, food is usually not a limiting factor. They will forage in Stage 3 if areas with mature trees are nearby. They readily use wooded urban and riparian areas.

Habitat requirements

Diet: insects such as ants, beetle larvae, caterpillars, and adult beetles; diet is supplemented with hard and soft mast

Water: obtained from diet

Cover: cavity nesters; holes are excavated in mature and dying trees and snags; management efforts should focus on maintaining or creating areas with large mature and dying trees, especially in open areas; within wooded areas, at least one large snag per acre should be available

Wildlife management practices

Create Snags: for a food source and potential nest cavities

Manipulate Succession: grazing management should maintain trees in riparian areas; grazing when woody vegetation is not growing rapidly (fall and winter) usually does less damage to woody vegetation than at other times of the year

Plant Shrubs: to establish corridors across large open areas

Plant Trees: especially softwood deciduous trees where trees are lacking for potential nesting cavities

Wildlife Damage Management: when woodpeckers are causing damage to wooden structures

House finch

General information

House finches are native to the western United States, but are an introduced species in the eastern United States. Their current range is the entire United States. They are found in a wide variety of urban, suburban, and agricultural areas that have trees (Stages 5 and 6), shrubs (Stage 4), and some open areas (Stages 2 and 3). They are also found in canyons and semi-arid regions in the western part of the country. House finches nest in a variety of raised locations and make a nest from weed stems, small branches and leaves. Finches eat a variety of seeds, soft mast, and buds from both the ground and in trees.

Habitat requirements

Diet: soft mast, buds, and weed seeds; in the warm season, house finches eat some insects

Water: free-standing water is needed daily in the warm season

Cover: nest 5 feet to 7 feet above the ground on low branches of trees, branches of bushes, in natural cavities, old holes excavated by woodpeckers, and any projection or ledge they can find on houses and buildings

Wildlife management practices

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

Establish Native Grasses and Forbs: to provide forb seed in rural areas where early successional habitat is limited
Manipulation of Succession: mowing (suburban areas) and prescribed fire (rural areas) can maintain Stages 2 and 3
Mowing: can be used to maintain open areas in urban environments
Plant Shrubs: adjacent to open areas for nesting and hiding cover
Plant Trees: in areas where trees are lacking nesting cover
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

House sparrow

General information

House sparrows are found throughout the United States. They are an introduced species from England (they are also called English sparrows) and are found in throughout urban areas. House sparrows are also very common in and around agricultural buildings. They are usually a nuisance, and management objectives are often needed to reduce the quality and quantity of available habitat. Wildlife damage management is often needed and commonly implemented. House sparrows are cavity nesters and will frequently occupy buildings and houses to nest within the eaves or other areas with a cavity or opening. House sparrows feed on the ground and above the ground in woody vegetation for seeds, insects, and soft mast. House sparrows outcompete bluebirds for cavity nesting space and compete with several other native birds for food and space.

Habitat requirements

Diet: variety of insects, soft mast, buds, forbs, weed seeds, and waste grain
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 the ground, and 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 will most likely be necessary in almost all situations, especially in suburban/urban and agricultural areas. Habitat management to attract house sparrows should never occur.
Wildlife Damage Management: trapand 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

House wren

General information

House wrens are found throughout the United States during the breeding season, and migrate to the deep southern
United States during winter months. In urban settings, house wrens prefer older residential areas with large shrubs (Stage 4) and trees (Stages 5 and 6). Wrens also use forested (Stages 5 and 6) and open areas (Stages 2 and 3) at higher elevations, as well as stands of aspen (Stages 5 and 6). House wrens nest in a variety of elevated cavities, as high as 30 feet above the ground. They forage both on the ground and above the ground.

Habitat requirements

Diet: spiders, grasshoppers, crickets, beetles, caterpillars, ants, bees, ticks, earthworms, and millipedes; artificial feeders are usually not used
Water: necessary water is obtained from the diet
Cover: nest in natural cavities in trees old buildings and other structures

Wildlife management practices

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 small to keep out house sparrows, starlings, and other birds; for specifics on nest box design and placement, visit your local Extension office
Plant Shrubs: where lacking for cover while feeding and for nesting
Plant Trees: where trees are lacking for cover and nesting

Hummingbird

General information

There are 18 species of hummingbirds found in North America. Other than a couple of exceptions, hummingbirds migrate into Central and South America during the winter months. Hummingbirds are found in Stages 2 through 6 rich in flowering plants. In urban

settings, they prefer areas with large trees and nearby flowering plants. A hummingbird's nest is a small cup built of lichens and other vegetation. Hummingbirds require high energy foods. Nectar is high in sugars that supply needed energy. Insects are an important source of protein.

Habitat requirements

Diet: nectar from flowers and insects found on flowers
Water: necessary water obtained from diet
Cover: trees and shrubs for nesting; flowers for feeding

Wildlife management practices

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
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
Rooftop/Balcony Gardens: can provide source of nectar if appropriate flowers are planted
Note: Plant Flowers should not be recommended to plant Rooftop/Balcony Gardens

Mallard

General information

The mallard has one of the most extensive breeding ranges of any duck in North America, extending across the northern one-third of the United States, and up to the Bering Sea. As migratory waterfowl, they winter south of Canada, throughout the United States and south to Central America. Mallards are dabbling ducks that nest in tall grasses and forbs or in shrubby cover. They need open water (Stage 2 of wetland succession) with associated emergent aquatic vegetation (Stage 3) to raise young. Mallards prefer to spend the winter in wetlands that contain all 4 wetland stages, including Stage 1 (open water) and Stage 4 (harvested grain crops). In addition, riparian areas with open water may be used. These birds feed at or near the surface of the water by filtering food items such as invertebrates, seeds, and other plant material. Dabbling ducks are often seen tipping upside down in the water to reach food at the bottom of a wetland. Unlike diving ducks, they feed in much shallower water and do not dive to obtain food.

Habitat requirements

Diet: aquatic plants, insects, and other invertebrates; hard mast (especially acorns), grains, and other seed are primary components in the diet; ducklings eat mostly aquatic insects; most food is associated with wetlands, but mallards will readily dry-feed in agricultural fields during winter
Water: see cover requirements below
Cover: nest in grass and forb vegetation (sometimes they nest under shrubs) preferably within one-half mile of a wetland that provides open water with some adjacent emergent aquatic vegetation; brooding cover is open water with considerable emergent aquatic vegetation for protection from predators; ideally, wetlands have a minimum of 50 percent open water and 10 percent to 20 percent emergent vegetation; in wintering areas, mallards rest on open water bodies, such as streams, rivers, and warm-water sloughs

Wildlife management practices

Delay Crop Harvest: (in some regions) hay and crop harvest adjacent to wetlands should be conducted after nesting season
Establish Native Grasses and Forbs: (in some regions) where nesting cover is limiting
Leave Grain Unharvested: to provide a winter food source
Manipulate Succession: prescribed fire is recommended to rejuvenate dense vegetation in nesting areas and to increase or maintain proper water and vegetation interspersion in wetlands; grazing management should provide areas with tall, healthy, herbaceous vegetation that are not disturbed during the nesting season
Nesting Structures: (in some regions) in areas where there is high nest predation on mallards, elevated nesting platforms can increase nest success
Plant/Manage Food Plots: shallowly flooded grain plots can provide beneficial foodsource for migrating and wintering mallards
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 and dugouts can be important for migrating and

wintering mallards; flooding grain fields, planted food plots, and oak woodlands in winter makes food more available and provides a feeding area with more protection from predators

Mourning dove

General information

Mourning doves may be found throughout much of the lower 48 states. They prefer Stages 2 and 3 for feeding with some shrubs and trees nearby for nesting and roosting. Nests are made of twigs and placed on branches of shrubs or trees. Nests are also placed on the ground. Mourning doves often use agricultural areas for feeding on a variety of grass and forb seeds. They also forage on waste grain from cropland and livestock feedlots. Small areas of bare ground are beneficial for doves to obtain grit (small gravel) to help in digesting food. Mourning doves prefer shorelines without vegetation when drinking.

Habitat requirements

Diet: a variety of grass and forb seeds, as well as several agricultural grains; small areas of bare ground are beneficial for obtaining grit (small gravel) to help digest food

Water: free-standing water required daily

Cover: shrubs and trees are used for nesting and loafing

Wildlife management practices

Create Snags: for perching/loafing sites in open areas

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

Establish Native Grasses and Forbs: to provide forb seeds for food

Leave Grain Unharvested: for a variety of small grain crops such as wheat, barley, millet, milo, or oats to provide additional food resource

Manipulate Succession: disking and herbicide applications will provide bare ground; prescribed burning will maintain Stage 3 and expose seed for feeding; chaining will reduce shrub cover

Plant/Manage Food Plots: in areas lacking grain

Plant Shrubs: for nesting and roosting in areas where shrub/tree cover is limiting; fence rows, field borders and other idle land area are good sites

Plant Trees: for nesting and roosting in areas where shrub/tree cover is absent; fence rows, field borders, and other idle land area are good sites

Tillage Management: tilling cropland may be delayed in spring to allow nesting in standing stubble; tillage may be eliminated in the fall to allow wildlife access to waste grain

Water Developments for Wildlife: where water is limited or absent, development of water sources is desirable; examples include dugouts, guzzlers, and shallow impoundments

Northern bobwhite

General information

Bobwhites require Stages 2, 3, and 4, well interspersed. Ideally, habitat is composed of scattered patches of shrubby cover with a diversity of native grasses and forbs. Native grasses, such as bluestems, are used for nesting cover, while more recently disturbed sites rich in forbs and insects are used for brood rearing. In some parts of the country, savannas provide excellent habitat. Savannas have very few trees with an understory of grass, forbs, and 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 the Great Plains and eastern deciduous forest). Some agricultural crops can provide seasonal food for bobwhites, but they are not a substitute for diverse native plant communities.

Habitat requirements

Diet: young quail eat insects; adult quail eat a variety of seeds, green vegetation (mostly forbs), insects, small grains, and hard mast

Water: necessary water is obtained through the diet

Cover: shrubs for escape and thermoregulatory cover throughout the year; perennial native grasses for nesting; native forbs for brood rearing

Wildlife management practices

Decrease Harvest: may be necessary if populations are declining in suitable habitat where hunting pressure has been excessive

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: where suitable nesting and brood cover is limited

Forest Management Techniques: forest regeneration will enhance habitat for a few years in stands ready for harvest

Leave Grain Unharvested: to provide additional food through fall and winter

Manipulate Succession: prescribed fire is the most important tool for quail management and should be used if possible; burn small areas in large expanses of Stages 3

and 4; burning every 1 year to 2 years in Stages 5 and 6 forest may, over time, create a woodland or savannah; disking small areas in large expanses of Stages 3 and 4 will encourage annual forbs and grasses, but disking should be avoided in native rangelands; fire will encourage similar plant communities without soil disturbance and at a lower cost; chaining small areas in large expanses of Stage 4 vegetation may increase Stages 2 and 3; grazing management should keep livestock from grazing food plots and should leave ample herbaceous vegetation for cover and food; grazing management may revert or maintain Stage 3; grazing management should be used to discourage a uniform structure of plants across the landscape; uniform clipping of vegetation by cattle across large areas leaves no nesting cover and does not encourage annual forb production; cattle grazing in combination with prescribed burning is an excellent quail management strategy that mimics historic natural disturbance events; grazing management should maintain dense shrub and herbaceous cover in some areas; however, up to one-third of an area can be grazed more intensively to encourage annual forb production for brood habitat, assuming the same areas are not repeatedly grazed the same way.

Plant/Manage Food Plots: relatively small linear food plots (one-fourth acre) may be established adjacent to suitable cover where food may be limiting

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

Plant Trees: in areas of the Gulf Coastal Plain, longleaf pine may be planted in certain areas to enhance bobwhite habitat

Tillage Management: eliminate fall tillage to provide waste grain

Northern flicker

General information

Northern flickers occupy all of North America, and inhabit most of the United States year-round. Flickers use open areas in Stages 2 and 3 interspersed with areas of Stages 5 and 6. Northern flickers are often found in riparian and urban areas. They prefer older urban residential areas with large trees, golf courses and parks. Flickers create cavities in trees for nesting and will occasionally use nest boxes. Flickers eat insects, especially ants, as well as soft mast and seeds. Flickers can become problematic in urban areas where they may create holes in wood siding on houses or damage ornamental trees. Wildlife damage management may be necessary.

Habitat requirements

Diet: ants are a favorite food and make up about 50 percent of the diet; seeds, soft mast and earthworms are also eaten; flickers are partial to poison ivy fruit and may use artificial feeders

Water: daily water requirements unknown; sufficient water is probably obtained from diet

Cover: tree cavities are used for nesting; old mature trees that show signs of dying or rotting are often used; softwood trees such as yellow poplar, cottonwood, and willow are preferred; flickers will nest in posts, holes in banks, and holes in houses and structures where trees are unavailable

Wildlife management practices

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

Create Snags: to provide possible nesting cavities

Forest Management Techniques: forest regeneration will provide more open area for a short time; timber stand improvement can open the structure of the forest; snags should be retained and may be created if needed with forest management techniques

Manipulate Succession: prescribed fire will consume the litter layer and facilitate foraging on the ground Mowing: can be used to maintain open areas in urban environments.

Plant Shrubs: several soft mast-bearing shrubs can provide additional food resource

Plant Trees: in large expanses without trees

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

Special: European starlings often take over flicker cavities for their own nests. Appropriate action should be taken to prevent starlings from occupying nesting cavities of flickers and other cavity-nesting wildlife.

Northern harrier

General information

Northern harriers occur in the northern portions of the Great Plains and throughout Canada during the nesting season. They winter throughout much of the country. Stages 2, 3, and 4 are preferred and may include wet meadows, grasslands, pasture and croplands. Harriers typically hunt by flying low to the ground in search of prey. Harriers nest on the ground in Stage 3.

Habitat requirements

Diet: small mammals, birds, reptiles and frogs
Water: necessary water obtained from diet
Cover: cover requirements of early successional prey (primarily small rodents) should be considered

Wildlife management practices

Delay Crop Harvest: in spring to avoid ground nests
Establish Native Grasses and Forbs: where early successional cover is limiting
Manipulate Succession: prescribed fire should be used to rejuvenate and maintain early successional habitat; grazing management should maintain a diverse structure of vegetation conducive to prey and the efficiency of hunting for Northern harrier; chainsawing can be used to remove trees and revert an area to an earlier successional stage that is to be maintained in Stages 2 through 4
Tillage Management: will facilitate hunting prey when waste grain is available

Ovenbird

General information

Ovenbirds frequent mature deciduous and mixed forests throughout the eastern third of the country. Ovenbirds require a well-developed herbaceous understory for cover as they forage and nest on the forest floor. They construct a nest of grasses and forbs arched over in the shape of a Dutch oven, hence the name. The nest is usually well hidden in herbaceous vegetation on the forest floor.

Habitat requirements

Diet: insects and spiders
Water: usually obtain necessary water from diet but will also use other water sources when available
Cover: mature forest with well-developed herbaceous understory

Wildlife management practices

Forest Management Techniques: timber stand improvement will encourage increased groundcover important for nesting and foraging
Manipulate Succession: grazing management should prevent livestock grazing in forested areas
Plant Trees: in areas where less than 75 percent of the area is in Stages 5 or 6 forest

Prothonotary warbler

General information

The prothonotary warbler nests in hardwood forests (Stage 6) near water, primarily in the southern United States. They are most often found in forested wetlands such as cypress swamps and other bottomland hardwoods. Prothonotary warblers are cavity nesters, so large overmature trees and standing dead trees are important. Additionally, this warbler feeds primarily on insects in the lower canopy or at ground level; thus, a mature hardwood forest with complex vertical structure provides the structure necessary for insect populations that prothonotary warblers require. Prothonotary warblers winter in Central and South America.

Habitat requirements

Diet: insects such as ants, beetles, mayflies, aquatic larvae and snails
Water: necessary water is obtained through the diet
Cover: forested wetlands and other mature bottomland hardwood forests; dead standing timber help ensure presence of cavities

Wildlife management practices

Forest Management Techniques: timber stand improvement can stimulate vertical structure where absent
Nesting Structures: nest boxes are readily used and will provide suitable nesting cover where natural cavities are limiting
Plant Trees: in open bottomlands where forest cover is lacking and natural regeneration is not sufficient
Water Developments for Wildlife: shallow impoundments can be established in bottomland hardwoods for habitat enhancement

Red-eyed vireo

General information

Red-eyed vireos occur in mature deciduous forests throughout eastern North America and the upper Midwest. They are usually found foraging in the middle to upper layer of the forest canopy but often nest in the understory or midstory. The nest is usually placed on a horizontal fork of a slender branch.

Habitat requirements

Diet: insects, spiders, and soft mast
Water: necessary water is obtained from diet
Cover: midstory and overstory of stage 6 mixed deciduous forest

Wildlife management practices

Forest management techniques: single-tree and group-selection methods of forest regeneration are compatible with the habitat requirements of red-eyed vireos; timber stand improvement may stimulate additional understory and midstory development and provide enhanced nesting cover in relatively open woods

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

Redhead

General information

Redheads range over the north-western and central United States and Mexico. They winter in southern areas of the United States into Mexico. Redheads are diving ducks that use Stage 2 wetlands for most activities. They may loaf in Stage 1wetlands and usually nest in emergent aquatic vegetation associated with Stage 3 wetlands adjacent to Stage 2 wetlands. Nests are built out of emergent vegetation and are usually placed above water or very near the shore in dense vegetation providing concealment.

Habitat requirements

Diet: young redheads primarily eat aquatic invertebrates (mollusks, snails, crustaceans) during late spring and early summer; during the rest of the year, redheads prefer aquatic plants such as pondweeds, muskgrass, bulrush seeds, wild celery, water lily seeds and coontail

Water: see cover requirements below

Cover: during spring and summer, dense emergent vegetation for nesting and wetlands composed of 50 percent Stage 3 interspersed with 50 percent Stage 2 wetland; during fall and winter, Stage 2 wetland; also may use stage 1 wetland during migration and winter

Wildlife management practices

Manipulate Succession: use prescribed fire every 3 years to 5 years to rejuvenate deteriorated vegetation; grazing management should maintain tall emergent aquatic vegetation adjacent to water; prolonged protection of nesting areas from disturbances such as fire and grazing, can result in deterioration of the vegetation; intense grazing of nesting areas every 3 years to 5 years (after nesting season) can rejuvenate vegetation; usually only one-third to one-half of the nesting area should be treated during any one year

Water Control Structures: should be installed if not present to promote growth of tall emergent aquatic vegetation (Stage 3 wetland) adjacent to Stage 2 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

Red-tailed hawk

General information

Red-tailed hawks are found throughout the country, in open areas (Stages 2 and 3 of plant succession) interspersed with Stages 4, 5, and/or 6. They hunt by soaring over Stages 2, 3, and 4 and eat small mammals, birds, and reptiles. Red-tailed hawks nest in trees and cliffs, and often roost in solitary trees in grasslands/ savannas.

Habitat requirements

Diet: small mammals, such as squirrels, rabbits, and mice, reptiles and other birds

Water: necessary water is obtained from diet

Cover: nests are usually built 30 feet to 90 feet above the ground, often in the fork of a tree branch; cliffs may be used for nest sites when trees are not present; small trees, electric poles and similar structures are used for perching

Wildlife management practices

Create Snags: in open areas to facilitate hunting

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: where less than 75 percent of the area is in Stages 2 or 3

Forest Management Techniques: forest regeneration in large expanses of stage 6 will provide open habitat for a few years and facilitate hunting prey

Manipulate Succession: prescribed fire, disking, and grazing management are recommended to rejuvenate and maintain Stage 3; prescribed fire and chaining are recommended to rejuvenate and maintain small areas in large expanses of Stage 4

Plant Shrubs: in large expanses of Stages 2 or 3 where trees and shrubs are not present to create perching and nest sites and provide habitat for prey

Plant Trees: in large expanses of Stages 2 or 3 where trees and shrubs are not present to create perching and nest sites

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

Red-winged blackbird

General information

Red-winged blackbirds breed across the United States and throughout central Canada. They winter across the United States and extreme southern Canada. They prefer Stage 3 wetlands dominated by emergent aquatic vegetation. Red-winged blackbirds are often a pest in agricultural areas where they damage crops. In such situations, wildlife damage management techniques may be necessary.

Habitat requirements

Diet: seeds of annual forbs in fall, winter, and early spring; waste grain in late fall and winter; insects associated with tall emergent aquatic vegetation such as cattails, bulrushes, and marsh grass in summer
Water: necessary water obtained from diet
Cover: dense clumps of emergent aquatic or other herbaceous vegetation for nesting; nearby trees and shrubs are also used for roosting and loafing

Wildlife management practices

Manipulation of Succession: prescribed fire every 3 years to 5 years will rejuvenate emergent aquatic vegetation; grazing management should prevent livestock from entering wetlands and maintain cattails, shrubs and trees adjacent to within wetlands
Plant Shrubs: if no shrubs or trees are available adjacent to wetlands but not on the dam or dike
Plant Trees: if no shrubs or trees are available adjacent to wetlands, but not on the dam or dike
Water Control Structures: should be installed if none are present to maintain shallow water where emergent vegetation can grow
Water Developments for Wildlife: shallow impoundments may be constructed to flood areas dominated by tall emergent aquatic vegetation
Wildlife Damage Management: population reduction, habitat modification and scare tactics may be necessary where crop damage occurs

Rock dove

General information

Rock doves (commonly called pigeons) are an introduced species found year-round throughout urban and agricultural areas in the United States. They are considered pests because they are generally protected in urban areas where they develop dense populations and damage buildings and other structures with accumulations of droppings. They also cause severe problems in agricultural areas by contaminating feed. Pigeons also can carry and spread diseases including salmonella, encephalitis, Newcastle disease, and others to people and livestock through their droppings. Droppings of rock doves may also contain histoplasmosis, a fungal disease that can cause respiratory problems in humans. Wildlife damage management practices are often required to control overabundant rock dove populations. Rock doves like large buildings, parks, and open areas. They create a shallow nest of sticks, leaves, and other vegetation, and nest above the ground and on or around buildings.
Rock doves primarily feed on the ground on small grains, seeds, crumbs, and garbage.

Habitat requirements

Diet: waste grain and weed seeds; in urban areas, rock doves live mostly on human handouts
Water: free-standing water is required frequently during warm seasons
Cover: barn lofts, window ledges, roof tops, bridges, and a variety of other structures

Wildlife management practices

Wildlife Damage Management: shooting, 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 doves should never occur

Ruffed grouse

General information

Ruffed grouse occur in Stages 4, 5, and 6 cover across the more northern latitudes of North America and down the Appalachian range. Ruffed grouse are found in a variety of deciduous forest types, but are particularly closely associated with aspen, especially young stands with relatively dense structure.

Habitat requirements

Diet: diet varies somewhat with location, but primary items include buds, hard and soft mast, insects and other invertebrates, and leaves of forbs
Water: necessary water obtained from diet
Cover: 6- to 20-year-old stands (Stage 5) are required for cover provided by the high stem density; mature stands (Stage 6, especially with a dense midstory) in close proximity to young stands may be used for feeding on

acorns and other hard mast; a variety of forest types and age classes are used for nesting

Wildlife management practices

Decrease Harvest: may be necessary if populations are declining in suitable habitat where hunting pressure has been excessive

Forest Management Techniques: forest regeneration within Stage 6 forest will stimulate regeneration that will provide optimum cover within 6 years; timber stand improvement practices can be used to stimulate desirable structure and stem density within Stages 5 and 6 and enable crowns of desirable trees to grow and produce additional mast

Manipulate Succession: prescribed fire can be used to maintain and rejuvenate areas of Stage 4 and improve brooding cover in Stages 5 and 6; grazing management is critical to avoid grazing in Stages 5 and 6 and protect trees and shrubs planted for grouse

Plant Shrubs: where additional soft mast is needed and to develop thickets and woody cover in fields and other areas where Stages 4 and 5 cover is lacking

Plant Trees: where Stages 5 and 6 represent less than 75 percent of the area considered, and where Stages 5 and 6 forest contain few or no mast-producing trees

Song sparrow

General information

Song sparrows inhabit all of America, but will migrate from extreme northern areas during the colder months of the year. Song sparrows occupy shrubby areas interspersed with Stages 2, 3, 5, and 6, especially along riparian areas. Song sparrows often nest along forest edges in a cup nest of grass and leaves on or near the ground. Nest is often placed on the ground under a shrub or in thick herbaceous cover and made of grass and forbs. Song sparrows primarily feed on the ground and eat seed, insects and fruit.

Habitat requirements

Diet: weed seeds, insects, soft mast

Water: free-standing water is required frequently during the warm seasons

Cover: thick shrubs and herbaceous cover for nesting, loafing, escape

Wildlife management practices

Artificial Feeders: millets and sunflower seeds are favorites

Establish Native Grasses and Forbs: interspersed with Stage 4 for cover and nesting

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

Water Development for Wildlife: birdbaths and pans of water can provide drinking water

White-winged dove

General information

White-winged doves use agriculture and open areas for feeding and shrubs and trees for nesting and loafing. They are also found in urban areas and riparian areas.

Habitat requirements

Diet: a variety of grass and forb seeds, waste grain from cropland and livestock feedlots; small areas of bare ground are beneficial for obtaining grit (small gravel) to help digest food

Water: free-standing water is required daily

Cover: tall shrubs and trees for nesting and loafing; nests are made of twigs placed on branches of shrubs or trees; nests may also be placed on the ground

Wildlife management practices

Create Snags: where needed to create perching sites ***Delay Crop Harvest:*** delayed crop harvest in the spring may allow more successful nests

Establish Native Grasses and Forbs: where additional forb cover is needed for food

Leave Grain Unharvested: will provide additional food from a variety of small grain crops such as millets, grain sorghum, wheat, and oats

Manipulate Succession: prescribed fire will enhance feeding areas, maintain Stage 3 and set back Stages 4 and 5; disking and herbicide applications will provide bare ground; grazing management can maintain Stages 2 and 3

Plant/Manage Food Plots: where additional food, specifically grain, is needed

Plant Shrubs: in large areas of Stages 2 and 3 where there are few trees or shrubs for nesting and loafing; may be planted along field borders, along fencerows or other idle areas

Tillage Management: delayed cropland tillage in the spring will allow standing stubble to be used for nesting; eliminate tillage in the fall to allow access to waste grain

Water Developments for Wildlife: where water is limited or absent; dugouts, guzzlers, or windmills can provide free-standing water

Wild turkey

General information

Wild turkeys use a wide variety of vegetation types across the United States. They are very adaptable and are limited only by tree cover for roosting and by snow depth and persistence for obtaining food. Optimum habitat contains an interspersion of brushy cover for nesting, native forbs and grasses for brooding, and hard- and soft-mast producing trees and shrubs for roosting and food availability.

Habitat requirements

Diet: various hard mast including acorns and beechnuts; soft mast including blackberries and black cherry; insects and other invertebrates including spiders and snails; miscellaneous seeds; leaves from forbs and grasses; grain from a variety of agricultural crops; chufa tubers

Water: obtain water from diet but will use freestanding water when available

Cover: mature forest, regenerating forest, brushy areas, and old-fields with rank cover for nesting; nest is a shallow depression on the ground lined with leaves and/or grass and is usually well concealed amongst vegetation or against some object (such as a tree, log or brush); mature forest, Stages 2 and 3 forb cover, and grain fields for feeding; trees or tall shrubs for roosting

Wildlife management practices

Decrease Harvest: may be necessary if populations are declining in suitable habitat where hunting pressure has been excessive

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: where less than one-quarter of the area is composed of Stages 2 and 3

Forest Management Techniques: forest regeneration methods can enhance nesting habitat, provide additional brood cover, soft mast, and miscellaneous seed for 2 years to 3 years after harvest; timber stand improvement practices can improve the structure of the understory for nesting and brood rearing, increase production of soft mast and miscellaneous seed, and enable the crowns of desired trees to grow and produce additional mast

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

Leave Grain Unharvested: (especially corn and grain sorghum) to provide a high-energy food source during fall and winter; especially important during years of poor acorn production

Manipulate Succession: prescribed fire, disking, herbicide application, chaining, roller beating, and grazing management can be used to maintain and rejuvenate Stages 2 to 4 when habitat quality begins to decline; grazing management should prevent livestock from degrading habitat by overgrazing and damaging planted trees and shrubs

Plant/Manage Food Plots: where grain crops and quality forages such as clovers are lacking to provide a supplemental food source and additional areas for brood rearing

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

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to Stages 4 through 6

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

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

Wood duck

General information

Wood ducks are primarily found along rivers and large creeks within bottomland hardwood forests, Stage 3 wetlands, and swamps with emergent woody vegetation adjacent to Stage 2 wetlands, and shallowly flooded Stages 5 and 6 hardwood forest. Wood ducks nest within cavities. Usually, nest sites are within or adjacent to flooded timber; however, wood ducks have been known to nest up to 1 mile from water. Cavity availability is critical for a sustainable population. Thus, artificial cavities are readily used by wood ducks and have been, most likely, the No. 1 reason for the increase in wood duck populations during the past 50 years.

Habitat requirements

Diet: acorns are the primary diet item in fall and winter; other hard mast, various miscellaneous seeds and soft mast, as well as waste grain (especially corn) also are eaten; insects and other invertebrates are most important for wood duck chicks and hens before and during the nesting season

Water: obtain water through diet and drink freestanding water regularly; see cover requirements below

Cover: Stage 3 wetlands and swamps; shallowly flooded bottomland hardwoods; nest in tree cavities in stage 6 hardwoods and artificial cavities

Wildlife management practices

Create Snags: to provide potential cavity nesting sites
Forest Management Techniques: timber 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 TSI and improve cover in those stands that can be flooded
Leave Grain Unharvested: (especially corn) to provide high-energy food source for wood ducks 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
Manipulate Succession: grazing management should prevent livestock from damaging trees and shrubs planted for wood ducks
Nesting Structures: nest boxes should be erected where suitable habitat exists or where planned; nest boxes for wood ducks should be at least 100 yards apart and should not be placed within sight of each other if possible
Plant/Manage Food Plots: shallowly flooded grain plots 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
Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially fields that can be shallowly flooded
Water Control Structures: should be installed in existing dikes if there are none present
Water Developments for Wildlife: specifically, shallow impoundments should be created where topography allows, to create feeding and nesting space for wood ducks

Yellow-rumped warbler

General information

Yellow-rumped warblers breed throughout southern Canada, the western United States, the Great Lakes region, and the northeastern United States. They winter throughout the southern United States. They are found in coniferous or mixed forest and use brushy thickets in winter. Yellow-rumped warblers eat insects gleaned from the branches and bark of trees and shrubs.

Habitat requirements

Diet: ants, caterpillars, and beetles
Water: necessary water obtained from diet, but free-standing water is used when available
Cover: coniferous or mixed forest during nesting season; occasionally nest in shrubs; nest is made of twigs, bark strippings, and weed stems and placed on small branches 5 feet to 50 feet above the ground; brushy thickets are used for feeding, loafing and escape during winter

Wildlife management practices

Forest Management Techniques: timber stand improvement can improve forest structure for nesting and feeding
Manipulate Succession: grazing management should not allow livestock to damage shrub cover
Plant Shrubs: where shrub cover is lacking in winter range
Plant Trees: where forest structure is limited during the nesting season

Mammals

American beaver

General information

Beavers occur throughout most of North America. They are found in riparian areas in Stages 4 and 5 and in wetlands that have permanent water with a variety of shrubs and trees adjacent to the water. Beavers build dams from tree branches, shrubs, and mud to form ponds that stabilize water levels, slow water movement, and provide shelter beneath the ice in winter. Beavers also build lodges from sticks, mud, and dig burrows in banks of streams and rivers. Beavers eat the inner bark of shrubs and trees and store cuttings in caches (piles of branches) for use during winter. The ecological benefits provided by beavers cannot be overstated. Beavers are responsible for creating habitat for a plethora of birds, mammals, reptiles, amphibians, fishes, and invertebrates. Without beavers, the distribution and abundance many freshwater wetland-associated species would decline dramatically. Unfortunately, beavers were once such a valuable fur resource that trapping led to their extinction in many parts of their former range. Today, beavers have rebounded with help from wildlife agency regulations and a lack of a viable fur market. In some areas, beavers have become a nuisance as they cut down trees, dam ditches, and streams in undesirable places. This causes cropland flooding, destabilization of road edges, and damaged timber when stands are flooded for extended periods. When beavers construct dams in places that cause problems, removal of the beaver is usually the best solution. If the dam is destroyed and the beavers remain, they will build the dam again.

Habitat requirements

Diet: primarily bark from shrubs and trees; also some forbs and grasses

Water: prefer slow-moving or still water at least 5 feet deep (to allow movement under water) with a constant level

Cover: bottomland riparian areas that can be dammed to provide still water with sufficient depth

Wildlife management practices

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

Manipulate Succession: grazing management should protect shrubs and trees along riparian areas; this may include developing livestock watering facilities in upland areas to discourage congregation in riparian areas

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

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

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

Big brown bat

General information

Big brown bats are one of 46 bat species in North America. They inhabit nearly all of the United States, except for south Florida and south-central Texas, and use a variety of vegetation types, from farmland to mature deciduous forest. Big brown bats are common in urban areas, including cities, parks, and suburban neighborhoods. They frequently use buildings and houses for daytime summer roosts and sometimes as winter hibernacula, but most hibernate in caves. Big brown bats are insectivores. Lactating females will eat their weight in insects daily. Males and females may roost individually or in small numbers, but males and females usually roost separately. Females may roost together in a maternal colony when pups are born and nursing. Females usually give birth to one or two pups, often in a hollow tree or attic. Big brown bats, as with all other bat species, are nocturnal and are the only mammals capable of flying. Big brown bats will drink “on-the-wing” by dipping their lower jaw into a water source. Big brown bats hibernate in the winter in northern latitudes, therefore, do not actively feed during winter months, but instead rely on stored fat reserves.

Habitat requirements

Diet: night-flying insects, especially beetles

Water: free-standing water is required daily when they are active

Cover: buildings and hollow trees are often used for daytime roosts; bat houses may also be used for daytime

roosting; caves, mines, and buildings are used for hibernation

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

Manipulate Succession: to maintain more than 50 percent open areas for foraging

Nesting Structures: may provide additional roost sites

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

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

Black bear

General information

Black bears 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, and riparian corridors are also used. They are generally secretive and avoid human contact; however, black bears are highly adaptable and may occur in and around human dwellings and become problematic, especially if food is available. Black bears are primarily nocturnal, but may be seen anytime during the day. They hibernate in winter (even in warm climates like Florida and Louisiana) and have large home ranges (several square miles) that vary based on sex, age, and/or time of year (breeding season, fall foraging areas, denning habitat). In general, adult male home ranges (up to 50 square miles) are much larger than female home ranges. Solitary females and females with cubs have considerably smaller (15 square miles) home ranges. Black bears are omnivorous, however more than 90 percent of their diet consists of vegetative matter. Liberalizing or restricting females in the harvest influences population growth. Regulation of bear population densities is influenced by public tolerance toward bear/human conflicts, property damage, livestock and agricultural damage, and the desire to see bears.

Habitat requirements

Diet: spring food sources are typically scarce and consist of early developing plants such as skunk cabbage, squaw root, grasses, and insects; occasionally, small to medium-sized mammals such as deer fawns and young livestock (calves and lambs) are preyed upon; during summer and early fall, a variety of soft mast such as blackberry, blueberry, serviceberry, black cherry, and pokeweed are important; during late fall, acorns, beechnuts, hickory nuts, and other hard mast, as well as field corn and soybeans, help bears prepare for hibernation; when natural foods are scarce, bears may wander near human residences and feed on bird seed, dog/cat food, and other food scraps

Water: free-standing water is used for drinking; spring seeps and other shallow water sources are used to cool off and get away from biting insects; water is seldom a limiting factor since black bears have such a large home range

Cover: mature hardwood or mixed hardwood/conifer forests for foraging; brushy areas and young regenerating forest for loafing and 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

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

Forest Management Techniques: forest regeneration, especially clearcut and shelterwood methods, creates dense escape and loafing cover for bears; an abundance of soft mast (pokeweed, blackberry, huckleberry, blueberry) is usually available in recently regenerated stands; timber stand improvement practices can lead to increased hard mast production if quality trees are retained in the stand, and can stimulate groundcover, which usually increases soft mast production

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

Leave Grain Unharvested: strips of corn, grain,

Bobcat

General information

Bobcats occur throughout the United States, except for some areas in the northern Midwestern states where intensive agriculture occurs or in areas lacking rugged or rocky mountainous terrain or extensive bogs and swamps.

Bobcats are carnivorous predators and are seldom active during the day. Bobcats have been found to be a significant cause of mortality to pronghorn and wild turkeys but are not considered a major source of mortality for deer. They are classified as a furbearer game species in many states.

Habitat requirements

Diet: rabbits, rodents, opossums, raccoons, skunks, pronghorns, deer, snakes, and many bird species including wild turkeys, ruffed grouse, Northern bobwhite, domestic poultry, and other livestock
Water: water requirements are not well known, free-standing water is used
Cover: dense cover, rocky outcrops and ledges, hollow logs, and other sheltered spots for denning; foraging occurs where prey is most numerous

Wildlife management practices

Decrease Harvest: may be necessary when additional bobcats are desired and hunting or trapping efforts may be limiting growth
Forest Management Techniques: forest regeneration will provide increased dense cover for additional prey; timber stand improvement can provide enhanced understory development that can lead to increased prey populations; down woody debris (logs) can provide denning sites
Increase Harvest: where populations can sustain additional hunting/trapping pressure for recreation and/or where populations need to be lowered
Manipulate Succession: prescribed fire, chaining, and herbicide application are recommended to maintain and rejuvenate Stage 4 when habitat quality begins to decline for desired prey; grazing management should prevent overgrazing in Stages 4 through 6 that would degrade habitat quality for rabbits, rodents, and other prey
Plant Shrubs: in areas where additional Stage 4 is needed to attract prey and provide security cover
Wildlife Damage Management: may be necessary if poultry or other livestock depredation is a problem

Common muskrat

General information

Muskrats are found throughout the United States, especially in shallow marches with abundant cattails. They are mainly nocturnal and need water at least 4 feet deep or flowing water that allows free movement under ice during winter. During summer, they prefer water 1 foot to 2 feet deep, with about 20 percent of the wetland open water free of emergent aquatic vegetation. Muskrats build lodges of cattails or other herbaceous vegetation, but do not use sticks or limbs. They sometimes nest in a bank burrow along a waterway. Burrowing and denning activities can cause problems in flooded agricultural areas, such as rice fields, and waterfowl management areas.

Habitat requirements

Diet: roots, tubers, and green shoots of emergent aquatic vegetation such as cattails and bulrushes
Water: necessary water obtained from diet
Cover: primarily Stage 2 wetlands; den in lodges built from cattails and bulrushes, which are usually in dense patches of cattails and bulrushes; loaf on floating logs or tops of lodges

Wildlife management practices

Decrease Harvest: where trapping efforts have reduced population below desirable levels
Increase Harvest: where populations can sustain additional trapping and/or where populations need to be lowered
Manipulate Succession: prescribed fire is recommended to rejuvenate old, decadent wetland vegetation; grazing management should restrict livestock 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
Water Control Structures: are necessary to control water levels so that approximately 80 percent of the wetland has water less than 2 feet deep so cattails and bulrushes can grow
Water Developments for Wildlife: small impoundments can be built in low-lying areas to provide additional wetland habitat
Wildlife Damage Management: may be necessary to ameliorate damage to dikes in agricultural areas and waterfowl management areas; populations can be reduced by managing against preferred habitat conditions or by additional harvest

Coyote

General information

Coyotes are found throughout the continental United States and have even been observed in large cities and urban areas. Grasslands, shrubland, and farmland provide optimal habitat for coyotes, but they also use Stages 5 and 6. Coyotes den in a variety of places, including

brush-covered slopes, steep banks, rock ledges, thickets, and hollow logs. Coyotes are most active at night, during early morning and around sunset, but they may be active throughout the day. Coyotes live in packs, alone or in mated pairs, depending on the time of year. Coyotes have an extremely varied diet that fluctuates with the seasons.

Habitat requirements

Diet: rodents, rabbits, and other small mammals, insects, birds, eggs, deer, carrion, and soft mast; livestock and wild ungulates (deer, elk, pronghorn) are usually represented in coyote stomachs as carrion; however, in some cases, coyotes prey heavily on deer and pronghorn fawns, limiting reproductive success

Water: requirements are not well documented; necessary water is probably obtained in diet

Cover: grasslands, shrublands, regenerating forest, mature forest; crevices and burrows along river banks, rock ledges, brushpiles, and holes under stumps or abandoned buildings are used as den sites for raising pups

Wildlife management practices

Decrease Harvest: may be necessary when additional coyotes are desired and hunting or trapping efforts may be limiting growth; realistically, because of a high reproduction rate and extreme survival abilities, this practice would most likely never be recommended for coyotes

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: where additional high-quality early successional habitat is needed for prey

Forest Management Techniques: forest regeneration and timber stand improvement can enhance conditions for increased prey

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

Manipulate Succession: prescribed fire, disking, chaining, and herbicide applications are recommended to maintain Stage 3; grazing management should maintain adequate cover for sorghum, or soybeans should be left standing, especially where adjacent to escape cover, to provide food close to cover

Manipulate Succession: Prescribed fire can stimulate groundcover and soft mast and maintain Stages 3 and 4

Plant/Manage Food Plots: where available food may be limiting, forage and grain plots may be planted to provide additional nutrition

Plant Shrubs: crabapple, high-bush blueberry, hawthorn, wild plum, and elderberry can be planted within forest openings where soft mast is lacking; this can also help maintain Stage 4

Plant Trees: apple, pear, cherry, persimmon, and dogwood are suitable choices to provide additional soft mast

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to Stages 4 through 6

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

Eastern cottontail

General information

Eastern cottontails occur in the eastern half of the country. They prefer brushy cover interspersed with Stage 3. Eastern cottontails are also found in suburban areas, parks, golf courses, and stream corridors.

Eastern cottontails represent prey for the majority of carnivorous predators within its range. They are prolific breeders, however, as female may have 7 litters per year, with 3 to 6 young per litter. This is required to perpetuate populations as 70 percent to 80 percent of all rabbits die each year.

Habitat requirements

Diet: forbs and grasses (Stages 2 and 3), browse, and soft mast from spring through fall; in winter, bark of shrubs and trees, as well as buds, grain, and browse

Water: necessary water obtained from diet

Cover: shrub cover, brushpiles, native perennial warm-season grasses and forbs (Stage 3) for loafing and escape cover; burrows are also used for denning and escape

Wildlife management practices

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

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grasses and Forbs: where high quality early successional habitat is limiting

Forest Management Techniques: forest regeneration, especially clearcutting, provides optimal brushy cover for a few years

Increase Harvest: where populations can sustain

additional hunting/trapping pressure for recreation and/or where populations need to be lowered

Leave Grain Unharvested: to provide additional food, especially corn

Manipulate Succession: prescribed fire, disking, chaining, and herbicide applications are recommended to maintain or rejuvenate Stages 3 and 4; in areas dominated by mesquite, root plowing combined with seeding grasses and legumes help maintain Stage 3; grazing management should keep livestock out of food plots and leave ample amounts of herbaceous vegetation in other areas used by cottontails for food and cover

Mowing: can be used to maintain open areas in urban environments

Plant/Manage Food Plots: where additional forage or grain is needed; one one-quarter acre plot per 10 acres to 15 acres should be sufficient

Plant Shrubs: in large areas of Stages 2 and 3 and in agricultural areas with few shrubs; field borders, fence rows, and other idle land areas are good places to plant; this is also appropriate for open areas in urban settings

Tillage Management: cropland tillage may be delayed in spring to allow use of standing stubble for cover; tillage may be eliminated in the fall to allow access to waste grain

Wildlife Damage Management: may be necessary to control damage to ornamental/landscaping and garden plants

Eastern fox squirrel

General information

The Eastern fox squirrel is found in the eastern half of the U.S., except for areas of New England. Eastern fox squirrels use Stage 6 forest interspersed small openings (Stages 2 and 3), as well as oak and pine woodlands and savannas. Riparian areas are important in the Midwest. Fox squirrels also may use urban areas where there are lots of trees. Fox squirrels spend much time foraging on the ground. They build a leaf nest, usually in the crotch of the main trunk of a tree more than 30 feet above the ground, but will regularly use natural cavities in trees, especially in winter.

Habitat requirements

Diet: a variety of hard mast, acorns, seeds, tree buds, and flowers, mushrooms, soft mast, eggs, and corn

Water: necessary water is generally obtained through diet, but free-standing water may be needed in late summer

Cover: Stage 6 hardwood and pine forest, woodland, and savannas; nest in tree cavities or build a nest of twigs and leaves; where den sites are scarce, may use nestboxes

Wildlife management practices

Artificial Feeders: in urban areas, corn or sunflower seeds spilled from feeders onto the ground may be eaten

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

Forest Management Techniques: timber stand improvement can encourage larger crowns of mast-producing trees and enable oaks, hickories, beech, and others to produce more mast; can also increase soft mast availability and provide snags for potential den sites

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

Leave Grain Unharvested: (corn fields) so squirrels can glean waste grain from the field; especially important during years of poor mast production

Manipulate Succession: prescribed fire, disking, and herbicide applications can be used to maintain Stages 3 and 4 adjacent to wooded areas used by fox squirrels; grazing management should prevent livestock from damaging riparian areas, protect trees planted for fox squirrels, and protect woods from overgrazing

Nesting Structures: 3 to 4 cavities per acre are desirable; where cavities are limiting, nest boxes may be beneficial

Plant Trees: in large areas of Stages 2, 3, and 4; along fence rows, adjacent to streams and grain fields, and other idle land areas are suitable sites

Tillage Management: eliminate tilling corn fields in the fall to provide additional food

Water Developments for Wildlife: in urban areas, a pool or pan of water may be used if water is not available

Wildlife Damage Management: exclusion from buildings or removal may be necessary if damage is occurring

Eastern gray squirrel

General information

The Eastern gray squirrel lives primarily in Stage 6 deciduous forests and woodlands. They also forage along the edge of crop fields, especially harvested cornfields. These squirrels have adapted to parks and other urban areas where mature trees are available. Eastern gray squirrels forage both in trees and on the ground. They den in cavities of mature trees and also build nests generally 30 feet or more above ground. Eastern gray squirrels will use nest boxes, but they are not necessary since nests are

built in the absence of cavities; thus, available cavities are not a limiting factor for population growth.

Habitat requirements

Diet: a variety of hard and soft mast, miscellaneous seeds, grains, bark, buds, and mushrooms; they may also eat eggs
Water: necessary water is generally obtained through diet, but free-standing water is also used
Cover: Stage 6 forest and woodlands; suburban and urban areas with mature trees; den in tree cavities and also build nests of leaves and twigs

Wildlife management practices

Decrease Harvest: may be necessary when additional gray squirrels are desired, and hunting pressure is limiting growth
Forest Management Techniques: timber stand improvement can encourage larger crowns of mast-producing trees and enable oaks, hickories, beech, and others to produce more mast; can also increase soft mast availability and provide snags for potential den sites
Increase Harvest: where populations can sustain additional hunting pressure for recreation and/or where populations need to be lowered
Leave Grain Unharvested: (cornfields) so squirrels can glean waste grain from the field; especially important during years of poor mast production
Manipulate Succession: grazing management should protect trees and shrubs planted for squirrels and protect woods from overgrazing
Plant/Manage Food Plots: corn plots adjacent to Stage 6 forest can provide as a food resource, especially in years of poor acorn production
Plant Shrubs: shrubs can be planted across large fields and in "odd areas" of crop fields not planted to crops
Plant Trees: plant mast trees where Stage 5 and 6 represent less than 50 percent of the area considered and where Stages 5 and 6 forest contain few or no mast-producing trees
Tillage Management: eliminate tillage in the fall, especially cornfields adjacent to Stage 6 forest
Wildlife Damage Management: may be required if squirrels become a nuisance around houses

Mink

General information

Mink are found in Alaska, Canada, and across most of the United States. They are mainly nocturnal and prefer habitat associated with streambanks, river banks, and the shores of a variety of wetlands. Mink are strictly carnivorous. Most food is found in close association with dense vegetation along wetland edges and other riparian areas. Availability of den sites is considered a key factor in how many mink use an area. Areas with lots of trees and shrubs and limited livestock grazing near riparian areas usually have more den sites. Mink can eat significant numbers of upland nesting waterfowl or game birds, especially in areas where nesting habitat is limited.

Habitat requirements

Diet: rabbits, mice, muskrats, frogs, crayfish, snakes, and birds
Water: closely associated with water; necessary water probably obtained through diet
Cover: wetland edges, riparian areas, dens under log jams and tree roots, old muskrat burrows, and rock piles

Wildlife management practices

Decrease Harvest: may be necessary when trapping pressure is limiting population
Increase Harvest: where populations can sustain additional trapping pressure, and when mink have been identified limiting upland nesting waterfowl or game birds
Manipulate Succession: prescribed fire is recommended to rejuvenate old decadent wetland vegetation that can improve habitat for prey; grazing management should prevent livestock from damaging vegetation and structure along banks of streams, rivers and other wetlands; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas
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 available habitat where appropriate

Northern raccoon

General information

Raccoons are very common throughout most of the United States, except in certain parts of the Rocky Mountains, Nevada, Utah, and Arizona. Raccoons are found in a variety of vegetation types but are usually most abundant near riparian areas and wetlands. They are also found in urban areas. Raccoons den in hollow trees, burrow under stumps or brush piles, or in chimneys, attics, and crawl spaces of houses and buildings. They are omnivorous and eat a wide variety of foods. Raccoons

can become pests in urban areas and in wetlands where waterfowl nesting is important. Raccoons have also been identified as major predators on game bird nests and young game birds. In such cases, wildlife damage management, or increased harvest may be necessary.

Habitat requirements

Diet: crayfish, frogs, birds, eggs, small mammals, insects, lizards, snakes, worms, fish, carrion, grains, seeds, hard and soft mast, and foods prepared for human and pet consumption

Water: require water frequently during warm seasons

Cover: riparian areas, bottomland hardwoods, and along other wetlands; natural tree cavities are used for denning and daytime loafing; also dens in ground burrows under stumps, brush and junk piles, old abandoned buildings and rocky cliffs and ledges

Wildlife management practices

Create Snags: relatively large dead trees with cavities can provide denning sites

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

Establish Field Buffers: to increase usable space for prey around row crop fields

Forest Management Techniques: forest regeneration and timber stand improvement can stimulate soft mast production and cover for prey; relatively large snags with cavities should be retained when implementing forest management

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

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

Manipulate Succession: prescribed fire is recommended to rejuvenate old decadent wetland vegetation; prescribed fire and disking can maintain Stages 2 and 3; prescribed fire, herbicide applications and chaining are recommended to revert Stage 4 and Stage 5 to Stages 2 and 3; grazing management should prevent livestock from degrading 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/Manage Food Plots: annual grain food plots, especially corn

Plant Shrubs: where soft mast is lacking and to provide corridors across large areas of Stages 2 and 3

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

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: 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 wetland habitat

Wildlife Damage Management: may be necessary if raccoons invade 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 euthanize is most effective for problem raccoons

White-tailed deer

General information

The white-tailed deer is the most important game animal in North America. They occur throughout the United States and southern Canada, except for California and Nevada. They are extremely adaptable and are found in a wide variety of areas including deciduous and coniferous forests, tropical evergreen forest, dry grasslands, and shrub desert. They are adaptable to humans and exploit suburban areas very well. Whitetails thrive in areas with fragmented habitat containing several well-interspersed vegetation types. White-tailed deer are classified as browsers, but have distinct dietary preferences through the seasons. Where overabundant, they can cause significant damage to ornamental plantings and row crops and can be hazardous for motor vehicles.

Habitat requirements

Diet: forbs, browse, acorns, beechnuts, grains, grasses, and mushrooms; in the northern parts of the range, coniferous browse is very important in winter

Water: obtain most of their water from diet but will drink free-standing water when available

Cover: dense woody vegetation as well as relatively tall early successional cover including native grasses, forbs, and shrubs

Wildlife management practices

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

Delay Crop Harvest: hay harvest may be delayed so

fawning sites are not disturbed; however, poor-quality hay will result; also, if fawns are found in a hayfield, it is probably symptomatic of poor fawning cover on the property

Establish Field Buffers: to increase fawning cover and forage availability (forbs) around row crop fields

Establish Native Grasses and Forbs: where there is not at least 25 percent of the property in high-quality early successional cover

Forest Management Techniques: forest regeneration will provide increased browse, soft mast production and dense escape cover; timber stand improvement can provide increased browse and soft mast production and stimulate better cover in stands with a poorly developed understory

Increase Harvest: where populations can sustain additional harvest pressure for hunting recreation and/or where populations need to be lowered because of overpopulation and habitat degradation; in these cases, it is important to concentrate the harvest on females

Water Developments for Wildlife: where lacking (within one-half mile), dugouts and shallow impoundments can provide an external water source for drinking

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

Other Species

Bluegill

General information

The bluegill is one of the most abundant bream species. It thrives in a variety of conditions, ranging from freshwater lakes, ponds and slow-moving streams, to brackish waters of coastal areas. The bluegill's native range is the eastern United States from southern Canada to Florida and Texas, but they have been successfully introduced throughout the United States.

Habitat requirements

Diet: a variety of zooplankton (microscopic animal life) during the first few months of life, progressing to insects and their larvae, eggs, earthworms, tadpoles, small minnows and crayfish

Cover: submerged rocks, woody debris, and aquatic vegetation where small fish (used for food) hide

Water: basic requirements include dissolved oxygen (minimum of four parts per million); pH between 6.5 and 9.0; and water temperature should reach at least 70 F during the summer (1 foot below surface in the shade)

Wildlife management practices

Decrease Harvest: refer to wildlife management practices for specifics on fish harvest

Increase Harvest: refer to wildlife management practices for specifics on fish harvest

Manipulate Succession: grazing management should maintain thick herbaceous vegetation surrounding the pond and in the watershed that drains into the pond; livestock watering facilities should be developed away from pond or allow access to only a part of the pond

Ponds: Construction/Reconstruction: where no pond is present and/or where an existing pond needs extensive repair, especially to the dike or dam, including significant tree removal on the dike or dam

Ponds: Deepen Edges: where pond edges are not at least 2 feet deep to discourage rooted aquatic vegetation

Ponds: Fertilize/Lime: 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

Ponds: Reduce Turbidity/Reseed Watershed: by reseeding the watershed where soil is eroding into the pond and causing muddy water

Ponds: Repair Spillway: if not functioning properly

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

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

Box turtle

General information

Found in forests and grasslands throughout most of the eastern and central portions of the United States. Box turtles are omnivores with a highly diverse diet.

Habitat requirements

Diet: insects, soft mast, mushrooms, various vegetation, and carrion

Water: often found near water, but most likely obtains necessary water from diet

Cover: forests with a diverse understory and early successional cover with native grasses, and forbs; constructs nest in open areas (Stages 2 and 3) that are

warmer because of increased sunlight

Wildlife management practices

Establish Field Buffers: to increase usable space around row crop fields

Establish Native Grass and Forbs: where early successional cover is lacking

Forest Management Techniques: forest regeneration and timber stand improvement can increase herbaceous vegetation for forage

Manipulate Succession: prescribed fire is recommended to maintain a dense herbaceous understory; grazing management should prevent livestock from forests and maintain adequate herbaceous vegetation in open areas

Bullfrog

General information

The bullfrog's native range extends from the Atlantic coast to eastern Colorado and eastern Mexico, and from southern Colorado to northeastern Mexico.

Bullfrogs are not native west of the Rocky Mountains but have been successfully introduced in many areas.

Bullfrogs inhabit permanent bodies of standing or slow-moving water. Bullfrog tadpoles require two years to metamorphose. They 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. All habitat requirements are often found in and around a single pond.

Habitat requirements

Diet: insects, crayfish, other frogs, reptiles, snails, fish, and occasionally small mammals and birds

Water: stable water levels are necessary for hibernation and 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

Wildlife management practices

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

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

Manipulate Succession: grazing management should maintain thick herbaceous vegetation surrounding the pond and in the watershed that drains into the pond; livestock watering facilities should be developed away from pond or allow access to only a small part of the pond

Ponds: Repair Spillway: if the existing spillway is not functioning properly

Water Control Structures: should be installed if none are present so water depth can be managed as appropriate

Water Developments for Wildlife: where insufficient water source is present, water developments such as small ponds and shallow impoundments can be provided

Butterfly

General information

There are hundreds of butterfly species in America that occupy nearly every ecotype available. In urban areas, butterflies are found in gardens, yards, and parks planted with shrubs, and flowers that attract butterflies. They often lay eggs on a specific kind of plant. They eat food in liquid form.

Habitat requirements

Diet: usually sweet liquids such as nectar from flowers; also eat leaves and twigs, forbs, and grasses as caterpillars

Water: may collect on moist sand or mud around water puddles where they extract minerals

Cover: flowers, shrubs and trees (listed below) where sheltered from the wind

Wildlife management practices

Artificial Feeders: can supplement food resources

Establish 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 windbreak; 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

Note: Plant Flowers should not be recommended to plant Rooftop / Balcony Gardens

Frog

General information

There are many frog species that inhabit wetland areas throughout the United States. Weeds and aquatic vegetation on the edges of ponds, lakes and slow-moving

streams are preferred areas. Mud bottoms are needed so frogs can bury themselves for hibernation during winter. Frogs typically breed and lay their eggs in water. Frogs are carnivorous and eat a varied diet of insects.

Habitat requirements

Diet: primarily insects but also aquatic plants, worms, eggs, frogs, and snails
Water: needed for moisture and hiding; many kinds of frogs will dry up and die if their skin is not kept moist
Cover: thick herbaceous vegetation on bank or shore adjacent to water; also floating vegetation in the water next to shore

Wildlife management practices

Establish Native Grasses and Forbs: around water sources to provide cover
Streams: Dams, Boulders or Logs: may provide more usable space for frogs
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

Largemouth bass

General information

Largemouth bass (members of the sunfish family) Largemouth bass are an extremely popular freshwater sportfish. They are found in freshwater lakes, rivers, large streams, farm ponds, and brackish marshes.

Habitat requirements

Diet: young bass eat insects and other invertebrates (worms, crayfish, and zooplankton); adults eat small fish such as bluegill and a variety of minnows, as well as tadpoles, crayfish, and evenducklings
Cover: submerged rocks, woody debris and near aquatic vegetation where small fish (prey) hide
Water: basic requirements include dissolved oxygen (minimum of four parts per million); pH should range between 6.5 and 9.0; water temperature should reach at least 70 F during summer (1 foot below surface in shade)

Wildlife management practices

Decrease Harvest: refer to the wildlife management practices for specifics on fish harvest
Increase Harvest: refer to the wildlife management practices for specifics on fish harvest
Manipulate Succession: grazing management should maintain thick herbaceous vegetation surrounding the pond and in the watershed that drains into the pond; livestock watering facilities should be developed away from ponds or allow access to only a small part of the pond
Ponds: Construction/Reconstruction: where no pond is present and/or where an existing pond needs extensive repair, especially to the dike or dam, including significant tree removal on the dike or dam
Ponds: Deepen Edges: where pond edges are not at least 2 feet deep to discourage rooted aquatic vegetation
Ponds: Fertilize/Lime: 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
Ponds: Reduce Turbidity: by reseeding the watershed where soil is eroding into the pond and causing muddy water
Ponds: Repair Spillway: if not functioning properly
Ponds: Restock: if the population is too far out of balance to correct via seining or fishing or if undesirable species are present
Water Control Structures: should be installed if none are present so water depth can be controlled

Rainbow trout

General information

Rainbow trout are native to the United States west of the Rocky Mountains. However, they have been introduced throughout the United States as a sport fish. Rainbow trout are cool- to cold-water fish that do best in freshwater systems below 70 F. They can thrive in both rivers and lakes. Rainbow trout are carnivorous and spawn in areas with a rocky river or lake bottom. A water flow that reduces sedimentation of the river floor will increase spawning. A healthy riparian system provides rainbow trout with shade. They are responsible for driving many native species into extinction or endangerment in places where they have been introduced. Thus, increased harvest may be required in some streams to control their abundance in river systems and protect native species.

Habitat requirements

Diet: fish, aquatic insects, crustaceans, and mollusks; may also eat terrestrial organisms that fall into the water, but this is not common
Water: streams, lakes and ponds where the water does not rise above 70 F in summer; ideally stream should have 50 percent riffles and 50 percent pools; basic requirements include dissolved oxygen (minimum of six

parts per million); pH should range between 6.5 and 9.0
Cover: rocks, as well as debris on the bottom of the river or lake, provide cover for hiding from prey or anglers

Wildlife management practices
Decrease Harvest: refer to wildlife management practices for specifics on fish harvest
Increase Harvest: refer to wildlife management practices for specifics on fish harvest; managers have begun reducing rainbow trout populations to minimize predation on or competition for resources with native fish species; increasing the harvest can reduce the rainbow trout population
Manipulate Succession: grazing management should maintain thick vegetation on banks and shores; livestock watering facilities should be developed away from streams, rivers, lakes or ponds; fencing along the riparian area or lakeside may also be necessary
Ponds: Construction/Reconstruction: where no pond is present and/or where an existing pond needs extensive repair, especially to the dike or dam, including significant tree removal on the dike or dam
Ponds: Deepen Edges: where pond edges are not at least 2 feet deep to discourage rooted aquatic vegetation
Ponds: Fertilize/Lime: 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
Ponds: Reduce Turbidity: by reseeding the watershed where soil is eroding into the pond and causing muddy water
Ponds: Repair Spillway: if not functioning properly
Ponds: Restock: if too few are present
Streams: Dams, Boulders Logs: gravel and cobble should be placed in stream to provide structure for insects and locations for spawning; structures should not change currents, which could increase bank erosion; boulders and logs may be placed in the stream or lake to provide cover for trout while hunting, as well as cover for prey species
Stream: Remove Fish Barriers: because most native rainbow trout populations are migratory, dams can impede their ability to return to spawning grounds; installing fish ladders or removing dams will improve rainbow trout's ability to migrate
Water Control Structures: should be installed if none are present so water depth can be controlled

Wildlife Management Practices (WMPs)

In this section, various practices used to manage wildlife and their habitat are described in further detail. They are listed in alphabetical order. The descriptions are brief and general and are not meant to be comprehensive. Identify and learn the practices recommended for the species listed in the regions you are studying. When preparing for a competitive event, it is only necessary to learn information pertaining to the WMPs appropriate for the species included in the region that will be used in the event.

Several practices are commonly used in certain regions, but not in others. Study only the appropriate practices listed on the chart found for the region you are studying. 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.

Some of the practices may seem contradictory. For example, Ponds: Deepen Edges discourages the growth of emergent aquatic vegetation, while Water Control Structures could encourage growth. ***Landowner objectives should determine which practices you recommend.***

Some practices may not be applied in all regions, even though you may be dealing with the same species. For example, Forest Management is not appropriate for mourning dove in the shortgrass prairie, but it may be in other regions. It is also important to remember that when deciding whether or not to recommend a WMP, you are assessing current conditions and determining if a WMP needs to be applied within the next year. However, keep in mind that the benefits of a WMP may not be seen for years. For example, planting mast 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. At times, the best recommendation is maintaining an area in its current condition. This can include protecting the area from development and applying various WMPs 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 WMPs.

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Control Nonnative Invasive Vegetation

General description

Nonnative 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 nonnative 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 nonnative 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 as a result of nonnative invasive species.

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

Without management, nonnative invasive species continue to spread, limit plant species diversity and degrade wildlife habitat. Most often, herbicide applications are necessary to control nonnative invasive species. Some species can be controlled by hand-pulling or mechanical techniques. Of course, nonnative invasive species should never be planted. Few properties in the country do not contain any nonnative species. When evaluating an area for this contest, consider the impact nonnative species are having on the native plant community and associated wildlife.

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

Kudzu is a common sight in Alabama. This invasive plant out-competes most native vegetation.

Effect on habitat

Killing nonnative 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** nonnative invasive species often leads to increased plant species diversity. **Eliminating** nonnative 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 nonnative trees and shrubs can increase space for desirable tree and shrub species, which can lead to increased mast production.

Decrease Harvest

General description

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.

Bass

Needed when seine samples and fishing records of a pond reveal no recent bluegill hatch many medium-sized bluegill in poor condition bass are few in number, but large and in good condition

Bluegill

Needed when seine samples and fishing records of a pond reveal many recently hatched bluegill very few medium-sized bluegill bass less than 1 pound and in poor condition no young bass

Trout

Needed when seine and fishing records of a pond reveal:

- fish in good condition
- few medium- and large-sized fish
- many small fish

Game birds and mammals

Regulated hunting is a primary tool used to keep several game species within the carrying capacity of available habitat. 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.

Delay Crop Harvest

General description

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. 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.

Note: This practice should be recommended only when a hay or row crop is present or is planned for the current growing season.

Effect of practice

Destroying fewer nests and young at a specific time, such as May/June when fawns and initial nests of most songbirds are most vulnerable, can help maintain a sustainable population or population increase.

Establish Field Buffers

General description

Field 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 buffers 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 buffers 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.

Note: Establish Native Grasses and Forbs and/ or Plant Shrubs should not be recommended to Establish Field Buffers. However, if there are existing field buffers of undesirable nonnative species, Control Nonnative Invasive Vegetation should be recommended. Only recommend additional field buffers if there are crop fields without buffers or additional buffers 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 on habitat

- Can prevent sedimentation and nutrient runoff
- Provides increased usable space for many wildlife species
- Provides nesting and/or brooding cover for many songbirds, bobwhites, and wild turkeys.
- Can provide increased forage and seed availability if desirable forbs are established.

Establish Native Grasses and Forbs

General description

Native grasses and forbs are recommended primarily to increase or enhance early successional habitat for a number of wildlife species. Nonnative 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 nonnative cover with selective herbicides and allowing native seed lying dormant in the seedbank to germinate.

Note: If native grasses and forbs are planted, it is imperative to eradicate undesirable nonnative grasses and forbs before planting. This will require herbicide applications. In this situation, you should also recommend Control Nonnative Invasive Vegetation.

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 predominantly forested and where the majority of existing early successional habitat is dominated by nonnative 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 miles of contiguous native grasses and forbs.

Desirable native warm-season grasses:
bluestems, switchgrass, sideoats grama, and indiangrass

Desirable native cool-season grasses:
wildryes and low panicgrasses

Undesirable nonnative warm-season grasses:
bermudagrass, cogongrass, johnsongrass, crabgrass, dallisgrass, and goosegrass

Undesirable nonnative cool-season grasses:
tall fescue, orchardgrass, bromegrasses, and timothy

Desirable native forbs and brambles:
ragweed, pokeweed, blackberry, dewberry, native lespedezas, beggar's- lice, old-field aster, partridge pea, perennial sunflowers, and crotons

Undesirable nonnative forbs:
sericea lespedeza, curly dock, spotted knapweed, sicklepod, and cocklebur

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 before 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.**

Forests with diverse understories containing native grasses and forbs support a wide variety of wildlife.

Effect on habitat

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.

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.

Fish or Wildlife Survey

General description

Fish surveys

Population balance is first established in ponds by stocking the correct number of fish. After the first year, pond balance should be checked during early summer by seining at intervals around the pond. Four to five seine sweeps in an average pond is usually enough. Balance is determined by comparing age groups, condition and numbers of bass and bluegill caught in the seine and from fishing records.

Recent reproduction of both bass and bluegill in the seine indicate the fish population is balanced. Fish caught by hook-and-line can be evaluated on body condition (fat, skinny, size of head in relation to body, etc.). Trout do not often reproduce in ponds, so overall health of the fish is used as an indicator of pond balance. Unwanted species (bullheads, crappie, etc.) may also be caught in the seine or when fishing, indicating the fish population may be killed (with Rotenone) or drained.

Seining is usually not effective for collecting fish in streams. Fish in streams are usually collected by fishing or electrofishing. Electrofishing 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 can be collected with a net to observe and record information such as the species, age, length, and condition. The fish are then returned to the water. This method provides a basis for determining stream balance.

Wildlife surveys

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.

Note: While fish and wildlife surveys are always important, they should not be recommended if it is stated or the field

condition sheet indicates a survey has been completed recently.

Forest Management Techniques

General description

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 (timber 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. Thus, 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; Eastern gray squirrels that were using that stand before harvest would have to move to an adjacent stand. At the same time, 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.

Note: 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, ' Manipulation of Succession' (chainsawing) and 'Establish Native Forbs and Grasses' 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.

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.

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.

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 close 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 chain saw or hatchet and applying herbicide to the wound.

Effect on Habitat

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 actually helps forest regeneration as newly emerging seedlings are protected from deer browsing.

Timber Stand Improvement (TSI)

TSI may involve any of several 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. TSI 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 TSI 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 chain saw or hatchet and applying herbicide to the wound.

Effect on habitat

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 TSI are able to grow larger crowns and produce additional mast. Down logs and other woody debris left following TSI provide sites for feeding, denning, drumming, reproducing, hiding, and resting for several species.

Increase Harvest

General description

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.

Bass

Needed when seine samples and fishing records of pond reveal many recently hatched bluegill, very few medium-sized bluegill, bass less than 1 pound and in poor condition, or few or no young bass. You should increase bass harvest cautiously, and target bass less than 1 pound and spread the harvest over the summer.

Bluegill

Needed when seine samples and fishing records of pond reveal no recent bluegill hatch, many medium-sized bluegill in poor condition, when bass are few, large and in good condition. You should target medium-sized bluegill using seine harvest or shoreline rotenone

Trout

Needed when seine or fish records reveal many fish, small

and in poor condition in many areas, extremely cold water reduces trout growth; in these situations, harvesting more may not be beneficial

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.

Leave Grain Unharvested

General description

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.

Effect on habitat

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.

Manipulate Succession

General description

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 in a n effort to retain the successional stage(s) beneficial for the focal wildlife species. There are essentially four general methods for manipulating succession: ***mechanical methods, fire, grazing, and herbicide applications.*** Each of these may be applicable for manipulating succession in any region for various species, but they may not produce the same effect.

One or more may be recommended over another depending on the situation. In some instances, more than one method may be applied. For the written segment of the contest, the recommended methods for manipulating succession should be specified and reasons given as to why they are recommended.

Mechanical methods

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 Nonnative Invasive Vegetation should be recommended for those areas.

Effect on habitat

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.

Chainsawing / Feller-bunchering

A chain saw 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.

Note: 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 Establish Native Grasses and Forbs or Plant/Manage Food Plots, it should be recommended as well.

Effect on habitat

Reduces tree density and encourages early successional plant communities.

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.

Effect on habitat

Helps remove competition of some kinds of shrubs, allowing grasses and forbs to grow better. Woody growth however, usually readily resprouts following chaining or roller beating. Helps maintain succession in Stage 4; encourages resprouting. In Stage 5, reverts succession to Stage 4.

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.

Effect on habitat

Helps maintain Stage 3 or 4.

Helps remove competition from some kinds of shrubs, allowing grasses and forbs to grow better. Maintains low shrub growth with certain species of shrubs by encouraging resprouting. In Stage 3 and 4, helps rejuvenate grasses, forbs and shrubs, which improves nesting cover for some bird species. Causes thatch build-up, which reduces availability of invertebrates and seed to young quail, grouse, turkeys, and other ground-feeding birds. Thatch buildup also reduces the ability of these animals to move through the field and suppresses the seedbank.

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. With the exception of intense fire, more frequent burning over time will change vegetation composition more so than less frequent burning.

Prescribed burning allows for the germination of some types of seeds.

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 in close proximity to 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.

Effect on Habitat

Reduces litter layer (such as dead leaves and grass), which reduces chance of wildfire and enables the seedbank to germinate. Improves seed and invertebrate availability for many species. Scarifies (breaks down outside coating) some seeds so they can germinate.
Releases nutrients into the soil.
Burning during the dormant season does not significantly alter vegetation composition. Small woody stems may be top-killed, but usually resprout. Burning during the late growing season more effectively kills woody stems and may reduce density of native warm-season grasses and encourage additional forb cover.

Grazing 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 nonnative forage pasture (such as tall fescue, orchardgrass, 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 to prevent 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.

Effect on habitat

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.

Allowing cattle to browse reduces vegetation cover and allows younger plants to grow.

Herbicide Applications

Herbicides are often applied to control undesirable vegetation and encourage plants that are more desirable for wildlife.

Effect on habitat

In some areas, hardwood brush reduces vegetative diversity and limits many plants important for wildlife. Proper herbicide applications control unwanted woody growth and encourage more herbaceous groundcover. May be used to revert Stages 4 or 5 to Stages 2 or 3.

Nesting Structures

General description

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. Contact your county Extension office for specific designs of nest boxes and other artificial nesting/roosting structures.

Note: 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.

Nesting structures such as this bird house provide necessary nesting and brooding shelter where natural shelters might not be present.

Effect on habitat

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.

Plant / Manage Food Plots

General description

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.

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 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 that 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.

Before planting, the seedbed should be prepared by conventional tillage or with herbicide applications before planting seed with a drill or planter. Tillage and herbicide applications, however, should not be recommended as separate practices in order 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.

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 on habitat

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, orchardgrass, bermudagrass, etc.), forage plots can supply high-protein foods, especially during late summer and through winter and spring.

Plant Trees

General description

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 on habitat

Provides hard or soft mast production, depending on the species planted. Large areas can be planted for reforestation. Provides additional 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.

Plant Shrubs

General description

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).

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 (TSI) should be recommended.

Effect on habitat

Can provide additional food and cover for many wildlife species in areas where specific species of shrubs are lacking. Shrubs are an important component of travel corridors,

which allow wildlife to move safely across open fields between two areas of cover. 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.

Shrub plantings may be useful in some urban settings where desirable cover and/or soft mast are lacking. 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.

Pond: Construction / Reconstruction

General description

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 on Habitat

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.

Ponds: Deepen Edges

General description

In ponds with excessive aquatic vegetation along the margins of a pond, the edges should be deepened to a minimum of two to 3 feet with steep side slopes. If the pond can be drained, this can be accomplished with a bulldozer or tractor with a rear blade. If the pond cannot be drained, a backhoe can be operated from the top of the pond bank. Soil can be removed from the site or piled around the bank and then smoothed out and planted to native grasses and forbs.

Effect on habitat

Reduces rooted aquatic vegetation around the edge of a pond, making prey more easily available to predator fish.

Ponds: Fertilize/Lime

General description

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 fish ponds 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.

Fish ponds 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 1 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 on habitat

Pond fertilization stimulates phytoplankton production, which is the first step in the food chain of a fish pond.

Ponds: Reduce Turbidity / Reseed Watershed

General description

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 has to be based on effectiveness, availability, cost and the ability of the pond owner to apply the product correctly.

Effect on habitat

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.

Ponds: Repair Spillway

General description

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 on habitat

Enables pond to fill to appropriate level and precludes vegetation from establishing around the inside perimeter of the pond.

Ponds: Restock

General description

Restocking a 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 warmwater ponds, bluegill fingerlings should be stocked in late fall and bass fingerlings are stocked the following June. Although various states have different stocking recommendations, typical stocking rates are 1,000 bluegill and 100 bass per surface acre if the pond is to be fertilized, or 500 bluegill and 50 bass per surface acre if the pond will not be fertilized.

Effect on habitat

Draining ponds and using fish toxicants remove unbalanced fish populations and allow establishment of desirable balanced fish populations.

Create Snags

General description

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.

Snags such as this one help create food source and sheltering options for birds and other wildlife

Effect on habitat

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.

Streams: Dams, Boulders or Logs

General description

Small (less than 1.5 feet high) dams are built across streams to raise the water level and create pools. Large boulders or logs are placed in streams (with hard bottoms) to improve fish habitat. The rocks need to be large enough so small floods will not move them. Any structures put in a stream have the potential to alter stream currents in an undesirable manner. The placement and design of such structures should be done with advice from experts.

Natural, rocky shorelines provide shelter for fish and foraging habitats for birds. The rocks also help reduce bank erosion.

Effect on habitat

Used to create pools for fish to hide and rest.

If designed properly, can be used to reduce some kinds of stream erosion.

Used in areas with considerably more riffles than pools.

Streams: Remove Fish Barriers

General description

Remove or replace culverts or large dams that prevent fish passage upstream. Culverts with great drops below them or with water flowing too fast through them can block fish from going upstream. These culverts can be replaced with arched or bottomless culverts or with bridges. In some cases, “fish ladders” or steplog structures can allow fish passage around barriers.

Effect on habitat

Allow fish to access and migrate within the stream system and between the stream and ocean to complete their life cycles.

Tillage Management

General description

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 practice

Increases supply of waste grain, which is eaten by many wildlife species, and may increase nesting success.

Water Control Structures

General description

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 on habitat

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

General description

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.

Dugouts (small ponds) can be created with backhoes or bulldozers. These 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.

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 before 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 and 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 on habitat

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.

Wildlife Damage Management Techniques

General description

Wildlife managers often have to manage wildlife to control damage. Wildlife damage management is most common in urban and suburban areas where wildlife and humans frequently interact. Examples of wildlife damage include 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, and 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 overbrowsing 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 nonnative 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.

Urban Wildlife Management Practices

Artificial feeders attract many popular species, like this Blue Jay.

Artificial Feeders

General description

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 nonnative 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 practice

Provides supplemental food source, primarily for viewing purposes.

Mowing

General description

Mowing with a push or riding lawnmower can maintain early successional habitat in urban areas. Lawns and park-like settings are the most often mowed areas. Mowing is usually the only practice for managing early successional habitat in urban areas as burning is typically not allowed, and chaining/roller beating, disking, and grazing are not practical. Many wildlife species inhabiting urban areas require early successional habitat interspersed with shrub and forest for foraging purposes and travel corridors.

Effect on Habitat

Mowing keeps succession in Stages 2 or 3. Wide expanses of mowed areas may not provide adequate cover for wildlife, therefore it is important to leave some areas unmowed or provide cover using islands of shrubs and flowers.

Plant Flowers

General description

Annual and perennial forbs can be planted to attract a number of 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 on habitat

Provides a supplemental source of food and cover.

Rooftop / Balcony Gardens

General description

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 on Habitat

Provides food, cover, and water, though in small amounts, for wildlife in urban areas.

Interpreting Wildlife Habitat from Aerial Photographs

Aerial photographs (black and white, color, or infrared) can be used to evaluate potential habitat for wildlife. This is especially helpful when evaluating property from a landscape scale. The proportion of open area to forested area, and the presence or need for riparian corridors or other travel corridors are sometimes not evident "on the ground," thus an aerial view is often very helpful.

It is important to realize 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 discerned. Although a 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, that distinction could not be made for more general species, such as white-tailed deer or wild turkey. The dominant tree species and structure of the understory in the forest would greatly influence habitat quality for deer and turkeys. Likewise, the species of grass, forbs and shrubs would influence habitat quality in Stages 3 and 4. These 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.

When using aerial photos, it is important to be able to identify certain 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. However, the most important information obtained from an aerial photo is the general landscape composition and the interspersion and arrangement of vegetation types and successional stages.

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 rough and hayfields are smooth.

When viewing aerial photos, hold them so the shadows of objects fall toward you. Otherwise, valleys appear as ridges, and vice versa. All objects are small, but you can determine what they are by comparing their size with the size of a known object. Other things that help are tone (shade of gray), shape and shadow. 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 date the photo was taken is usually in the upper left corner. The scale of aerial photos can vary, but often either 4 or 8 inches on the photo equals 1 mile on the ground.

Terraserver® and Google Maps® are good resources for samples of aerial photos. Your local Natural Resources Conservation Service Office or government planning office may also be able to provide you with sample aerial photos. The following are some examples of common features of aerial photographs with examples of what those resources look like from the ground. Discuss these examples with your team. Concentrate on learning to recognize what different shapes, textures and colors in aerial photos represent in terms of natural resources.

Example 1: Pine versus Hardwood

Figure 1. This aerial photo shows two different forest types. Row, or planted, Pine (#1); Mixed deciduous hardwoods (#2); and an open field (#3).

Figure 2. This is what the row pines (#1) in Figure 1 look like from the ground.

Figure 3. This is what the hardwoods (#2) in Figure 1 look like from the ground.

Figure 4. This is what the open field (#3) in Figure 1 looks like on the ground.

Summary of Example 1

Notice that the pine trees (see Figure 2) 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 (Figure 1, point #1). It also makes them stand out against the more natural, random arrangement of trees in the hard- wood forest (see Figure 3.). Because the hardwoods sprout and grow naturally (or randomly) the canopy appears to be even, without the "wrinkles" of the planted pines (Figure 1, point #2). Figure 1 also shows an open field (point #3). Notice that the field appears very smooth compared to the surrounding forest. You can tell the pines are tall, because they cast a shadow on to the field (Figure 1, arrow).

Example 2: Open Water, Utility Swath, & Dam

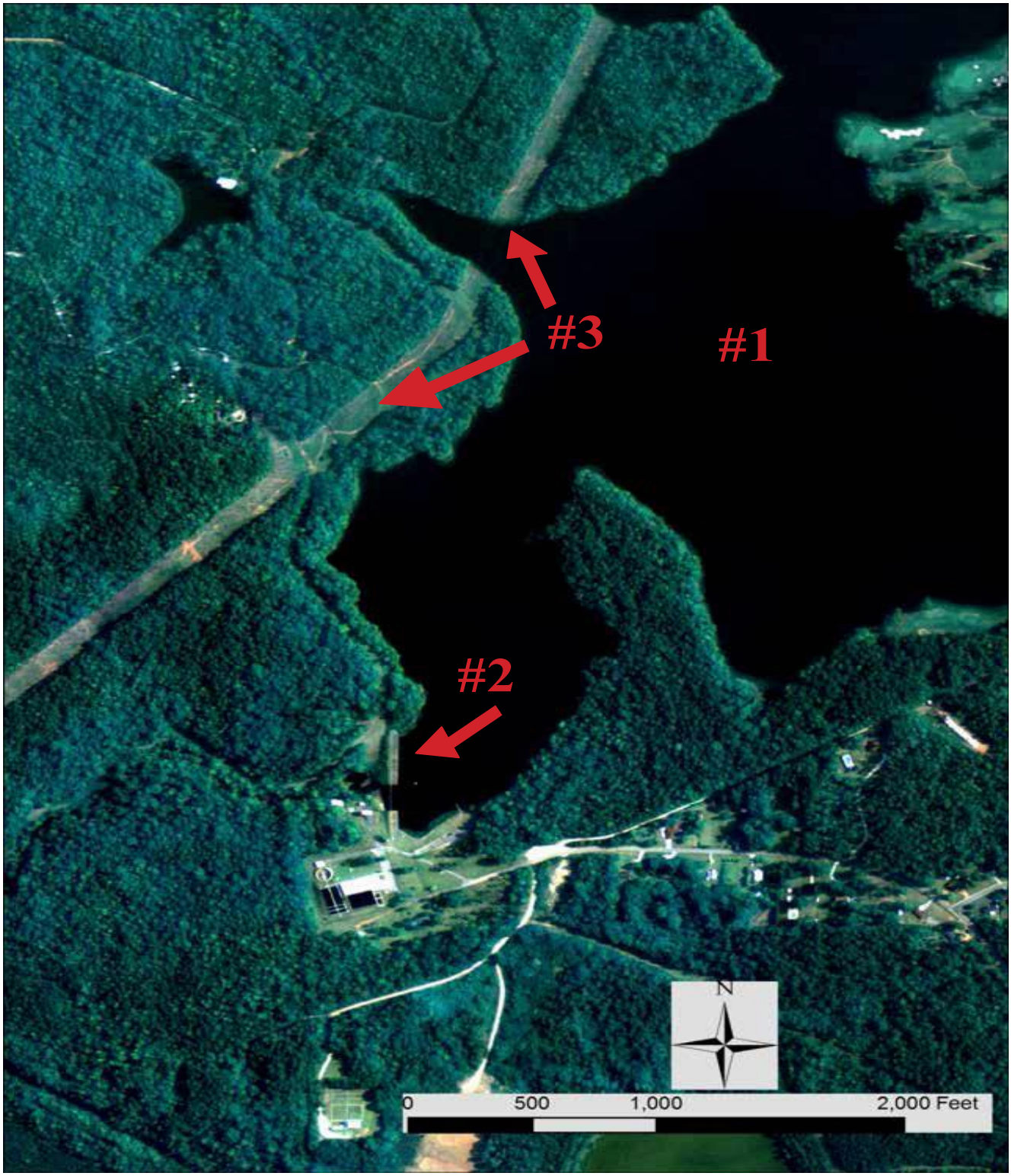

Figure 5. Most of this photo is dominated by mixed hardwoods, and a large lake (#1). It also shows a dam (#2) and a utility swath (#3).

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

Figure 7. This is the dam (#2) shown in Figure 5.

Figure 8. This is what the utility corridor (#3) looks like.

Summary of Example 2

You can tell the lake is very deep because it is very dark (Figure 1). Shallow lakes look light green or turquoise on aerial photos, while deep lakes look dark blue or black. The dam (#2) and the utility swath (#3) stand out in Figure 1 because of their straight lines. It is unusual to see straight lines in natural landscapes, so they are a good indication of human activities such as farming, timber harvests, road construction, and suburban home construction.

Additional Resource

One of the best ways to study for the aerial photos contest is to use Google Earth®. This free program allows you to view aerial imagery for the entire United States. The program also has a feature that provides a street-level view from most roadways. To learn more or download the program yourself, visit ***www.earth.google.com.***

WHEP Activities and Scoring

Individual Activities

Wildlife Identification, Wildlife Foods, Interpretation of Aerial Photographs, and Wildlife Management Practices will be scored on an individual basis. Awards may be presented to the top five individuals for these activities. The top individuals overall will be identified by the sum of the scores of these activities. The top three individual scores for each individual activity will count toward the total overall team score. For teams of four members, the lowest score will be dropped. For teams of three members, all scores will count.

Activity I: Wildlife Identification (20 points)
Activity II: Interpretation of Aerial Photos (25 points)
Activity III: Wildlife Foods (25 points)
Activity IV: On-Site Recommendation of Wildlife Management Practices (30 points)

Team Activity

Activity IV: Written Wildlife Management Plan (140 points)

Activity I: Wildlife Identification (20 Points)

Wildlife managers must be able to identify the species they are managing. The objective of Activity I is to test the participants' ability to identify wildlife species within the various regions presented in the Alabama WHEP manual. Activity I will ask participants to identify wildlife species that occur in Alabama. The species represented in this activity will be drawn from the species list found in the WHEP Addendum. To practice for Activity I, teams are encouraged to use field guides and websites.

Activity I may be presented in audio, visual, and specimen displays and may include a PowerPoint® presentation. The participants must identify the species provided and write its name next to the corresponding number on the scorecard.

The species displayed may be an adult or juvenile; male or female; or a body part.

Each participant will be given a score sheet containing the name of each species on the wildlife ID list. They will record the number of the corresponding animal.

This is an individual event. Contestants are not allowed to have any electronic devices with them during the contest.

Activity II: Interpretation of Aerial Photos (25 points)

Aerial photos are a useful tool for wildlife managers. They allow managers to rapidly assess the features and habitat resources present across a large area. The purpose of this activity is to test the participants' ability to identify and interpret natural habitat features using aerial photos.

Aerial photographs will be displayed and question sheets provided. Participants will mark their answers on the scoresheet provided.

The following is an example of typical questions for this activity. Answers will appear in red. Junior and Senior division participants may have different scoresheets as appropriate.

Interpreting Wildlife Habitat from Aerial Photos

Name:_____County: _____ Jr. or Sr. _____

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? Answer: A

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

Rank	Property
2	A
1	B
3	C
4	D

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

Rank	Property
3	A
4	B
2	C
1	D

4. Which of these properties includes a large riparian corridor? Answer: B

5. Which one of these properties would be most suitable for Wood Duck? Answer: B

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? Answer: B

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

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

Rank	Property
3	A
1	B
2	C
4	D

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

Rank	Property
2	A
4	B
1	C
3	D

A

C

B

D

Activity III: Wildlife Foods (25 points)

You'll be asked to identify common wildlife foods and identify which species eat them. The food items may be represented by pictures, preserved specimens, or live specimens. To prepare for this activity, study the foods charts in the South Eastern mixed and Outer Coastal Plain Forest, unless otherwise specified.

Important points to remember about the food preferences of wildlife species: 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.

Appendix B (Definitions of Food Groups) of this handbook contains definitions of, and information on, all of the wildlife foods participants may be tested on. These definitions will let you know what to expect when you see these foods during this activity.

Procedure

Participants will be given a blank scorecard similar to the food habit tables found in each region's description in this manual. Food items will be placed on two long tables and numbered 1 through 10. Participants form two lines (one on each side of the tables) and move from 1 to 10, identifying the represented wildlife foods. Then, they return to their seat and fill out the rest of the scorecard.

Scorecard

The contest scorecard will look similar to the food habits tables in each of the region descriptions in this handbook. The scorecard will be blank, except for the column headings. The column headings will display wildlife species, chosen by the Alabama WHEP Committee. The selected species, as well as the wildlife foods chosen, will vary and not be the same between years. The following instructions will appear on the scoresheet: "Write the name of each food item on the score sheet by the corresponding number. Then, mark an "X" in the boxes with the appropriate food for each species. It is possible that some wildlife species listed may not eat any of the food items presented."

Scoring

There are 100 cells on the scorecard (10 foods IDs, plus 90 wildlife /food associations). For the ten food identifications, a point will be awarded for every food correctly identified.

The remaining 90 cells are food/animal associations, representing the food habits of the ten given species, credit will be awarded for a cell if:

1. A cell that should be marked is marked; or
2. A cell that should be left blank is left blank.

For the food association, scoring will be as follows:

$$\frac{\text{Correct-Incorrect}}{90} \times 15$$

and is worth up to 15 points. This score will be added to the food identification score (up to 10 points). These scores will be added together to make up the total wildlife food score (up to 25 points).

Activity IV: On-Site Recommendation of Wildlife Management Practices (WMPs 30 Points)

Activity IV involves the recommendation of WMPs necessary to manage wildlife and habitat on a given site. Management recommendations in Activity IV should consider each species listed ***separately*** and WMPs recommended as if each species was the only species considered on the site. Note that not all WMPs are listed for each region. Only those practices appropriate for the region are listed. Refer to the WMP charts in the "Regions" section.

This activity will take place at a location to be determined by the Alabama WHEP Committee. Before starting Activity IV, participants will be given a written scenario/field condition sheet describing conditions at the site and the landowner's objectives. Based on this information, and the participant's observations, circle the "X" on the WMP sheet that should be implemented to achieve the goals in the scenario. Contestants will have one hour to complete Activity IV. This is an individual activity, so no talking is allowed.

Scoring

Total Score = [(total correct - total incorrect)/ total possible correct] × 30

Refer to the Southeast Mixed and Outer Coastal Plain Forest III-5. All boxes with an "X" are counted in the scoring. There are 210 possible correct answers.

Participants receive points:
Circling the appropriate "X" on the score card; and Not circling "X's" that should not be marked based upon the scenario/field condition sheet.

Note: During the contest, all "X's" on the WMP chart may or may not be used, because the correct answers depend on the information given about the site and the conditions present on-site at the time of the contest.

Participants lose points:
"X's" that should be circled are not circled; and "X's" that should not be circled are circled.

No negative scores will be assigned. The minimum individual score on Activity IV is zero. Blank WMP worksheets for each region are provided in Appendix A for practice use.

Activity V: Written Urban Management Plan (140 Points)

Referring to an identified area, teams make written recommendations based on landowner objectives as stated on a written Field Condition Sheet, which is provided to each team before Activity II-A. Each team interprets the objectives, identifies the focal species, recommends WMPs and their intended impact, and states how the plan will be evaluated. The "Judges' Scoring Sheet – Written Management Plan," shown below, details how plans are judged. All plans must be written using paragraph format. A sample management plan work sheet is also included to help teams prepare for writing management plans.

For the Alabama WHEP Contest, teams may use one side of each of two pieces of paper provided. The team name must be written on the blank back side of each sheet. Both sides of one sheet of paper should not be used to write the management plan. Plans not written in the proper format or correctly identified will not be judged.

Participants will be required to draw a sketch and locate where recommended practices will be implemented. An aerial photo of the area may be provided. Teams will have one hour to complete this activity.

Sample Written Wildlife 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 multiuse 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.

This is a team activity. Use only one side of each of two (2) pages to write your plan. You have one hour to complete this activity. Good Luck!

Sample Written Wildlife Management Plan work sheet

This sample work sheet is intended to help you learn the correct format for writing management plans. In a contest, you will be given two blank pieces of paper. You must know the format and what is to be included in each section. You can only use one side of each of two sheets of paper. Learn to write neatly, using small print and short concise sentences. For the total score, in addition to the points listed below, a maximum of 20 points will be given for use of the correct format and inclusion of an accurate sketch of the site.

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 are able to utilize all successional stages on this property.

Part 3: Plan Implementation (70 Points)

This section should indicate the team has an understanding of 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 chainsawing 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 chain saw 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.

Wildlife Habitat Education Program Judges' Scoring Sheet – Written Management Plan

Activity IV-B

Scale for Scoring:	0= not at all 2= poor or poorly 4 = fair or slightly well	6= good or fairly well 8 = excellent or very well 10 = outstanding	Team County Jr. or Sr. Judge's Initials

Part 1: Plan Background (20 points maximum)

The plan accurately identified the wildlife species to be managed	0	2	4	6	8	10
The plan accurately identified the management objectives	0	2	4	6	8	10

Part 1: Plan Background Subtotal _____

Part 2: Plan Development (20 points maximum)

The team demonstrated understanding of the habitat needs of each species	0	2	4	6	8	10
The team accurately evaluated the existing habitat (what is present and what is lacking) based on management objectives and species to be managed	0	2	4	6	8	10

Part 2: Plan Development Subtotal _____

Part 3: Plan Implementation (70 points maximum)

The team included the **appropriate management practices**	0	2	4	6	8	10
The team fully explained **when and where** each practice should be implemented	0	4	8	12	16	20
The team demonstrated knowledge of practices effects on existing habitat and benefits to each species	0	4	8	12	16	20
The team used the appropriate native plant species in their plan and/or recognized invasive species	0	2	4	6	8	10
The team recognized the management compromises necessary to meet the needs of each species and showed understanding of the mutual benefits of implementing certain WMPs	0	2	4	6	8	10

Part 3: Plan Implementation Subtotal _____

Part 4: Plan Evaluation (10 points maximum)

The team presented a realistic plan for monitoring the success of their plan	0	2	4	6	8	10

Part 4: Plan Evaluation Subtotal _____

Part 5: Content (20 points maximum)

The team presented the plan in the appropriate narrative format	0	2	4	6	8	10
The team included a sketch of the area that accurately reflected the management practices to be implemented.	0	2	4	6	8	10

Part 5: Content Subtotal _____

Total Points for Part 1 _____
Total Points for Part 2 _____
Total Points for Part 3 _____
Total Points for Part 4 _____
Total Points for Part 5 _____
Final Score _____

Appendix A Scoresheets

Eastern Deciduous Forest Table	black bear	bluegill	bobcat	box turtle	brown thrasher	Eastern bluebird	Eastern cottontail	Eastern gray squirrel	great horned owl	largemouth bass	mourning dove	Northern bobwhite	ovenbird	ruffed grouse	white-tailed deer	wild turkey	wood duck
Control Nonnative Invasive Vegetation																	
Decrease Harvest																	
Delay Crop Harvest																	
Establish Field Buffers																	
Establish Native Grasses and Forbs																	
Fish or Wildlife Survey																	
Forest Management																	
Increase Harvest																	
Leave Grain Unharveste																	
Manipulate Succession																	
Nesting Structures																	
Plant/Manage Food Plots																	
Plant Shrubs																	
Plant Trees																	
Ponds: Construction / Reconstruction																	
Ponds: Deepen Edges																	
Ponds: Fertilize / Lime																	
Ponds: Reduce Turbidity																	
Ponds: Repair Spillway																	
Ponds: Restock																	
Create Snags																	
Tillage Management																	
Water Control Structures																	
Water Developments for Wildlife																	
Wildlife Damage Management																	

Eastern Deciduous Forest Table								
Control Nonnative Invasive Vegetation								
Decrease Harvest								
Delay Crop Harvest								
Establish Field Buffers								
Establish Native Grasses and Forbs								
Fish or Wildlife Survey								
Forest Management								
Increase Harvest								
Leave Grain Unharveste								
Manipulate Succession								
Nesting Structures								
Plant/Manage Food Plots								
Plant Shrubs								
Plant Trees								
Ponds: Construction / Reconstruction								
Ponds: Deepen Edges								
Ponds: Fertilize / Lime								
Ponds: Reduce Turbidity								
Ponds: Repair Spillway								
Ponds: Restock								
Create Snags								
Tillage Management								
Water Control Structures								
Water Developments for Wildlife								
Wildlife Damage Management								

Southeast Mixed & Outer Coastal Plain Forest Table	American kestrel	black bear	bluegill	coyote	Eastern bluebird	Eastern cottontail	Eastern Gray Squirrel	great horned owl	hairy woodpecker	largemouth bass	mallard	mourning dove	Northern bobwhite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild turkey	wood duck
Control Nonnative Invasive Vegetation																			
Decrease Harvest																			
Delay Crop Harvest																			
Establish Field Buffers																			
Establish Native Grasses and Forbs																			
Fish or Wildlife Survey																			
Forest Management																			
Increase Harvest																			
Leave Grain Unharveste																			
Manipulate Succession																			
Nesting Structures																			
Plant/Manage Food Plots																			
Plant Shrubs																			
Plant Trees																			
Ponds: Construction / Reconstruction																			
Ponds: Deepen Edges																			
Ponds: Fertilize / Lime																			
Ponds: Reduce Turbidity																			
Ponds: Repair Spillway																			
Ponds: Restock																			
Create Snags																			
Tillage Management																			
Water Control Structures																			
Water Developments for Wildlife																			
Wildlife Damage Management																			

Southeast Mixed & Outer Coastal Plain Forest Table								
Control Nonnative Invasive Vegetation								
Decrease Harvest								
Delay Crop Harvest								
Establish Field Buffers								
Establish Native Grasses and Forbs								
Fish or Wildlife Survey								
Forest Management								
Increase Harvest								
Leave Grain Unharveste								
Manipulate Succession								
Nesting Structures								
Plant/Manage Food Plots								
Plant Shrubs								
Plant Trees								
Ponds: Construction / Reconstruction								
Ponds: Deepen Edges								
Ponds: Fertilize / Lime								
Ponds: Reduce Turbidity								
Ponds: Repair Spillway								
Ponds: Restock								
Create Snags								
Tillage Management								
Water Control Structures								
Water Developments for Wildlife								
Wildlife Damage Management								

Urban Table	American robin	big brown bat	Eastern bluebird	butterfly	common nighthawk	Eastern cottontail	Eastern gray squirrel	European starling	frog	house finch	house sparrow	house wren	hummingbird	Northern flicker	Northern raccoon	rock dove	song sparrow	wild turkey	wood duck
Control Nonnative Invasive Vegetation																			
Establish Native Grasses and Forbs																			
Fish or Wildlife Survey																			
Nesting Structures																			
Plant Shrubs																			
Plant Trees																			
Steams: Dams, Boulders, or Logs																			
Water Control Structures																			
Water Developments for Wildlife																			
Wildlife Damage Management																			
Artificial Feeders																			
Mowing																			
Plant Flowers																			
Rooftop / Balcony Gardens																			

Urban Table								
Control Nonnative Invasive Vegetation								
Establish Native Grasses and Forbs								
Fish or Wildlife Survey								
Nesting Structures								
Plant Shrubs								
Plant Trees								
Steams: Dams, Boulders, or Logs								
Water Control Structures								
Water Developments for Wildlife								
Wildlife Damage Management								
Artificial Feeders								
Mowing								
Plant Flowers								
Rooftop / Balcony Gardens								

Wetlands Table	American beaver	bluegill	bullfrog	Canada goose	common muskrat	largemouth bass	mallard	mink	northern raccoon	redhead	red-winged blackbird	wood duck
Control Nonnative Invasive Vegetation												
Decrease Harvest												
Delay Crop Harvest												
Establish Native Grasses and Forbs												
Fish or Wildlife Survey												
Forest Management Techniques												
Increase Harvest												
Leave Grain Unharvested												
Manipulate Succession												
Nesting Structures												
Plant Shrubs												
Plant Trees												
Ponds: Construction / Reconstruction												
Ponds: Deepen Edges												
Ponds: Fertilize / Lime												
Ponds: Reduce Turbidity												
Ponds: Repair Spillway												
Ponds: Restock												
Create Snags												
Water Control Structures												
Water Developments for Wildlife												
Wildlife Damage Management												

Wetlands Table												
Control Nonnative Invasive Vegetation												
Decrease Harvest												
Delay Crop Harvest												
Establish Native Grasses and Forbs												
Fish or Wildlife Survey												
Forest Management Techniques												
Increase Harvest												
Leave Grain Unharvested												
Manipulate Succession												
Nesting Structures												
Plant Shrubs												
Plant Trees												
Ponds: Construction / Reconstruction												
Ponds: Deepen Edges												
Ponds: Fertilize / Lime												
Ponds: Reduce Turbidity												
Ponds: Repair Spillway												
Ponds: Restock												
Create Snags												
Water Control Structures												
Water Developments for Wildlife												
Wildlife Damage Management												

Appendix B

Definitions of Food Groups

Aquatic Plants: a plant that grows 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 this contest, 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 and 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

Centipedes and Millipedes: elongated arthropods having many body segments; millipedes have pairs of legs

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

Ferns: flowerless, seedless vascular plants with roots, stems and fronds; reproduce by spores; may be represented by the whole plant or a part of the plant that defines it

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

Fruit and Berries: display must include the soft, fleshy, pulp-covered seed

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 midrib 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: small invertebrate (without a backbone) animals, except for spiders, centipedes and millipedes, which are segmented

Leaves and Twigs: this food group is represented by leaves and/or twigs of woody species only; not forbs, grasses or other herbaceous plants

Lichens: a fungus that grows symbiotically with algae, resulting in a composite organism that characteristically forms a crust-like or branching growth on rocks or tree trunks; lichens may be shown with a rock or branch or without dissolved oxygen and release harmful gases

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 from flowers: represented by the flower with no other plant parts present

Scorpions: arachnid having a long, segmented tail ending in a venomous stinger

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

Spiders: 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

Tubers: represented by either the nutlet of the yellow nutsedge (chufa) or by potato

Turtle and Tortoise: animals with a special bony shell developed from their ribs; "turtle" is often used for aquatic species, but aquatic freshwater turtles are also 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: n. leaves and ends of twigs of woody species; v. to eat browse

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

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

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 breakdown 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 of time; long period with little or no rain
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

ecosystem: the plant community along with the animal community together with soil, air, water, and sunlight

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 1 year of age

fluctuate: to vary, or rise and fall irregularly

forage: n. refers to the vegetation eaten by animals; v. to search for food

forest stand: a contiguous area of trees of similar species composition, age and structure that can managed as a unit

forb: broad-leaved herbaceous plant

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

hardwoods: an ambiguous and often inaccurate term given to nonconiferous 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 plants

insecticide: chemicals used to control insects

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

legume: plants that bear seeds in a pod; examples include lespedezas, clovers, soybeans, peas
and black locust

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 a given area that interact with each other

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

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 grazable portion of the year

subclimax: successional stage occurring before climax stage, but further development is inhibited by some factor(s) other than climate

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

woody: referring to trees and shrubs

zooplankton: microscopic animals that float/swim in water

Appendix C Selected Wildlife Species

Birds	Mammals	Reptiles & Amphibians	Fish
American goldfinch	armadillo	alligator	alligator gar
American kestrel	beaver	American toad	black crappie
American robin	black bear	banded water snake	bluegill
American woodcock	bobcat	box turtle	channel catfish
bald eagle	chipmunk	bullfrog	green sunfish
barn owl	coyote	copperhead	largemouth bass
barred owl	Eastern cottontail	coral snake	redear sunfish
black vulture	flying squirrel	corn snake	smallmouth bass
blue jay	fox squirrel	Eastern diamondback rattlesnake	spotted Bass
blue-winged teal	gray fox	fence lizard	striped Bass
brown pelican	gray squirrel	five-lined skink	white crappie
Canada goose	groundhog	garter snake	
cardinal	mink	gray rat snake	
Carolina chickadee	mole	green anole	
cattle egret	muskrat	green snake	
common goldeneye	opossum	green tree frog	
Eastern bluebird	raccoon	hognosed snake	
Eastern screech owl	red fox	ring-necked snake	
great blue heron	river otter	scarlet kingsnake	
great horned owl	shrew	snapping turtle	
green-winged teal	striped skunk	soft-shelled turtle	
hooded merganser	weasel	timber rattlesnake	
mallard	white-tailed deer	water moccasin / cottonmouth	
mourning dove			
Northern bobwhite			
Northern pintail			
Osprey			
pied-billed grebe			
pileated woodpecker			
prothonotary warbler			
red-bellied woodpecker			
red-cockaded woodpecker			
red-eyed Vireo			
redhead			
red-headed woodpecker			
red-tailed hawk			
ruby-throated hummingbird			
ruddy duck			
tufted titmouse			
turkey vulture			
wild turkey			
wood duck			

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