Wildlife Habitat Education Program*:
A Manual for Mississippi

*Also known as Wildlife Judging; formerly known as the Wildlife Habitat Evaluation Program.

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MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

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The Wildlife Habitat Evaluation Program began in 1978 under the direction of Drs. James Byford and Thomas Hill, Extension specialists of wildlife and fisheries, 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. 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 a manual was produced with sponsorship by Champion International Corporation and the U.S. Fish and Wildlife Service. The manual has undergone several revisions to reflect 4-H leaders' suggestions over the years and to incorporate new information in wildlife science and management. Starting in 2010, FFA teams were invited to compete in WHEP. FFA teams and 4-H teams do not compete against each other, but rather against teams within each organization.

The 4-H Wildlife Habitat Education Program (WHEP) is designed to teach youth about the fundamentals of wildlife science and management. The National Invitational Judging event is open only to senior division 4-H members. Junior division 4-H 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 from around the country who have interests in natural resources and the outdoors.

In this program, youth learn that management for wildlife includes management of habitat and populations. The information in this manual teaches wildlife habitat management concepts and helps prepare participants for 4-H natural resources competitive events. The manual and activities are focused not only on increasing knowledge in the wildlife management field, but also on developing skills to apply that knowledge. The National Invitational and Club Congress contests address these concepts with the following activities:

1. On-site recommendation of wildlife management practices (individual activity);
2. Written wildlife management plan (team activity) and oral defense of written plan (individual activity);
3. General wildlife knowledge (individual activity); and
4. Wildlife identification test (individual activity).

Junior-level participants in Mississippi will be responsible only for the general wildlife knowledge and wildlife identification portions.

Before making recommendations on habitat management, it is important to know all possible information about the life requirements of the specific animal(s) for which the area is being managed. The Concepts and Terms, Region, Wildlife Species, Wildlife Management Practices, and Wildlife Management sections of this manual provide basic information about wildlife ecology as well as the life requirements of various wildlife species.

Wildlife managers must be able to inventory and evaluate the present condition of the habitat and explain the condition to landowners and other interested parties. The aerial photography information helps in this inventory and evaluation process. Once the inventory is complete, the manager must decide which 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 participants to explain and illustrate their decisions so others can understand and carry out the recommendations.

About the Manual

The manual is divided into the following major sections:

1. Wildlife Management Concepts and 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 plans and oral presentations as appropriate.

2. Regions identify areas of the U.S. with distinctly different vegetation communities and wildlife species. This manual has been edited from the original national version found at www.WHEP.org and contains only the regional information that is relevant to the Mississippi contests. Students attending the national contest will need to obtain and study the material relevant to the ecoregion in which the national contest is held. This section gives a brief description of the vegetation and land use found in the region, explains typical stages of plant succession, lists wildlife species that may be in state contest events, and summarizes habitat management practices that can be used. A chart identifying the major food items for each species in the region is also included.

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

4. Wildlife Management Practices explains each of the management practices discussed in the Wildlife Species section. Interpreting wildlife habitat from Aerial Photography explains how to evaluate wildlife habitat using aerial photographs. Examples on how to identify features are included.

5. Activities and Scoring addresses 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 national contest will be scored. In national events, all of the activities and scorecards will be used as printed specifically for the region(s), species, and management techniques in this manual. However, they may be modified for local and state events. This section also contains a number of study tools, such as blank score sheets for the WMP's portion of the contest and a written management plan worksheet. Scoring the Contest explains the scoring procedure for the national competition.

6. Glossary and Appendix defines some of the technical words used in the manual and explains the various food categories included on the foods chart.

All of the information necessary to succeed in these activities is in this manual or, in the case of species identification and aerial photographs, alternate sources have been given. However it is very important for the participants to practice their knowledge in the field when preparing for the management practices, written plan, and oral presentation portions of the contest. ***The manual is considered the final source of information for the WHEP contests; although it is highly recommended that other materials be used to build knowledge, the information contained within this manual (state contests) or the national manual (invitational) will be considered the final authority.***

Preparing for Contests

The National Invitational and state WHEP contests address these concepts with the following activities:

Activity I: On-site recommendation of wildlife management practices
Activity II: Written wildlife management plan (II-A) and oral defense of written plan (II-B)
Activity III: General wildlife knowledge
Activity IV: Wildlife identification

Participants in the senior-division contest (ages 14 to 19 as of January 1) will be asked to perform all contest activities described in this manual. Information from the entire manual, including the glossary, may be used in the General Knowledge portion. Students can participate as individuals (restricted to no more than 2 individuals per county) or as teams of 3-4 youth from the same county

In Mississippi, junior division participants are not expected to perform all the activities in WHEP. They are required only to be prepared for the General Wildlife Knowledge and Wildlife Identification portions of the contest. The junior-level contest will contain more general, less specific information than that at the senior-level, focusing on basic life history of the wildlife species rather than specifics about management practices or habitat successional stages.

Participants and leaders should first learn the Concepts and Terms section of the manual. Leaders should explain the concepts and try to find local examples in the outdoors to help make this section more interesting and relevant. This section is important because the program activities require understanding of these concepts and terms. Students should use these terms and concepts in their written and oral presentations at the senior-level contests.

After participants understand the concepts, the leader should review the information on Southeast Mixed and Outer Coastal Plain region with them. Although a small portion of northern Mississippi actually falls within the Eastern Deciduous Region, the Mississippi contests will use information relevant to the Southeast Mixed and Outer Coastal Plain Region only.

Leaders and participants should study the wildlife species for the ecoregion. Collecting pictures of the species from several different sources will help with the identification portion of the contest. Students should learn to identify species from many different sources so they are able to identify the male, female, juvenile, and adult of any of the selected species. Read and study the species information, including habitat requirements, and identify the recommended habitat management practices for each animal.

Leaders and participants should review plant succession processes, common plants, wildlife species, and wildlife management practices. Specific information about habitat requirements and recommended management practices are found in the Wildlife Species section. Learn the management practices appropriate for the region; these are described in the Wildlife Management Practices section. Whenever possible, participants should go to the field and find examples of the principles and practices found in these sections. Leaders can use “quiz bowls” and question/answer sessions to measure learning.

By following the above exercises, leaders can introduce participants to the various activities found in the manual. Conducting practice sessions using aerial photographs and outdoor sites will be helpful. Start with only one or two wildlife species, and add more as participants become more knowledgeable. Evaluate aerial photographs (available online); consider their features and discuss how they are important to wildlife. Identify which habitat requirements are available

for the selected species and which requirements are missing.

Videos, field guides and other teaching materials may be used to further learning; however, only material in the manual will be included in contest activities. Mississippi State University's Extension Service and county 4-H offices may have information regarding the availability of such materials.

Please note: If senior division students participate in the national invitational, they will be responsible for learning the wildlife and plant species, management practices, and regional information that correspond to the contest's location.

General Rules and Guidelines

The junior-division contests, generally termed "wildlife judging," are held during Project Achievement Days in the four regions of Mississippi. The senior-division contest is held at Mississippi State University in conjunction with the annual 4-H Club Congress. The winner of the state contest is eligible to participate in the National 4-H Wildlife Invitational event. For more information about the National 4-H Wildlife Invitational, please go to www.WHEP.org. The general rules for all state contests are as follows:

A. All contestants must provide their own pens or pencils and clipboards.
B. No electronic devices of any kind are allowed at the contest site. This includes, but is not limited to, cell phones.
C. Absolutely no talking by contestants will be allowed during the contest except when working on designated team activities (only applicable to senior activities).
D. Anyone caught cheating will be disqualified.
E. All adults, except contest officials, will be separated from contestants at all times while the contest is in progress.
F. Contestants will work independently on Activity I, II-B, and III. Activity II is a team event. Preparation for Activity II-B may also be done as a team. Scorecards will be turned in to an official committee member immediately after each event.
G. An official committee will score the contest and analyze results. Its decision is final.
H. The team score will be the sum of the three highest scores in each of Activities I and III plus the team score for Activities II (which will include the top three scores for Activity II-B).
I. After the event, individual and team scores will be made available to the teams. Contest score sheets will not be distributed.

WHEP Activities and Scoring

Individual Activities:

The top three individual scores for each individual activity will count toward to 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: On-Site Recommendation of Wildlife Management Practices (30 points)
Activity III-A: General Wildlife Knowledge Test (30 points)
Activity III-B: Wildlife Identification Test (20 points)

Team Activities:

Activity II will be scored as team effort and will include scores for Activity II-A and II-B. High teams for the written management plan will be identified by the combined score of Activity II-A and the three highest individual scores on Activity II-B.

Activity II-A: Written Management Plan -Team Activity (140 points)
Activity II-B: Oral Defense of Management Plan – Prepared by Team, defended independently by Team Members (60 points total, 20 per individual)

Activity I: On-Site Recommendation of Wildlife Management Practices

Activity I involves the recommendation of wildlife management practices (WMPs) necessary to manage wildlife and habitat on a given site. Management recommendations in Activity I should consider each species listed **separately;** WMPs should be recommended as if each species were the only species considered on the site. A blank scorecard for the region is provided for reference.

Before starting Activity I, participants will be given information about the site (a scenario) and its field conditions, either verbally or written. Based on this information, contestants will mark an "S" in the box for each WMP recommended. Contestants will have 1 hour to complete Activity I. This is an individual activity, so talking among team members is not allowed.

Contestants should be prepared to individually read and interpret a field conditions sheet and evaluate the habitat on-site. Based on this information, contestants will be required to mark an "X" in the box for the management practice(s) that should be implemented on the given site for the listed species to achieve the desired management objective.

Contestants will have 1 hour to complete Activity I. This is an individual activity. No talking is allowed. For this activity, each species is to be considered separately and managed independently (as if it were the only species to be managed on this site). Refer to the WMP charts in the "Regions" section of this manual.

Scoring Activity I

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

All boxes are counted in the scoring. For example, for the Eastern Deciduous Forest there are 200 possible correct answers because there are 25 WMP's x 8 possible species on an answer sheet. Participants are given credit for the following:

- Putting an "x" in the appropriate boxes [NOTE: Keep in mind that during a contest, all "x's" marked on the WMP chart may not be used, as the correct answers depend on the information given about the site and the conditions present on-site at the time of the contest], and;
- Leaving boxes blank where no "x" is indicated on the WMP chart. [NOTE: Regardless of the scenario and field conditions, boxes that are not marked on the WMP chart should never be marked during the contest, as these practices have been determined to be inappropriate for that species and region].

Answers will be incorrect if

- Boxes that should be marked are left blank, and

- Boxes that should not be marked are marked.

No negative scores will be assigned. Minimum individual score on Activity I is zero. Blank forms that can be used for practice are provided in the Appendix.

Activity II-A: Wildlife Management Plan

Referring to an identified tract of land, teams make written recommendations based on landowner objectives as stated on a written Field Condition Sheet, which is given 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" (in appendix) explains how plans are judged. A sample management plan worksheet is also included to help teams prepare for writing management plans.

For the state contests and national invitationals, teams may use **one side** of each of two pieces of paper provided. The team number **must** be written on the blank side of each sheet. DO NOT use both sides of one sheet of paper to write your 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 to be managed may be provided.

Teams will have 2 hours to complete this activity.

Example: Written Wildlife Management Plan Field Condition Sheet

The three peaks area has long been favored by outdoor enthusiasts. The area is owned by the Bureau of Land Management (BLM). Managing the area for multiple user groups is often difficult. Users at three peaks include hunters, recreational shooters, hikers, bird watchers, ATV riders and remote control airplane fanatics. BLM requests your assistance in developing a management plan for wildlife on the 4000-acre tract. The area marked by flags is a representative sample of the habitat found on the 4000-acre tract.

The sage grouse population on this area is not hunted. University researchers have surveyed the area and determined sage grouse populations are very low. Early indicators suggest a lack of brood rearing habitat and nest disturbance by recreational users may be to blame.

Bird watchers and hikers on the area occasionally observe red-tailed hawks pursuing desert cottontails and kangaroo rats. BLM would like to see an increase in the red-tailed hawk population. Some bird watchers have also reported spotting sage thrashers.

The fact that Interstate 15 was constructed directly through the mule deer winter migration corridor leading to this area has had a negative impact on the herd. Biologists have determined this hunted mule deer population is negatively impacted by deer/car collisions and have been found to have low body weights.

The presence of cheat grass on the site is of major concern because of its

invasive nature. Therefore, fire is not the preferred method of disturbance on this site, as it allows cheat grass to dominate. If disturbance occurs naturally or by recommendation, efforts should be made to establish native grasses and forbs to avoid this problem.

Prepare a plan to meet BLM's objectives for mule deer, sage grouse, red-tailed hawk and sage thrasher. This is a team activity! Use only one side of each of two pages to write your plan. You have 2 hours to complete this activity. Good luck!

Example: Written Wildlife Management Plan Worksheet

This sample worksheet is intended to help you learn the correct format for writing management plans. In a contest situation, 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 use only one side of each of two sheets of paper. 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 to be managed. A maximum of 60 points is also added for the individual oral presentations, for a total of 200 points for the Activity II.

Part 1: Plan Background (20 Points)

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

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

B. State the management objectives (10 points)

The management objectives are to increase populations of Eastern bluebirds, decrease populations of coyote, and maintain populations of American kestrel.

Part 2: Plan Development (20 Points)

A. Species Habitat Requirements (10 Points) – State basic habitat needs of each species to be managed.

Eastern bluebirds are found in early successional areas interspersed with trees and shrubs, where they forage on insects. Water is obtained from their diet. Bluebirds nest in cavities when available but will readily use nesting boxes.

B. Habitat Assessment (10 points) – Evaluate the area and state what is present and lacking with respect to the needs of each of the species for which you are managing.

The area is primarily Stages 5 and 6. Stages 2 and 3 lack Eastern bluebirds.

Part 3: Plan Implementation (70 Points)

A. This section should show that the team has a complete understanding of the appropriate WMPs that should be implemented and the effects of those practices on the habitat and other species to be managed.

Forest regeneration and chainsawing will open the Stage 6 forest band provide more usable space for bluebirds. Native grasses and forbs should be established to provide suitable foraging areas. Although a few cavity trees are available and should be retained when implementing forest regeneration and chainsaw work, additional nesting cover is desirable, and nest boxes should be put in place.

Part 4: Plan Evaluation (10 Points)

A. State what you will do to determine if your plan worked.

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.

Activity II-B: Oral Defense of Written Plan

To be successful and score well in Activity II-B, it is important that all team members actively participate in developing the written plan. Every team member should understand the habitat needs of each species considered and be able to discuss why any WMP should or should not be implemented. Comprehensive knowledge of the written plan is necessary to orally respond to judges' questions about the team's plan successfully. After completing the written wildlife management plan, each team member will be expected to demonstrate his or her understanding of the plan. Team members are called individually into a room of two or three judges, where they are asked a series of questions to test their knowledge of the team's plan. For example, team members may be asked to explain a certain part of the plan, such as the background or the implementation, or they may be asked to further explain certain management practices recommended within the plan. They may be asked to explain the habitat needs of the focal species. Questions can cover anything related to the plan, the focal species, and management practices recommended.

Each team member will be scored individually. The top three scores will be added together and combined with the written plan score for the total score for Activity II.

Example: Defense questions

- Explain the WMPs your team implemented for red-eyed vireo.
- Two of the four species in your plan had very different habitat requirements. Identify those species and explain the compromises you made to accommodate those species.
- The Eastern bluebird requires Stages 2 and 3. Explain the techniques your team chose to manage disturbance and why they were recommended.
- In assessing habitat on this site, what do you consider the most limiting factor for wood duck?
- Explain two methods you would use to determine the effectiveness of your team's plan.

Activity III: General Wildlife Knowledge

Activity III is 30 multiple-choice questions, each worth one point. The objective is to demonstrate knowledge of the region involved, wildlife management concepts, wildlife management

terminology, wildlife management practices, and the biology and ecology of the wildlife species found within a region. The test may be presented as a PowerPoint program or on paper. Contestants will have 30 to 45 minutes to complete the test.

Questions for Activity III may be from information within **Concepts and Terms**, **Region**, **Wildlife Species**, **Wildlife Management Practices**, and the **Glossary**. Definitions of wildlife foods are provided in the Appendix. For the purpose of WHEP, foods have been placed in groups. Participants should be prepared to indicate which foods are eaten by specific wildlife species and be familiar with the good group definitions. Foods charts are contained in **Region**, and further information on foods can be found in **Wildlife Species**. Questions about aerial photo interpretation may also be asked.

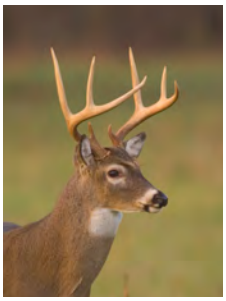
Example: General Knowledge Questions

1. In the Eastern Deciduous Forest, the final successional stage consists of
    a. deciduous trees such as oaks, hickories and beech.
    b. a mix of conifers and deciduous trees.
    c. deciduous trees such as blackgum, red maple, and sycamore.
    d. deciduous trees such as southern magnolia, American holly and slippery elm.

2. Mid-story trees in the Eastern Deciduous Forest include
    a. blackgum, flowering dogwood, hornbeam and redbud.
    b. flowering dogwood, hornbeam, spicebush and redbud.
    c. hornbeam, flowering dogwood, redbud and sweetbay.
    d. shadbush, titi, American hornbeam and flowering dogwood.

3. Would the area circled on the aerial photo to the right be considered suitable habitat for a species that requires early (such as 1 or 2) stages of plant succession?
    a. Yes
    b. No
    c. The answer cannot be determined from an aerial photo.

4. The diet of the Northern bobwhite includes all of these **except**
    a. forbs
    b. fungi
    c. hard mast
    d. buds



5. Which of the following groups of foods is **not** eaten by this species?
    a. forbs, fungi, grain
    b. grass, hard mast, soft mast
    c. seeds, snails, soft mast
    d. fungi, grass, twigs

Activity IV: Wildlife Identification

Wildlife managers must be able to identify the species for which they are managing. The objective of Activity IV for Mississippi contest is to test the participant's ability to identify wildlife species within the Southeastern Mixed and Outer Coastal Plain Region. To practice for Activity IV, participants and coaches are encouraged to use field guides and websites.

Activity IV will be provided as hard copy pictures (Junior Division), PowerPoint presentation, physical specimens, such as skulls, hides, or feathers (Senior Division), or a mix of these. The photograph or specimen provided may be of an adult, juvenile, male or female. Each of 19 species will be assigned a number, and participants will write the name of the species in the space provided on the answer sheet. Answers must be legible, spelled and capitalized correctly, and written in full as listed below. If the judges cannot read the answer, the answer will be considered incorrect.

Species included in the Mississippi WHEP contest are listed below:

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

Note: ***For the identification portion of the contest, refer to this list for the correct spelling and capitalization of each species.***

Wildlife Management Concepts and Terms

Before you can evaluate wildlife habitat and make management recommendations, you should understand some basic concepts about habitat and how it affects different wildlife species. In this section, some of the basic concepts are described. Since most of the contest will be based on these concepts, it is important that 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. Explanations of the following concepts and terms are described in this section.

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 and Stream Habitat
- Food Webs
- Invasive Species

Concept 1: 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, populations of organisms associated with a decaying log or within an ephemeral pond form communities. Likewise, the area can be expanded to include all the communities associated with a forest.

Concept 2: 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 bobwhite and Eastern cottontail are

somewhat similar. They 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 squirrel 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 bobwhite and American kestrel 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 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 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 weeks to 3 weeks of age, they roost above ground, and—as mast becomes available in the fall—frequently roost in mature hardwood forests.

Concept 3: Focal Species

There are two basic goals in wildlife habitat management. One is to provide the best habitat possible for a particular, or focal, wildlife species. The other, which is explained later in this manual under the concept of Species Richness and Diversity, is to provide habitat 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 selected, determine the habitat requirements for the focal species and evaluate the capability of the area to provide those requirements. If one or more of the habitat requirements is in short supply or lacking, then various habitat 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 management practices that provide the habitat requirements that are most lacking and thus are limiting the population (limiting factors). For instance, if a species requires trees for cover with water nearby and the habitat you are evaluating has plenty of trees but no water, a management practice that supplies water will improve the habitat more effectively than planting trees. When determining which management practices to apply, remember that management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage habitat for any one species or group of species that require similar habitats without influencing other species in some manner. For example, if you plan a clear-cut in a deciduous forest area to benefit ruffed grouse, you may also benefit wild turkey, white-tailed deer, and Eastern cottontail, while species like ovenbirds, wood thrush, and Eastern gray squirrel, which prefer unbroken mature deciduous forests, will be forced to use another area.

Concept 4: 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.

Concept 5: 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 (non-woody plants such as grasses, forbs, and legumes) succeed to woody species. In drier climates, perennial (plants that live more than two growing seasons) grasses and forbs or shrubs may represent the ultimate, or climax, successional stage. In other words, the climax stage is the final stage of a site if no disturbance takes place. Disturbance events, such as fire, grazing, ice and windstorms, lightning, and flooding, continually set back succession, and the process starts over.

Succession occurs rapidly in areas with warm temperatures and abundant rainfall. For example, in the Southeast Mixed and Outer Coastal Plain Forest, grasses and forbs germinate from the seedbank after a field is disked. Within 20 years, without continued disturbance, trees will grow 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.

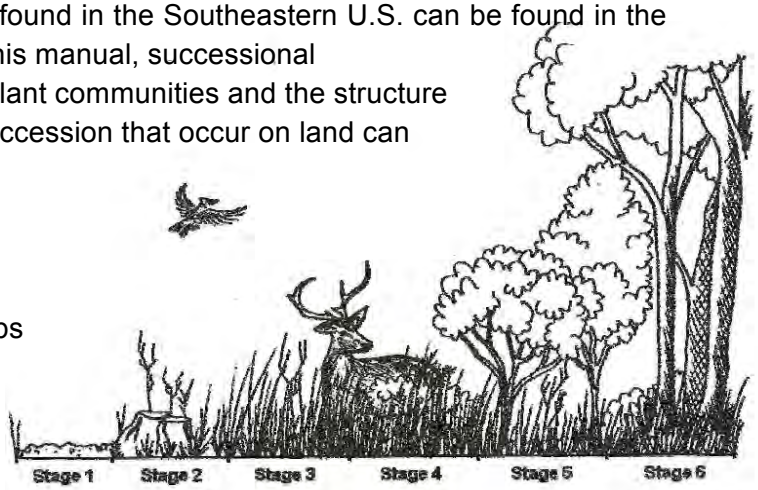
Others, such as grasshopper sparrow, sage-grouse and ovenbird, may be found only in one or two successional stages. In other words, it is important to manage a particular successional stage for some species. It is also important to manage for a diversity of vegetation types and successional stages if a diversity of wildlife species is a goal or consideration.

Although succession is set back through natural disturbance, humans have altered many natural disturbance events. For example, levees have been built to prevent natural flooding, and great effort is expended to suppress and control fire. Also, extensive plantings of non-native sod-forming grasses have unnaturally altered or interrupted succession in nearly every region of the country. Because of their dense nature at ground level, the seedbank is suppressed, and response (such as succession) is limited.

The compositional and structural changes of plants following disturbance events are fairly predictable within a given region. Thus, wildlife managers intentionally manipulate disturbance 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 the Southeastern U.S. can be found in the regions section of this manual. 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 follows:

Stage 1 — bare ground
Stage 2 — annual forbs and grasses
Stage 3 — perennial grasses and forbs
Stage 4 — shrubs
Stage 5 — young forest
Stage 6 — mature forest



Although successional stages have been defined and numbered here for simplicity, successional stages sometimes can be difficult to distinguish. That's 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 and forbs are often present in early successional areas. Brushy areas often slowly develop into young forest, 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 savannah 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 savannah 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 savannah, 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.

Stage 1 – Bare ground

Stage 2 – Annual grasses and forbs

Stage 3 – Perennial grasses and forbs

Stage 4 – Shrubs

Stage 5 – Young forest

Stage 6 – Mature forest

Concept 6: 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.

Forest with developed understory and midstory

Forest with little understory and no midstory

Concept 7: 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 Habitat Requirements). For example, northern bobwhite may forage on seeds in shrubby old fields during the fall but use native grass pasture for nesting in the spring. When a field with abundant forb cover is located near a field containing native warm-season grasses, distance from nest sites to brooding areas is 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.

Concept 8: Edge

An edge is formed where two or more vegetation types or successional stages meet. For example, a field meeting a forest is an edge between two vegetation types. A young mixed-hardwood stand meeting an older mixed hardwood stand is an edge between two successional stages.

The transition in vegetation types or successional stages can be abrupt or gradual. An example of an abrupt change is where a hayfield meets mature woods. This type of edge has high contrast and is called a hard edge (see the photo to the right). An example of a gradual change is 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 is 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. 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. 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 nearby.

Increased interspersion can lead to increased species diversity as more vegetation types or successional stages are available. It may provide habitat requirements for a larger number of species.

However, it is important to realize the presence of edge is not always beneficial for all 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. Also, some species may actually avoid edges and seek areas that are uniform. 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 bermudagrass. 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.

Concept 9: Area-Sensitive Species

Fragmentation is the disruption of vegetation types and can be man-made or natural. 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.

Concept 10: 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 are 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.

Areas of suitable habitat or paths that do not restrict movement are required for animals to move within their home range or during migration. These areas are known as *corridors*. The type of vegetation within the corridor and the width and length of the corridor vary depending on the animal. An example is a riparian corridor, which allows various wildlife species to travel through areas of otherwise unsuitable habitat. Examples of corridors for migrating mule deer include valleys between mountain ranges or overpasses across highways.

Concept 11: 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, water, cover, and space determines the carrying capacity. The requirement in shortest supply, called the *limiting factor*, determines the carrying capacity. By increasing the limiting factor, 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, disease, or competition. Young wildlife and animals in poor health experience the highest mortality rates. Hunting and fishing remove some animals and help prevent over-population for some species.

In suburban areas, the biological carrying capacity may be able to support a given number of animals. However, humans may demand that the density of certain wildlife be lower because of wildlife damage issues. For example, white-tailed deer populations can thrive in urban areas 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 the damage. In this case, the *cultural carrying capacity* is much lower than the biological carrying capacity.

Concept 12: Pond Dynamics, Pond Balance, and Stream Habitat

A properly managed pond can provide excellent fishing and benefit many species of wildlife. The basics of a well-managed pond are proper stocking of the right species and number, a balanced harvest of fish, a correct fertilizer scheme, 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. 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* (microscopic animals) and aquatic insects feed on phytoplankton, and small fish eat zooplankton and aquatic insects. 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 algal cannot bloom. Excessive exchange of water through the pond prevents adequate phytoplankton blooms because fertilization is diluted.

Low water levels can cause significant problems as well. 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.

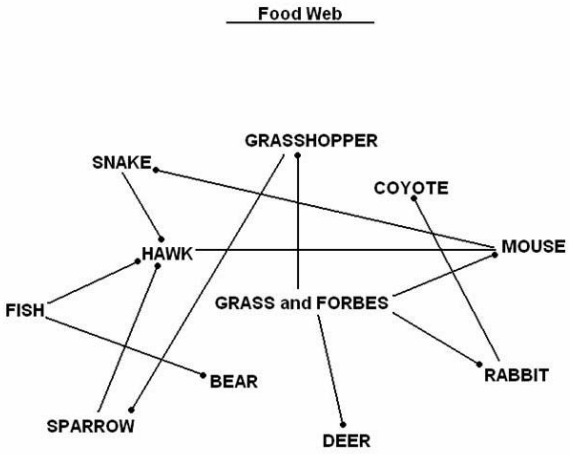
A stream can be defined as a body of water moving in a definite pattern and following the course of least resistance to a lower elevation. Because water volume and rate of land erosion fluctuate along the course of the stream, the bottom and shoreline are relatively unstable. As the water moves, it carries materials such as gravel, sediment, or 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*.

Riparian buffers are vegetated areas along streams and ponds. They may be forested or grassy, depending on the water body. Vegetated buffers are important to maintain bank stability, as the roots of the vegetation along the stream help to hold the soil in place. Additionally, the aboveground vegetation in buffers filters sediment from water moving into the stream or pond after rainfalls. Also, buffers of vegetation provide shade, which lowers summer water temperatures and may help cold-water fish species to survive.

Pools and riffles are important habitat types for the various fish species 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 habitat for spawning. It is important that fish be able to move freely between these various habitats in the stream. While some species of fish can complete their life cycles within a small portion of the stream, other species, such a salmon, must migrate to the ocean and return to the stream to spawn.

Concept 13: Food Webs

A food web is a network of interconnected food chains, which are the step-by-step passage of energy (food) through an ecosystem. Plants are *primary producers* in a food 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*, that is, 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.



Primary consumers are eaten by *secondary consumers*, or carnivores (meat-eaters). 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 that 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.

Concept 14: Invasive Species

Many plants and animals have been introduced, either accidentally or intentionally, into the United States from around the world. Some of these species became established and compete with native plants and animals. Often these species are successful because the climate is similar to that from which they originated. Some no longer have natural pests and competitors that limited them in their original location. These plants or animals are known as invasive species. Invasive species can contribute to loss of habitat for native species and cause native species to decline. This poses a considerable challenge for natural resource managers. Often invasive species are difficult to control or eradicate. Prescribed fire, herbicide, mechanical removal, and other methods are commonly used to limit their impact on native species. In some instances, biological control, such as an insect pest, may be used. Not only do invasive species impact native wildlife and plants, they also impact agriculture production, water resources, municipal

capacity, and even human health and safety. Every effort should be made to prevent the introduction of exotic species that are likely to become invasive.

Regional Information

Areas of the country can be separated into regions having similar climate, vegetation, and wildlife. The majority of Mississippi – with the exception of a few locations along the northern boundary of the state – falls within the **Southeast Mixed and Coastal Plain Forest Region.**

Physical Description: The terrain is rolling hills to mostly flat. Marshes, lakes, and swamps are numerous along the coastal plain. The average annual precipitation ranges from 40 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 pine, shortleaf pine, or a mix may be the principal overstory species. Fire suppression has decimated the longleaf pine community to a fraction of its former range throughout this region. Planted loblolly pine is widespread over much of the region, but without fire and judicious thinning, the value of planted 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 stages 2 and 3 include lespedezas, partridge pea, ragweed, pokeweed, bluestems, paspalums, wiregrass, povertygrass, and many others. Vines such as Virginia creeper, trumpet creeper, grapes, yellow jasmine, and greenbriar are common. Shrubs include sumacs, viburnums, elderberry, wild plum, blueberry, blackberry, hawthorns, and wax myrtle.

Typical invasive plans in the Southeast mixed forest include Japanese climbing fern, privet, cogongrass, bahaigrass, Japanese honeysuckle, kudzu, and

Chinaberry.

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 non-native grasses and legumes as forage for livestock. Unfortunately, most of these are not beneficial for wildlife.

Plant Succession Stages in the Southeast Mixed and Coastal Plain Forest Region:
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.

Wildlife Species

This chapter of the WHEP manual contains information on species featured in this region. There are three sections: birds, mammals, and other species. The species are listed alphabetically in each section. Each species has specific information on habitat requirements, including diet, water, and cover. Key management practices are also discussed here. Check the charts in the manual to determine which practices and foods are appropriate for the species in Mississippi. You must know specific details of each of the featured species to succeed in the contest.

This chapter contains all the information you need 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 here. There are also many good websites available for further study. Some find making flashcards very helpful. Collecting pictures of the species from several different sources will help with the identification portion of the test.

Birds

American kestrel

General Information

American kestrels are found year-round throughout America. Kestrels use stages 2 and 3 of plant succession 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: They eat primarily insects and small mammals associated with open areas.
Water: Kestrels obtain necessary water from diet and do not need water for drinking.
Cover: Kestrels nest in tree cavities and other sites, including holes in cliffs, canyon walls, and artificial nesting boxes.

Management Practices

Establish field buffers to increase cover for prey around row crop fields.

Establish native grasses and forbs as needed to provide increased early successional habitat for prey; Stages 2 and 3 should be interspersed with Stages 5 and 6.

Manage forest; forest regeneration will provide open areas for hunting for a couple of years.

Manipulate disturbance using prescribed fire, chaining and herbicide applications 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.

Add 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 use as cover for hunting prey.

Plant trees for future perching sites and cavities for nesting.

Create snags for perches.

Manage tillage when waste grain is available to facilitate hunting prey.

Eastern bluebird

General Information

Bluebirds are found in early successional habitats (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 fencing that provide perches.

Habitat Requirements

Diet**:** Eastern bluebirds eat insects, spiders, and small amounts of soft mast.

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

Cover**:** They nest in cavities of trees and fence posts. Old woodpecker cavities are especially important. Eastern bluebirds readily nest in nest boxes, which have helped restore bluebird populations in some areas.

Wildlife Management Practices

Establish field buffers to increase useable 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.

Manage forest properly: in large areas of Stage 6 where regeneration is needed, forest regeneration will create foraging habitat 1 year to 3 years postharvest. Retain some mature trees to provide cavities for bluebirds.

Manage disturbance using prescribed fire, disking, herbicide application, mowing, chaining and roller beating 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 bluebird 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 for bluebirds. Hedgerows may be established across open fields larger than 4 acres.

Plant trees to create potential nest sites where young trees are lacking.

Create snags to provide potential nest sites and perching areas in open areas.

great horned owl

General Information

The great horned owl is found throughout North America in a wide variety of habitats, including open stage 6 woodlands, interspersed with areas of stages 2, 3, and 4, including orchards, farm woodlots, and city parks. They are also 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. Their diet is extremely varied but commonly includes small- to medium-sized mammals, including rabbits, skunks, squirrels, and others, as well as reptiles, amphibians, large insects, and fish.

Water: They obtain necessary water from their diet.

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

Wildlife Management Practices

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 early successional habitat (stages 2 – 4).

Manage forest using forest regeneration in large areas of stage 6, which 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 through mowing, chaining, roller beating, controlled burning, disking, herbicide application, and grazing to maintain and rejuvenate areas of Stages 2 – 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 nesting cover does not exist.

Create snags where perching sites are limited.

Manage tillage to facilitate hunting prey when waste grain is available.
Manage wildlife damage if 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 also use wooded urban and riparian areas.

Habitat Requirements:

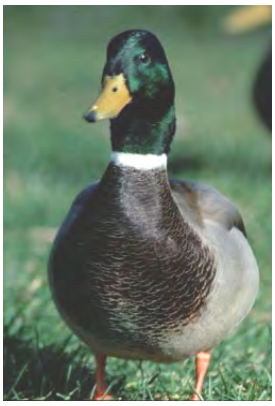
Diet: Hairy woodpeckers eat insects, such as ants, beetle larvae, caterpillars, and adult beetles. Diet is supplemented with hard and soft mast.
Water*:* The obtain water from their diet.
Cover: They are cavity nesters. They excavate holes in mature and dying trees and snags. Management efforts should 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:

Manage disturbance using grazing management, which should maintain trees in riparian areas. Grazing during fall and winter, when woody vegetation is not growing rapidly, usually does less damage to woody vegetation than at other times of the year.
Plant trees, especially softwood deciduous trees, where trees are scarce to be used as nesting cavities.
Create snags for a food source and potential nest cavities.
Manage wildlife damage when woodpeckers are causing damage to wooden structures.

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 U.S. and up to the Bering Sea. They are migratory waterfowl and winter south of Canada, throughout the U.S., and to Central America. Mallards are dabbling ducks that nest in tall grasses and forbs or in shrubby cover; however, they do not nest in Mississippi. Therefore, information on nesting and brooding rearing will not be included in the MS contest. 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 materials from the water. Dabbling ducks are often seen tipping upside down in the water to reach food at the bottom of a pond. They feed in much shallower water than diving ducks do and will not dive under 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. Mallards will readily dry-feed in agricultural fields during winter.
***Water*:** See cover requirements below.
Cover: In wintering areas, mallards rest on open water bodies, such as streams, rivers and warm-water sloughs.

Wildlife Management Practices

Leave grain unharvested to provide a winter food source.
Plant and manage food plots. Shallowly flooded grain plots can provide food for migrating and wintering mallards.
Manage tillage: eliminating fall tillage can provide waste grain in the winter
Use water control structures to control water level in wetlands
Create water developments. Shallow impoundments and dugouts can be important for migrating and wintering mallards. Flooded grain fields, planted food plots, and oak woodlands in winter make food more available and provide feeding areas with more protection from predators.

mourning dove

General Information

Mourning doves may be found over much of the lower 48 states. They prefer stages 2 and 3 of plant succession for feeding with some shrubs and trees nearby for nesting and roosting. Nests are made of twigs placed on branches of shrubs or trees. Nests are also placed on the ground. Mourning doves often feed in agricultural areas 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 food digestion. When drinking, mourning doves prefer shorelines without vegetation.

Habitat Requirements

***Diet*:** Mourning doves eat a variety of grass and forb seeds, as well as several agricultural grains. Small areas of bare ground are beneficial for the birds to obtain grit (small gravel) to help in food digestion.
***Water*:** Free-standing water is required daily.
Cover: Shrubs and trees are used for nesting and loafing.

Wildlife Management Practices

Delay crop harvest in some regions to avoid nest destruction in spring.
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.
Manage disturbance by disking and herbicide applications to provide bare ground. Prescribed burning will maintain stage 3 and expose seed for feeding. Chaining will reduce shrub cover.
Plant and manage food plots in areas lacking grain.
Plant shrubs for nesting and roosting in areas where shrub and tree cover is limiting. Fencerows, field borders, and other idle land area are good sites for shrubs.
Plant trees for nesting and roosting in areas where shrub and tree cover is absent. Fencerows, field borders, and other idle land area are good sites for trees.
Create snags for perching and loafing sites in open areas.
Manage tillage: 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.
Develop water sources where water is limited or absent; examples include dugouts, guzzlers and shallow impoundments.

Northern bobwhite

General Information

Northern bobwhite require stages 2, 3, and 4, well interspersed. The ideal habitat is scattered patches of shrubby cover with many types of native grasses and forbs. Native grasses, such as bluestems, are used for nesting cover. More recently disturbed sites, rich in forbs and insects, are used for brood rearing. In some parts of the country, savannahs provide excellent habitat. Savannahs have very few trees and an understory of grass and forbs maintained by fire every 2 to 4 years. In the Southeast Mixed and Outer Coastal Plain, the trees are pines. Some agricultural crops can provide seasonal food for bobwhite quail, but they do not 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 diet.
Cover**:** Quail require shrubs for escape and thermoregulatory cover throughout the year, perennial native grasses for nesting, and native forbs for brood rearing.

Wildlife Management Practices

Decrease harvest if populations are declining where habitat is suitable but 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.
Manage forest using forest regeneration to enhance habitat for a few years in stands ready for harvest.
Leave grain unharvested to provide additional food through fall and winter.

Manage disturbance using prescribed fire if possible; prescribed fire is the most important tool for quail management. Burn small areas in large expanses of stages 3 and 4. Burning every 1 to 2 years in stage 5 and 6 forest may eventually 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 away from food plots and leave enough herbaceous vegetation for cover and food. Grazing management may revert or maintain stage 3. Grazing management should **discourage** a uniform structure of plants across the landscape, as 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. Chainsawing and feller bunchering may be used to open forest and allow sunlight to reach the forest floor. Herbicides may also be used to remove undesirable plants or to reduce woody plants if they are overly abundant.

Plant and manage food plots adjacent to suitable cover where food may be limiting. Make the plots linear and relatively small (one-fourth acre).

Plant shrubs where woody cover is scarce; if shrub patches are within 50 yards to 75 yards of one 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.

Manage tillage: provide waste grain by eliminating fall tillage.

prothonotary warbler

General Information

The prothonotary warbler nests in hardwood forests (stage 6) near water, primarily in the Southern U.S. 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 the insects they require. Prothonotary warblers winter in Central and South America.

Habitat Requirements

Diet: Warblers eat insects, such as ants, beetles, and mayflies, and aquatic larvae and snails

Water: Necessary water is obtained through the diet.

Cover: Forested wetlands and other mature bottomland hardwood forests provide cover. Dead standing timber help ensure presence of cavities.

Wildlife Management Practices

Manage forest using timber stand improvement techniques to stimulate vertical structure where absent.

Add 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.

Develop water sources. Shallow impoundments established in bottomland hardwoods will enhance habitat.

red-eyed vireo

General Information

Red-eyed vireos live 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**:** Vireos eat insects, spiders, and soft mast.

Water**:** Necessary water is obtained from diet.

Cover: Midstory and overstory of stage 6 mixed deciduous forest provide cover.

Wildlife Management Practices

Manage forest with single-tree and group-selection methods of forest regeneration. 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 for future habitat.

wild turkey

General Information

Wild turkeys use a wide variety of vegetation types across the U.S. They are very adaptable and are limited only by tree cover for roosting. 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.

Habitat Requirements

Diet: Turkeys eat 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; and chufa tubers.

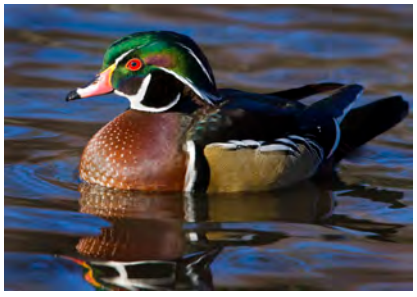
Water: They obtain water from their diet but will use free-standing water when available.

***Cover*:** Mature forest, regenerating forest, brushy thickets, or old fields with rank cover are required for nesting. Nest is a shallow depression on the ground lined with leaves or grass, usually well concealed in vegetation or against some object (e.g., a tree, log or brush). Turkeys feed in mature forest, stages 2 and 3 forb cover, and grain fields. Trees or tall shrubs are necessary for roosting.

Wildlife Management Practices*Decrease harvest* if populations are declining where habitat is suitable but 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 in stages 2 and 3.
Manage forest using forest regeneration methods to enhance nesting habitat and provide additional brood cover, soft mast, and miscellaneous seed for 2 to 3 years after harvest. Timber stand improvement practices can improve the structure of the understory for nesting and brood rearing, enable the crowns of desired trees to grow, and produce additional mast and miscellaneous seed.
Increase harvest where populations can sustain additional hunting pressure 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. Leaving grain is especially important during years of poor acorn production.
Manage disturbance using prescribed fire, disking, herbicide application, chaining, roller beating and grazing management 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 and 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.
Eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to stages 4 through 6.
Create water developments when there is little or no free-standing water available.
Manage wildlife damage in rare instances when wild turkeys are depredating crops.

wood duck

General Information



Wood ducks are found primarily in three places: along rivers and large creeks within bottomland hardwoods forests, in stage 3 wetlands and swamps with emergent woody vegetation next to to stage 2 wetlands, and in shallowly flooded stage 5 and 6 hardwood forest. Wood ducks nest in cavities. Usually, nest sites are in or next 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. Artificial cavities are readily used by wood ducks and have likely been the main reason wood duck populations have risen over the past 50 years.

Habitat Requirements

Diet: Wood ducks eat primarily acorns in fall and winter. They also eat other hard mast, miscellaneous seeds, soft mast, and waste grain (especially corn). Chicks and hens need insects and other invertebrates before and during the nesting season.
Water: Wood ducks obtain water through their diet and drink free-standing water regularly. (See cover requirements below.)
Cover: They live in stage 3 wetlands and swamps and shallowly flooded bottomland hardwoods. They nest in tree cavities in stage 6 hardwoods or artificial cavities.

Wildlife Management Practices

forest using timber stand improvement in bottomland hardwoods that can be flooded. Timber stand improvement in such areas should encourage larger crowns of favored trees, increase mast production, increase woody stem density, and improve cover.
Leave grain unharvested (especially corn) to provide a 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
Manage disturbance using grazing management to prevent livestock from damaging trees and shrubs planted for wood ducks.
Provide 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 and manage food plots. Shallowly flooded grain plots can provide an important source of energy in fall and winter, especially during years of poor mast production.
Plant shrubs in open areas that can be flooded and lack emergent woody vegetation.
Plant trees next to or in open areas suitable for flooding. Mast trees can provide food and nesting cavities.
Create snags to provide potential cavity nesting sites.
Manage tillage. Eliminate tillage in the fall to provide additional waste grain during winter, especially in fields that can be shallowly flooded.
Install water control structures in existing dikes if there are none present.
Create water developments for wildlife. Specifically, create shallow impoundments where topography allows, allowing feeding and nesting space for wood ducks.

Mammals

black bear

General Information

Black bears use primarily mature deciduous or mixed deciduous and coniferous forest interspersed with early successional openings containing soft mast. They also use young regenerating stands, shrub thickets with dense brushy cover, and riparian corridors. Generally, they are secretive animals and avoid human contact; however, bears

are highly adaptable and may be found in and around human dwellings. Black bears hibernate in winter (even in warm climates, such as Florida and Louisiana). They have large home ranges (several square miles) that vary based on sex, age, and time of year (breeding season, fall foraging, denning). In general, home ranges for adult males are up to 50 square miles -- much larger than female home ranges. Solitary females and females with cubs have considerably smaller home ranges of about 15 square miles. Bears are omnivorous, but 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 of bear/human conflicts, property damage, livestock and agricultural damage, and bear sightings. Mississippi bears are a protected species and not subject to harvest.

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, bears prey on small to medium-sized mammals, such as deer fawns and young livestock (calves and lambs). During summer and early fall, a variety of soft mast, such as blackberry, blueberry, serviceberry, black cherry, and pokeweed are important. During late fall, bears feed on acorns, beechnuts, hickory nuts, and other hard mast; field corn; and soybeans to prepare for hibernation. When natural foods are scarce, bears may wander near human residences and feed on birdseed, dog or 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 because black bears have such a large home range.

Cover**:** Bears forage in mature hardwood or mixed hardwood and conifer forests. They also forage -- usually for soft mast -- in early successional openings. They use brushy areas and young regenerating forest for loafing and escape. They hibernate in rock crevices, excavations, hollow trees, and dense thickets.

Wildlife Management Practices

Manage forest using forest regeneration, especially clearcut and shelterwood methods, to create dense escape and loafing cover for bears. Recently regenerated stands also offer an abundance of soft mast, pokeweed, blackberry, huckleberry, and blueberry. Timber stand improvement practices can increase hard mast production if quality trees are retained in the stand. TSI can also stimulate groundcover, which usually increases soft mast production.

Leave grain unharvested. Strips of corn, grain sorghum, or soybeans should be left standing, especially where next to escape cover, to provide food near cover.

Manage disturbance using prescribed fire to stimulate groundcover and soft mast and maintain stages 3 and 4.

Plant and manage food plots. Where available food may be limiting, forage and grain plots may be planted to provide additional nutrition.

Plant shrubs, such as crabapple, high-bush blueberry, hawthorn, wild plum and elderberry, in forest openings where soft mast is lacking. Planting shrubs can also help maintain stage 4.

Plant trees, such as apple, pear, cherry, persimmon and dogwood, to provide additional soft mast.

Manage tillage. Eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to stages 4 through 6
Management wildlife damage if bear/human conflicts occur in agricultural or urban settings.

coyote

General Information

Coyotes are found throughout the continental U.S., including large cities and urban areas. Coyotes prefer grasslands, shrubland, and farmland, but they also use stages 5 and 6. They den in a variety of places, including brush-covered slopes, steep banks, rock ledges, thickets, and hollow logs. Coyotes are most active 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. They have an extremely varied diet that fluctuates with the seasons.

Habitat Requirements

Diet: Coyotes eat rodents, rabbits, other small mammals, insects, birds, deer, carrion, and soft mast. Coyotes usually eat livestock and wild ungulates (deer) as carrion, but they do sometimes prey heavily on deer fawns, limiting reproductive success.
Water*:* 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, and brushpiles; and holes under stumps or abandoned buildings are used as den sites for raising pups.

Wildlife Management Practices:

Decrease harvest as necessary when additional coyotes are desired and hunting or trapping efforts may be limiting growth. Realistically, because of high reproduction and survival rates, this practice would almost 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.
Manage forest using forest regeneration and timber stand improvement to increase prey.
Increase harvest where populations can sustain additional hunting and trapping pressure or where populations need to be lowered.
Manage disturbance using prescribed fire, disking, chaining and herbicide applications to maintain stage 3. Grazing management should maintain adequate cover for prey
Plant shrubs in areas where additional stage 4 is needed to attract prey and provide security cover.
Manage wildlife damage where livestock depredation is a problem.

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 are prey to most carnivorous predators within their range. They are prolific breeders, however. A female may have seven litters per year, with three to six young per litter. High reproduction rates are required to perpetuate populations, as 70 to 80 percent of all rabbits die each year.

Habitat Requirements

Diet: Easter cottontails eat forbs, grasses (stages 2 and 3), browse, and soft mast from spring through fall. In winter, they eat bark of shrubs and trees, buds, grain and browse.
Water: Necessary water is obtained from diet.
Cover: They use shrubs, brush piles, and 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 if additional rabbits are desired and hunting or trapping 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.
Manage forest using forest regeneration, especially clear-cutting, to provide optimal brushy cover for a few years.
Increase harvest where populations can sustain additional hunting and trapping pressure or where populations need to be lowered.
Leave grain unharvested to provide additional food, especially corn.
Manage disturbance using prescribed fire, disking, chaining, and herbicide applications to maintain or rejuvenate stages 3 and 4. 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 and manage food plots where additional forage or grain is needed. A 1/4 acre plot for every 10 to 15 acres should be enough.
Plant shrubs in large areas of stages 2 and 3 and in agricultural areas with few shrubs. Field borders, fencerows and other idle land areas are good places to plant. Planting shrubs is also appropriate for open areas in urban settings.
Manage tillage by delaying cropland tillage in spring to allow use of standing stubble for cover. Tillage may be eliminated in fall to allow access to waste grain.
Manage wildlife damage to control damage to ornamental, landscaping, and garden plants.

Eastern gray squirrel

General Information

Eastern gray squirrels live 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 on the ground and in trees. They den in cavities of mature trees; if cavities are not available, they build nests, generally 30 feet or more above ground. Eastern gray squirrels will use nest boxes, but because they also build nests, cavities are not a limiting factor.

Habitat Requirements

Diet: Squirrels eat a variety of hard and soft mast, miscellaneous seeds, grains, bark, buds, and mushrooms. They will also eat eggs.
***Water*:** Necessary water is generally obtained through diet. Free-standing water is also used.
Cover: They use stage 6 forest and woodlands and suburban and urban areas that have mature trees. They den in tree cavities or build nests of leaves and twigs.

Wildlife Management Practices:

Decrease harvest if additional gray squirrels are desired and hunting pressure is limiting growth.
Manage forest using timber stand improvement to encourage larger crowns of mast-producing trees and enable oaks, hickories, beech and others to produce more mast. TSI can also increase soft mast availability and provide snags for den sites.
Increase harvest where populations can sustain additional recreational hunting pressure or where populations need to be lowered.
Manage disturbance using grazing management to protect trees and shrubs planted for squirrels. Protect woods from overgrazing
Create nesting structures where cavities are limiting**.** Three to four cavities per acre are best. Nest boxes may be beneficial.
Plant shrubs across large fields and in "odd areas" of crop fields not planted to crops
Plant mast trees where stages 5 and 6 make up less than 50 percent of the area considered and where stages 5 and 6 forests contain few or no mast-producing trees
Manage tillage. Eliminate tillage in the fall, especially in cornfields next to stage 6 forest.
Manage wildlife damage if squirrels become a nuisance around houses.

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, burrows under stumps or brushpiles, or in chimneys, attics and crawl spaces of houses and buildings. They are omnivorous and eat a wide range 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 of game bird nests and young game birds. In such cases, wildlife damage management or increased harvest may be necessary.

Habitat Requirements

***Diet*:** Raccoons eat crayfish, birds, eggs, small mammals, insects, lizards, snakes, worms, fish, carrion, grains, seeds, hard and soft mast, and foods prepared for human or pet consumption.
***Water*:** They require water frequently during warm seasons.
Cover: Raccoons use riparian areas, bottomland hardwoods, and other wetlands. They use natural tree cavities for denning and daytime loafing. They also den in ground burrows under stumps, brush and junk piles, in old abandoned buildings and on rocky cliffs and ledges.

Wildlife Management Practices:

Decrease harvest if hunting pressure is limiting population growth and an increase is desired
Establish field buffers to increase usable space for prey around row crop fields.
Manage forest using forest regeneration and timber stand improvement to stimulate soft mast production and cover for prey. When implementing forest management, retain relatively large snags with cavities.
Increase harvest where populations can sustain additional recreational hunting or trapping pressure or where populations need to be lowered.
Leave grain unharvested, especially in cornfields next to bottomland hardwoods and riparian areas.
Manage disturbance using prescribed fire 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 stages 4 and 5 to stages 2 and 3. Grazing management should prevent livestock from degrading riparian areas and other wetlands. Grazing management may require developing livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas.
Plant and manage food plots. Maintain annual grain food plots, especially corn.
Plant shrubs to provide soft mass where needed and to provide corridors across large areas of stages 2 and 3.
Plant trees, especially in riparian areas and next to wetlands where trees are scarce. Maintain approximately 50 percent deciduous forest cover. Maintain forested riparian corridors.
Create snags. Relatively large dead trees with cavities can provide denning sites.
Manage tillage. Eliminate fall tillage of grain crop residue next to cover to make waste grain available as food.
Create water control structures to control water levels, provide water less than 2 feet deep, stimulate emergent vegetation, and enhance habitat for prey.
Create water developments. Shallow impoundments can provide a water source and additional wetland habitat.

Manage wildlife damage 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 southern Canada and the U.S., except in 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 they are overabundant, they can cause significant damage to ornamental plantings and row crops and can be hazardous for motor vehicles.

Habitat Requirements

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

Water: They 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 and an increase is desired.

Delay crop harvest so fawning sites are not disturbed, but be aware that poor-quality hay will result. Fawning sites in hayfields often suggest insufficient 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 less than 25 percent of the property is high-quality early successional cover.

Manage forest using forest regeneration to increase browse, soft mast production and dense escape cover. Timber stand improvement can increase browse and soft mast production and stimulate better cover in stands with a poorly developed understory.

Increase harvest where populations can sustain additional recreational hunting pressure or where populations need to be lowered because of overpopulation and habitat degradation. To reduce overpopulation, concentrate the harvest on females.

Leave grain unharvested to provide additional food, especially near cover.

Manage disturbance. Prescribed fire is recommended to maintain stages 2 through 4 and to revert stage 4 to stage 3. Prescribed fire is also recommended to stimulate the understory for increased forage and soft mast in stages 5 and 6 of Eastern Deciduous Forest and Southeast Mixed Forest. Mowing and chaining can also maintain stages 3 and 4. Grazing management should maintain forbs, grasses, shrubs and trees for food and cover.

Plant and manage food plots where naturally occurring food sources are limited. Food plots may provide additional nutrition, particularly in late summer and winter of most regions.
Plant shrubs where needed to provide additional soft mast, brushy cover, and browse. Plant shrubs in ravines, field borders, other idle land areas, and across large areas of stages 2 or 3 to provide travel corridors.
Plant trees where needed to maintain at least 30 to 40 percent forest cover. Plant mast-producing trees, especially oaks, where mast producers are lacking.
Manage tillage. Eliminate fall tillage of grain crop residue next to cover to make waste grain available as an additional food source.
Create water developments where lacking. Water developments should be within one-half mile of one another. Dugouts and shallow impoundments can provide an external water source for drinking.
Management wildlife damage using fencing, repellents, and scare tactics to keep deer from ornamentals, gardens and some crops. Reducing the population through shooting is recommended when widespread overabundance is causing crop depredation and 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 U.S., from southern Canada to Florida and Texas, but they have been successfully introduced throughout the U.S.

Habitat Requirements

Diet**:** Bluegill eat 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, crayfish, and small fish.
Cover**:** They use submerged rocks, woody debris and aquatic vegetation where small fish hide.
Water**:** Basic requirements include dissolved oxygen (minimum of four parts per million); pH between 6.5 and 9.0; and water temperatures of at least 70 F during the summer (1 foot below surface in the shade).

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.
Manage disturbance using grazing management to 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.
Construct ponds where no water is present or where an existing pond needs extensive repair, especially to the dike or dam, including tree removal on the dike or dam.

Deepen pond edges to at least 2 feet deep to discourage rooted aquatic vegetation.
Fertilize or lime ponds when needed. Fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface. Add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm.
Reduce pond turbidity by reseeding the watershed where soil is eroding into the pond and causing muddy water.
Repair spillway or levee if either is not functioning properly.
Restock pond if the population is too far out of balance to correct via seining or fishing or if undesirable species are present.
Install water control structures if none are present so water depth can be controlled.

largemouth bass

General Information

Largemouth bass are not really bass but members of the sunfish family. Largemouth bass are an extremely popular freshwater sportfish. They can be found in freshwater lakes, rivers, large streams, farm ponds and brackish marshes.

Habitat Requirements

Diet**:** Young bass eat insects and other invertebrates, such as worms, crayfish and zooplankton. Adults eat small fish, such as bluegill, a variety of minnows, tadpoles, crayfish, and even ducklings.
Cover: Bass take cover in submerged rocks, woody debris and aquatic vegetation where small fish (prey) hide.
Water: Basic requirements include dissolved oxygen (minimum of four parts per million); pH of between 6.5 and 9.0; water temperature should of at least 70 F during summer (one 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.
Manage disturbance using grazing management to 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.
Construct ponds where no water is present or where an existing pond needs extensive repair, especially to the dike or dam, including significant tree removal on the dike or dam.
Deepen pond edges where pond edges are less than two feet deep to discourage rooted aquatic vegetation.
Fertilize or lime pond if needed. Fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface. Add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm.
Reduce pond turbidity by reseeding the watershed where soil is eroding into the pond and causing muddy water.
Repair spillway or levee if either is not functioning properly.

Restock pond if the population is too far out of balance to correct via seining or fishing or if undesirable species are present.
Install water control structures if none are present to control water depth.

Southeast Mixed & Outer Coastal Plain Forest **Food Groups**	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	

Section E. Wildlife Management Practices (WMPs)

In this section, various practices used to manage habitat are described in further detail. They are listed in alphabetical order. The descriptions are brief, general, and not meant to be comprehensive. Additional reading, research, and guidance from other wildlife resources and wildlife management professionals are suggested.

Some of the practices may seem contradictory. For example, Practice 14 - Ponds, Deepen Edges discourages the growth of emergent aquatic vegetation, while Practice 25 - Water Level Manipulation Techniques encourages growth. Landowner objectives will determine which practices you recommend**.** At times, the best habitat management is maintaining an area in its current condition. This can include protecting the area from development and applying various management practices that will help maintain the area. **Remember, when assessing whether or not to recommend a wildlife management practice, you must determine if it needs to be applied within the next year.**

In this manual, costs and budgets are not considered when recommending practices. However, in actual situations, wildlife managers must consider economics when planning and recommending management practices. For the written and oral segments of the contest, you should specify which practice(s) should be used and why that practice is applicable.

Wildlife Management Practices:

- Control Non-Native Invasive Vegetation
- Decrease Harvest
- Delay Crop Harvest
- Establish Field Buffers
- Establish Native Grasses and Forbs
- Fish or Wildlife Survey
- Forest Management Techniques
- Increase Harvest
- Leave Grain Unharvested
- Manage Disturbance
- Nesting Structures
- Plant/Manage Food Plots
- Plant Trees
- Plant Shrubs
- Ponds: Construction
- Ponds: Deepen Edges
- Ponds: Fertilize / Lime
- Ponds: Reduce Turbidity / Reseed Watershed
- Ponds: Repair Spillway / Levee
- Ponds: Restock
- Create Snags
- Tillage Management
- Water Control Structures
- Water Developments for Wildlife
- Wildlife Damage Management

Southeast Mixed & Outer Coastal Plain Forest	American Kestrel	black bear	bluegill	coyote	Eastern bluebird	Eastern cottontail	Eastern gray squirrel	great horned owl	hairy woodpecker	largemouth bass	mallard	mourning dove	Northern bobwhiite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild turkey	wood duck
Control non-native 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	
Delay crop harvest																	X		
Establish field buffers	X			X	X	X		X					X	X			X	X	
Establish native grasses & forbs	X			X	X	X		X				X	X				X	X	
Fish & 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	X	X
Increase harvest			X	X		X	X			X				X			X	X	
Leave grain unharvested		X				X					X	X	X	X			X	X	X
Manage disturbance	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
Plant shrubs	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			X							X									
Ponds: deepen edges			X							X									
Ponds: Fertilize/lime			X							X									
Ponds: Reduce Turbidity/reseed			x							X									
Ponds: Repair spillway/levee			X							X									
Ponds: Restock			X							X									
Create snags	X				X			X	X			X		X	X				X
Tillage management	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	

Control Non-Native 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 outcompete 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. There are few properties in the country that 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, *Manage disturbance* should not be selected unless succession needs to be altered as well. Then, both practices should be selected.

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 one pound and in poor condition
- no young bass

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, such as white-tailed deer. However, it may be necessary to decrease harvest levels for other species, such as Northern bobwhite, or when harvest data or observation indicate species populations are declining in areas with good habitat and excessive hunting pressure. 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 almost always a result of poor habitat resulting from existing site quality, degradation, or destruction 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. Note that crop yield and quality are often reduced dramatically when harvest is delayed. This is especially true when hay harvest is delayed until seedheads form. Making sure the focal wildlife species has adequate usable space across the property is much more important than delaying crop harvest. Reducing the acreage cropped or hayed to increase acreage available for wildlife may be necessary.

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 through 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 sediment and nutrient run-off. They also can provide excellent nesting, brooding, and escape cover for many wildlife species.

Field buffers should be at least 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 *Plant Shrubs* should **not** be recommended in order to *Establish Field Buffers*. However, if existing field buffers have undesirable nonnative species, *Control Nonnative Invasive Vegetation* **should** be recommended. Recommend additional field buffers only if there are crop fields without buffers or if fields need additional buffers. 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 sediment and nutrient runoff
- Provides increased usable space for many wildlife species
- Provides nesting and brooding cover for many songbirds, bobwhites, and wild turkeys
- Can increase 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. Nonnative grasses often compete with native grasses and forbs and prevent their establishment. Warm-season grasses and forbs grow primarily during late spring and summer. Cool-season grasses and forbs grow primarily 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 to allow native seed lying dormant in the seedbank to germinate.

Note: If native grasses and forbs are planted, be sure 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. Additional early successional habitat is particularly needed for those species and others in areas that are predominately forested and where the majority of existing early successional habitat is dominated by non-native species. The amount of early successional habitat required depends on the focal species. Some species, such as Eastern cottontails, will thrive in relatively small areas of early successional habitat.

Early successional habitat must be maintained. Prescribed fire, disking, and grazing are recommended to prevent litter buildup and excessive woody plant succession from deteriorating the vegetative structure. 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 sprit green-up or in late summer or early fall, so nests and young wildlife are not disturbed. Ideally, **early successional habitat should not be mowed**.

Effect on Habitat

- Native grasses and forbs provide nesting, bedding, roosting and cover for several songbird species, bobwhites, wild turkeys, white-tailed deer, cottontails, and other small mammals. These areas are also important for predators, such as hawks, owls, coyotes and others.
- Ground-nesting birds usually build their nests at the base of a bunch or clump of native grass.
- Although some wildlife, such as elk, readily eat native grasses, forbs provide a greater food source for more species. Forbs produce edible foliage, and the seed produced by many forbs, such as native lespedezas, ragweed, sunflowers and pokeweed, is an 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. They can walk easily between bunches of grasses and under the canopy of forbs, eating insects, other invertebrates, and forb seeds.
- Areas burned or disked at least two years before provide dead, dry vegetative material birds use for 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. The recommended width is 100 feet, but width may vary with size and order of the stream, topography, and landowner objectives.

Examples of desirable species:	Examples of undesirable species:
Native warm-season grasses	*Nonnative native warm-season grasses*
Bluestems	Bermudagrass
Switchgrass	Cogongrass
sideoats grama	Crabgrass
indiangrass	Dallisgrass
	Goosegrass
Native cool-season grasses	Nonnative cool-season grasses
Wildryes	Tall fescue
Low panicgrasses	Orchardgrass
	Bromegrasses
	Timothy
Native forbs and brambles	Nonnative forbs
Ragweed	Sericea lespedeza
Pokeweed	Curly dock
Blackberry	Spotted knapweed
Dewberry	Sicklepod
Native lespedezas	Cocklebur
Beggar's-lice	
Old-field aster	
Partridge pea	
Perennial sunflowers	
Crotons	

Fish or Wildlife Survey

General Description of Fish Surveys

First, establish a population balance by stocking the correct number of fish. After the first year, check pond balance during early summer by seining at intervals around the pond. In an average pond, four to five seine sweeps is usually enough. Balance is determined by comparing ages, conditions, 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.). 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 the pond drained.

Seining is usually not effective for collecting fish in streams. Fish in streams are usually collected by fishing or electroshocking. Electroshocking 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 their ages, conditions and

population numbers are recorded to determine stream balance. The fish are then returned to the stream.

General Description of Wildlife Surveys

Wildlife managers should monitor wildlife for increasing or decreasing populations or body weights. Wildlife biologists routinely collect data on white-tailed deer, black bear, wild turkeys, Northern bobwhite, mourning doves and many songbirds using infrared cameras, roadside counts, call counts, check stations, transects and questionnaires. Data is used to prescribe future harvest or land management strategies.

Note: While fish and wildlife surveys are always important, they should not be recommended if a survey has been completed recently. For the contest, you will be told (either verbally or in writing) if a survey has been completed recently.

Forest Management Techniques

General Description

A forest can be managed by harvesting a stand 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 absolutely crucial when managing wildlife that use forest.

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. Thus, a young forest is established. This process changes the structure of the forest and the composition of plants growing in the forest understory. Some wildlife species benefit, and others do not. For example, rabbits and bobwhites readily use the cover and food resources provided in a recently clearcut stand of mixed hardwoods, while Eastern gray squirrels using that stand prior to harvest would have to move to an adjacent stand. Still other species, such as wild turkeys and white-tailed deer, would use both the recently harvested stand and 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 disperse regenerating stands across the area being managed. The regeneration method recommended depends upon forest type and composition, site quality, and landowner objectives.

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. If additional early successional habitat is needed and the area is currently forested, *Forest Regeneration* should **not**

be recommended automatically. Instead, *Manage Disturbance (chainsawing)* and *Establish Native Forbs and Grasses* should be recommended.

Regeneration methods:

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, basswood) when present.

Shelterwood regeneration method removes a pre-determined number of trees from the stand to allow development of seedlings (regeneration) from beneath. Later (usually in 6 to 8 years), the remaining overstory (shelterwood) is removed as the regeneration develops.

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.

Group selection regeneration method harvests small groups of trees (no more than 2 acres) within a stand. This method increases diversity within the stand and generally allows less light into the stand, which can allow both shade-tolerant and shade-intolerant trees to regenerate.

Single-tree selection regeneration method harvests only selected 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 almost always 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 nearby. Typically, regenerated stands should be near more developed stands to provide travel corridors and space for wildlife that do not use young stands. Also, whenever stands are harvested, it is important to leave standing dead trees (snags) for wildlife that use them. Where snags are not available and species that use snags and down woody material are desirable, consider creating snags when the stand is harvested by killing some trees and leaving them standing. Trees can be killed and left standing by girdling the tree with a chainsaw or hatchet and applying herbicide to the wound.

Effect on Habitat – Regeneration Methods

- 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. Many herbaceous plants will persist until 5 or 6 years post-harvest, when they will be 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.
- Retaining snags and cavity trees when harvesting trees provides nesting, roosting, denning and perching sites. Enhancing cover for prey species subsequently provides food for predators.
- The tops and slash of harvested trees remaining on the site provide down woody debris. Down woody debris is very important for several reasons. As the material rots, its nutrients return to the soil for other 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, commonly nest adjacent to the brushy material and logs left behind, which simulate a tree knocked over during a storm. The brushy debris left behind after a logging operation also provides important cover for various species and actually helps regenerate forest by protecting seedlings 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 sunlight and nutrients toward production of desired products, which may include timber 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 remove at least part of the trees for a useful product. Removing trees increases the amount of sunlight entering the forest canopy, promotes increased growth of the remaining trees, and favors food-producing plants, both woody and herbaceous.

Effects on Habitat – Timber Stand Improvement

- 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.
- When adjacent competing trees are removed, trees retained following TSI can 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 are 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
- few or no young bass

Increase bass harvest cautiously. Target bass less than 1 pound and spread the harvest over the summer.

Bluegill are needed when seine samples and fishing records of pond reveal

- no recent bluegill hatch
- many medium-sized bluegill in poor condition
- bass are few, large and in good condition

Target medium-sized bluegill, using seine harvest or shoreline rotenone.

Game birds and mammals are needed when animals show these signs of stress and overpopulation:

- destruction of habitat by overgrazing or overbrowsing
- poor body condition and weight loss
- low reproductive rate
- increase in prevalence of parasites and diseases

Regulated hunting is the most effective and efficient way 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 next to cover. This practice should be recommended only if there is an unharvested crop present. It is not appropriate for grain food plots.

Effect on Habitat

Leaving grain unharvested provides additional food, which can be particularly important when naturally occurring foods are in low supply and in years with poor acorn production.

Manage Disturbance

General Description

Succession is the orderly and predictable series of changes in plant species composition through time. It occurs in all natural communities. Wildlife habitat is most often managed by setting back succession in an effort to retain the successional stage(s) beneficial for the focal wildlife species. There are four basic ways of manipulating succession: **mechanical methods**, **fire**, **grazing**, and **herbicide applications**. Each of these may be used to manipulate 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 and oral segments of the contest, you should specify the recommended methods for manipulating succession and give your reasons for recommending them.

Manage Disturbance -- 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 way to reduce grass coverage, encourage germination and growth of forbs, and expose bare ground. Areas in stages 2, 3 and 4 (depending on size and height of shrub cover) can be disked to maintain and 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 for controlled burning, it should not be recommended in order to burn. Disking should not be prescribed for areas 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, returns succession to stage 2

Chainsawing / Feller-Buncherring: A chainsaw or feller-buncher may be used to kill 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: This practice implies that once the trees are removed, the area will be managed in something other than trees, such as native 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 and Manage Food Plots*, it should be recommended as well.

Effect on Habitat

- reduces tree density
- encourages early successional plant communities

Chaining / Roller Beating: Chaining involves pulling a very large chain strung between two bulldozers running parallel to each other about 50 to 100 feet apart. The chain knocks down shrubs and small trees. Roller beating involves bulldozers pulling a roller with large, sharp metal blades that knock down and chop up 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 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, returns 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, do not mow until late winter or early spring. When used to manage fields or other early succession habitat, mowing should be conducted only when 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, recommend prescribed burning and disking 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 of some kinds of shrubs by encouraging resprouting
- in stages 3 and 4, helps rejuvenate grasses, forbs, and shrubs, which improves nesting cover for some bird species
- causes thatch build-up, which suppresses the seedbank and reduces availability of invertebrates and seed to young quail, grouse, turkeys and other ground-feeding birds. Thatch build-up also reduces the ability of these animals to move through the field.

Manage Disturbance -- 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 in stages 5 and 6. Wherever burning is possible, prescribed fire should be used to manage early successional habitat instead of mowing or mulching.

Timing, intensity and frequency of fire strongly influence vegetation composition and structure. Burning in late summer or early fall tends to reduce woody composition more than burning in winter or spring. Low-intensity fire is recommended to prevent damaging trees when burning a forest understory. Like other methods, fire sets back succession only temporarily. With the exception of intense fire, more frequent burning over time will change vegetation composition more so than less frequent burning. For example, if an area is burned every 1 to 2 years, it will eventually be dominated by annual and perennial herbaceous vegetation. Where there is adequate rainfall, if that same area is burned every 3 years to 5 years, considerable woody cover will be present. If burned every 5 years to 10 years, the site will be dominated by woody species. Intensity and timing of fire will dictate whether woody species are killed or if only the leaf litter is consumed.

Although a very beneficial practice, prescribed burning may not be possible in all locations. Sites near urban areas, hospitals or busy roadways may not be suitable for burning because of safety and smoke management concerns.

Burning should be conducted only when danger of wildfire is low (when the wind, temperature, and humidity allow a controlled burn). It 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.

- during the late growing season, kills woody stems and may reduce density of native warm-season grasses and encourage additional forb cover.

Manage Disturbance -- 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 succession 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) 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 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.

Manage disturbance: 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, reduces vegetative diversity and limits many plants important for wildlife.
- can 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, such as bluebirds and wood ducks, den, nest or roost in cavities they don't excavate themselves. 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) in a

certain location (field, woods or water) and at a certain height above ground. The design and placement of nest boxes often determine which wildlife species use the structures. Nest boxes should be monitored to ensure use by targeted species. Contact your county Extension office for designs for nest boxes and other artificial nesting and roosting structures.

Effect on Habitat:

- In open areas (stages 2, 3, and 4), nest boxes are useful for bluebirds unless plenty of nesting cavities in trees or fence posts are available. Nest boxes for bluebirds should be placed at least 80 yards apart to prevent territorial fighting between males.
- Where trees with cavities suitable for nesting are absent, nesting structures near water sources provide secure nesting sites for wood ducks. Nest boxes for wood ducks should be at least 100 yards apart. Ideally, boxes should be hidden from one another to prevent dump-nesting by other females.

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, rape, chicory, winter peas, soybeans, cowpeas and lablab. Some plantings may provide forage and grain or 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 (depending on the focal wildlife species and the type of food plot planted). Ideally, they are 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 next 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 planted not only for upland wildlife (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. Food plots should only **supplement** 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 prior to 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 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 are applied at the correct rate 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 as needed with herbicides to control weed competition and pesticides to control 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) 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 acorn production.
- In areas where little herbaceous vegetation is present (such as large areas of stages 4, 5 or 6) 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 Shrubs

General Description

When properly located, shrubs provide cover and soft mast that 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 or woods borders, odd areas (such as field corners and gullies), riparian areas and any other areas where soft mast is scarce. Establishing hedgerows of shrubs to break up fields is very beneficial, especially when they are planted next to high-quality early successional cover or a good food source (such as a 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

- Shrubs 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 that can be managed differently to meet the various food and cover requirements of different wildlife species.
- Shrub plantings may be useful in some urban settings where desirable cover 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, topography, and landowner objectives.

Plant Trees

General Description

Trees provide food (hard or soft mast) and cover for many wildlife species. Trees should be planted in winter, while they are dormant. When mast production is the objective, planting a mixture of species is usually recommended. This reduces the chances of a mast failure in any given year. Region, site, and landowner objectives help determine which species are planted. Hard mast producers that are important for wildlife include oaks, hickories, American beech and pecan. Soft mast producers that are important for wildlife include persimmon, mulberry, apple and pear.

Effect on Habitat

- Trees provide hard or soft mast production, depending on the species planted.
- Large areas can be planted for reforestation.
- Trees provide 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 protect 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, topography, and landowner objectives.

Ponds: Construction

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 pond's purpose and region. 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.

When constructing ponds, artificial reefs can be included for additional cover. 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. Note: the wildlife management practice *Pond: Restock* should not be checked when *Pond: Construction* is recommended.

Effect on Habitat

Ponds can provide suitable habitat for some fish and wildlife species.

Note: Although many wildlife species use ponds for various reasons, pond construction 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

If ponds have excessive aquatic vegetation along their margins, the edges should be deepened to at least 2 to 3 feet with steep side slopes. If the pond can be drained, sides can be deepened with a bulldozer or tractor with a rear blade. If the pond cannot be drained, sides can be deepened with a backhoe 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

Deepening the edges reduces rooted aquatic vegetation around the edge of a pond, making prey more available to predator fish.

Ponds: Fertilize/Lime

General Description Ponds can be fertilized to increase available natural food 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, ponds that are turbid (muddy), 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, test the total alkalinity and pH of the pond water. 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 powder (or its equivalent) or one gallon of 11-37-0 liquid fertilizer or 15 pounds of 0-46-0 granular per acre. Apply fertilizer at two-week intervals 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 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 turbidity is caused by sedimentation (erosion) from the watershed or the pond bottom (cattle or fish) and will usually clear relatively quickly. Reducing erosion in the watershed is best accomplished by reseeding the watershed immediately 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 type and amount of product used 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 / Levee

General Description

This practice is needed if the spillway in an existing dam or dike is eroding or otherwise damaged, keeping the pond level too low and increasing the chance of the dam eroding during heavy rains. In some cases, leaks around the spillway or levee structure can be stopped with special clays or plastic liners.

Effect on Habitat

Repairing spillways and levees enables ponds to fill to appropriate levels and prevents 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 and prey combination. Restocking should be done only after all fish in the pond have been removed, either by draining or applying a fish toxicant. In warm water ponds, bluegill fingerlings should be stocked in late fall and bass fingerlings, the following June. Although different states have different stocking recommendations, typical stocking rates are 1,000 bluegill and 100 bass per surface acre if the pond will 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.

When managing for species that use snags and down woody material but snags are not available, it may be desirable to create some snags by killing some trees and leaving them standing. Trees can be killed and left standing by girdling the tree with a chainsaw or hatchet and applying herbicide to the wound.

Effect 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.

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, in which soil is turned over and covers up crop residue, such as moldboard plowing or disking. Instead, use implements that do not turn the soil over, such as chisel plows. **Note**: This practice should be recommended only if a grain crop is present.

Effect on Habitat

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 too little 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, or woods.

Effect on Habitat

- allows ponds to be drained for managing water quality and controlling 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 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 gradual to provide easy access to wildlife.

Ephemeral pools are natural depressions that may be seasonally flooded by rainfall. These wetlands provide important habitat for many amphibians (frogs, toads, and salamanders), which breed in these pools during wet periods. During dry periods, these ephemeral pools dry, and vegetation often grows in them. When they flood again, this vegetation serves as cover for breeding amphibians and places for their eggs to be attached. Also, waterfowl and other wetland birds eat the seeds and aquatic insects associated with the vegetation.

Shallow impoundments

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

- Water developments can provide drinking water and wetland habitat.
- Flooded grain fields or stage 6 bottomland hardwoods in fall and 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.
- Water developments can be sources 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 a house; bats or squirrels in an attic; snakes in a house; deer eating ornamental plants in a yard or feeding in soybean crops; bobcats, coyotes, or owls preying on livestock or pets; rabbits or raccoons eating vegetable gardens; beavers killing trees or flooding crops and roads; red-winged blackbirds eating crops; birds striking planes near airports; rock doves defecating on buildings; starlings roosting in 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, 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 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 eliminate the damage by eliminating the individual(s) causing the damage. Nonlethal methods typically result in 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 elsewhere. 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 absolutely identify the species causing the damage. An integrated wildlife damage management program that employees two or more methods is best, 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: In this contest, it sometimes can be hard to decide 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 and the species can be harvested legally, *Increase Harvest* should be recommended. For example, if white-tailed deer are over-browsing a forest understory and destroying habitat for various songbirds, *Increase Harvest* should be recommended. Likewise, if raccoons have been found to limit wild turkey recruitment or coyotes have been found to limit fawn survival, *Increase Harvest* should be recommended for raccoons or coyotes. For non-native species that are often problematic, such as house sparrows, European starlings, or rock doves, *Wildlife Damage Management* should be recommended to control associated damage, as they are not considered game species.

Interpreting Wildlife Habitat from Aerial Photographs

Aerial photographs (black and white, color, or infrared) can be used to evaluate potential habitat for wildlife. Photographs are 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 is sometimes not evident from the ground, so 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 other 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 possible only with on-site verification.

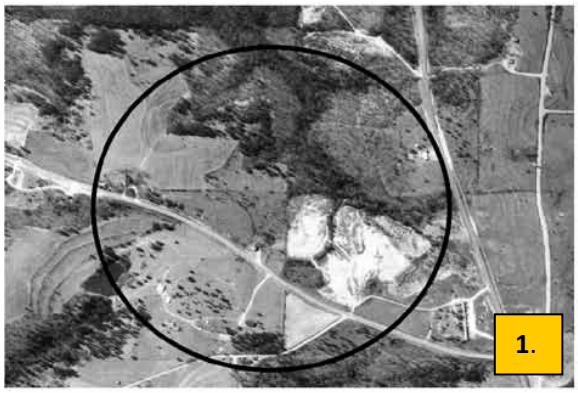
When using aerial photos, it is important to be able to identify certain features such as rivers and streams, ponds and lakes, structures (houses, barns, and commercial buildings), stages of

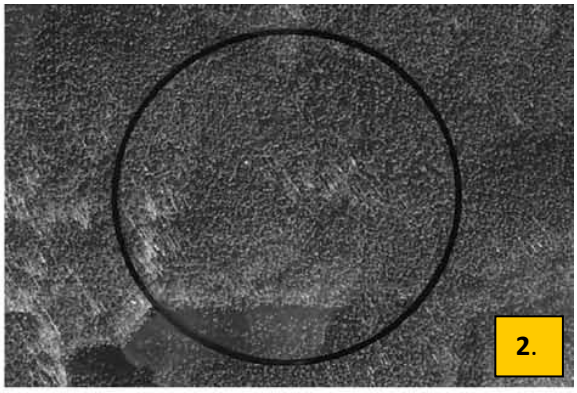
succession, agricultural land, pasture, hard edge, soft edge, residential and urban areas, roads, power lines, etc. However, the most important information obtained from an aerial photo is the general landscape composition and the interspersion and arrangement of vegetation types and successional stages. When looking at aerial photos, imagine how the countryside would look if you were in an airplane. For example, buildings look like squares or rectangles, silos appear round, woods are rough, and hayfields are smooth.

When viewing aerial photographs, hold them so that shadows of objects fall toward you. Otherwise valleys appear to be ridges, and vice versa. All objects are small, but you can determine what they are by comparing their size to 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, so it is important to know in what season the photo was taken. The date the photo was taken is usually in the upper left corner. The scale of such photos can vary, but often either 4 or 8 inches on the map equals 1 mile on the ground.

Terraserver and Google maps are good resources for samples of aerial photos. Your local Natural Resources Conservation Office or government planning office may also be able to provide you with sample aerial photos.

Following are sample aerial photos with features identified and items for consideration when evaluating aerial photos.





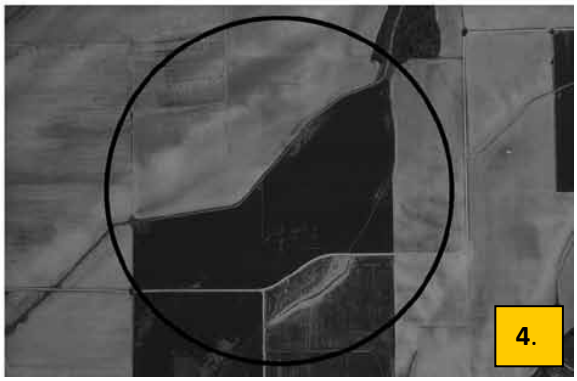


Photo 1 contains mostly stage 3 with scattered stage 4 and some mature deciduous trees located along a drainage. There are two main roads and a few secondary roads in the photo. There is a pond in the lower left quadrant. In the lower left center of the photo, there appears to be bare ground area, possibly where construction is planned. Soil erosion may be a problem in this area. The area shown in this photo would probably be adequate for species that require interspersion of stages 2, 3, 4 and 5, with some stage 6. However, habitat quality is difficult or impossible to determine because the species of grass, forbs, shrubs, and trees cannot be identified. Because the fields have obviously been managed, they probably contain nonnative species and probably do not provide adequate structure or optimal early successional habitat.

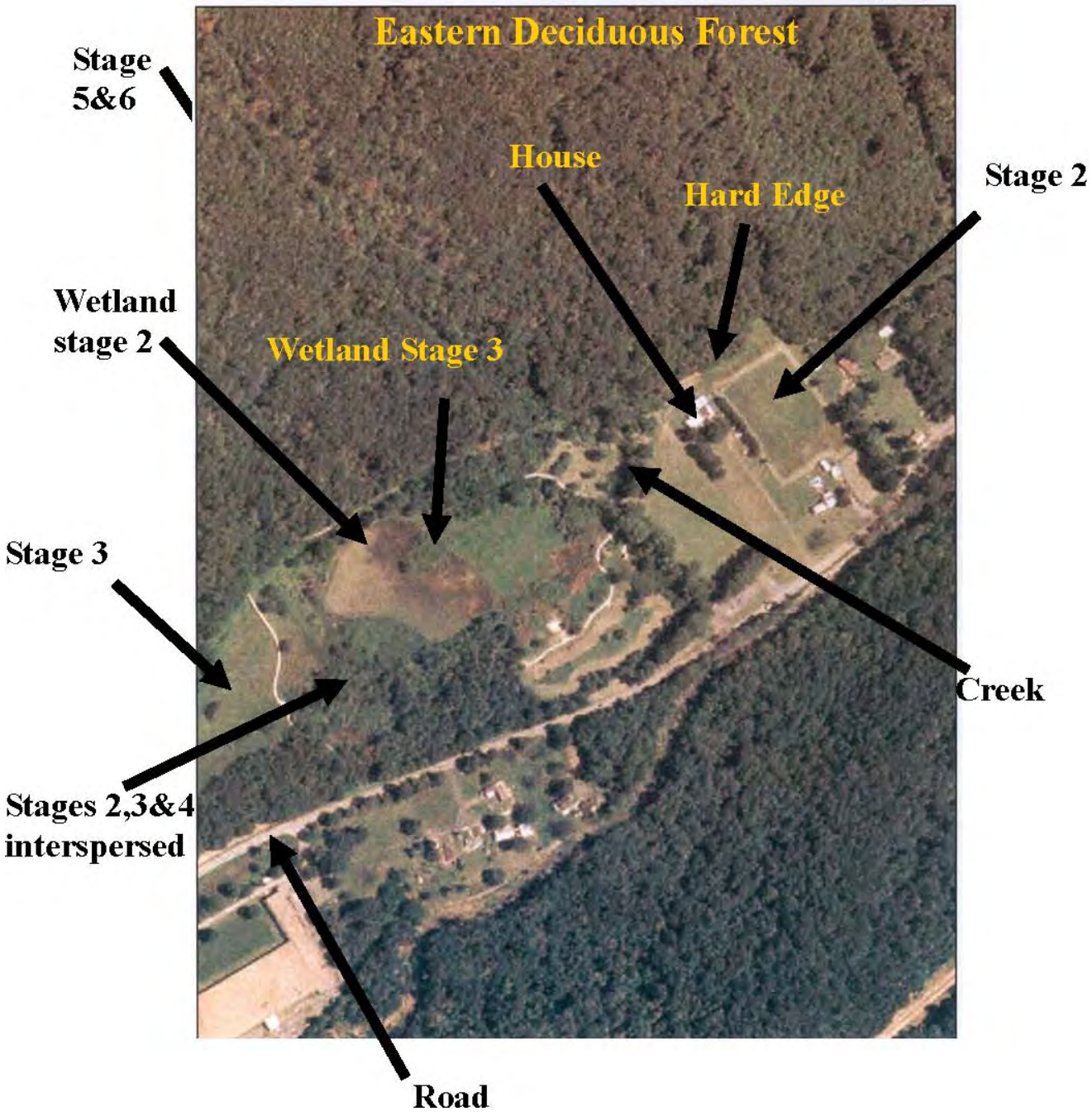
Photo 2 contains all mature deciduous forest. Tree species composition and understory structure and composition are unknown. Nonetheless, this area would probably provide adequate habitat for wildlife that require mature deciduous forest cover.

Photo 3 contains approximately one-third mature pine forest, one-third stage 4 and 5, and one-third stage 3. There is a drainage with deciduous trees running diagonally across the photo with lower-order creeks feeding the main drainage. Species composition is unknown.
However, the area is likely to provide suitable habitat for species that require a mixture of vegetation types and successional stages.

Photo 4 is an agricultural setting, composed of cropland and hayfields. Types of crops or species of hay are unknown. Tree and shrub cover is completely lacking, except for a small area in the upper right quadrant of the photo. With a lack of structural cover, water and continual disturbance, this area would not provide optimal habitat for any wildlife species.

Sample Features on Aerial Photos

Below is a sample aerial photo with features identified. Questions about aerial photos may be a part of the general knowledge quiz.


Eastern Deciduous Forest
Stage 5&6
House
Hard Edge
Stage 2
Wetland stage 2
Wetland Stage 3
Stage 3
Creek
Stages 2,3&4 interspersed
Road

Section G: Appendix

Definitions of Food Groups

Aquatic Plants: An aquatic plant is 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 can also be included in this group. In this contest, only examples from the following genera will be considered.

Algae: various genera American lotus-*Nelumbo lutea*

Arrowhead/duck potato-*Saggitaria spp*

Big duckweed-*Spirodela spp*

Bladderworts-*Utricularia spp*

Bulrushes-*Scirpus spp*

Burreeds-*Sparganium spp*

Cattails-*Typha spp*

Coontail-*Cerratophylum spp*

Cordgrass-*Spartina spp*

Duckweed-*Lemna spp*

Floating hearts-*Nymphoides spp*

Naiads-*Najas spp*

Pondweed-*Potomageton spp*

Rushes-*Juncus spp*

Sedges –*Carex spp*

Smartweed- *Polygonum spp*

Spikerush-*Eleocharis spp*

Waterlily-*Nymphaea spp*

Watermeals-*Wolffia spp*

Watermilfoil-*Myriophyllum spp*

Waterprimrose-*Ludwigia spp*

Waterweed-*Elodea spp.*

Bark: the tough outer covering of the woody stems and roots of trees, shrubs, and other woody plants.

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 carrion, 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 sequella to decomposition and may be present on the carrion. They should not be considered in grouping the specimen as carrion.

Centipedes & Millipedes: elongated arthropods having many body segments. Millipedes have pairs of legs.

Crayfish: a small, freshwater decapod crustacean that resembles a lobster. Regionally, they have many names, including crawdad, crawfish and crawdaddy.

Earthworms: terrestrial worm that burrows into and helps aerate soil. Earthworms often surface when the ground is cool or wet and are used as bait by anglers.

Eggs: Only the eggs of vertebrate species (mammals, birds, reptiles, amphibians, fish) are considered eggs. Invertebrate eggs (insect and spider) represent the adult invertebrate.

Ferns: Fern are flowerless, seedless vascular plants having roots, stems, and fronds and reproducing by spores. Ferns may be represented by a picture, the whole plant, or a part of the plant that defines it.

Fish: A fish is a poikilothermic (cold-blooded), water-dwelling vertebrate with gills.

Forbs: A more common term for them is "weed." A forb is a non-wooded, broad-leaved plant other than grass, especially one growing in a field, prairie, or meadow. A scientific definition would be "herbaceous plant other than those in the Gramineae (true grasses), Cyperaceae (sedges), and Juncaceae (rushes) families, i.e., any nongrasslike plant having little or no woody material.” They may be represented on the contest by a single leaf or by the entire plant, including the flower.

Frogs & Salamanders: food group; may be represented in any life stage except the egg.

Fruit & Berries: The display must include the soft, fleshy, pulp-covered seed.

Fungi: A kingdom of plantlike spore-forming organisms that grow in irregular masses without roots, stems, leaves, or chlorophyll.

Grains: cereal grains; include only wheat, oats, rye, barley, rice and corn. These may be represented on the test by the seed alone, the seed head, or by the entire plant, including the seed head.

Grass: The leaves of the grasses are usually tall and thin with a mid rib and parallel veins. In most species, the leaf forms a collar around the stem, although in some species this is modified. The grasses may be represented by a single leaf, a group of leaves, or the entire plant, including the seed head.

Hard Mast: This food group includes the nuts from walnut, hickory, oak, beech, pecan, almond and the common hazel. They may be shown with the husk or without.

Insects: small invertebrate (*without a backbone*) animals, except for spiders, centipedes and millipedes.

Leaves & Twigs: In this contest, this food group will always be represented by a leaf and associated woody material (twig). This is to avoid confusion with the food group forbs.

Lichens: a fungus, usually of the class Ascomycetes, 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.

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. This group may be represented by a photograph, a live animal, a museum mount specimen, or by any part of the animal that is representative of the mammal class, such as teeth or hair.

Mussels: These are the freshwater mollusks found throughout the U.S. in streams with good water quality. The group may be represented by the whole organism, a single shell, or group of shells.

Nectar from Flowers: This food group will be represented by the flower with no other plant parts present.

Scorpions: arachnid of warm, dry regions having a long segmented tail ending with a venomous stinger.

Seed: a fertilized ovule containing an embryo, which forms a new plant upon germination.

Snails: Snail applies to most members of the molluscan class Gastropoda that have coiled shells.

Snakes: Snakes are cold-blooded, legless reptiles closely related to lizards, which share the order Squamata.

Spider: arachnid that usually has silk-spinning organs at the back end of its body. Spiders spin silk to make cocoons for eggs or traps for prey.

Tubers: Will be represented by either the nutlet of the yellow nut sedges (chufa) or by potato.

Turtle & Tortoise: Turtles are reptiles of the order Testudinata. Most of their bodies is shielded by a special, bony shell developed from their ribs. The term turtle is usually used for the fresh-water species also referred to as terrapins. The term is also used (esp. in North America) to refer to all members of the order, including tortoises, which are predominantly land-based.

Glossary

aerate: to supply or expose water to air to increase dissolved oxygen and release harmful gases

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

broadleaf: a plant with wide blade leaves, such as an oak or cottonwood. Seeds are borne from flowering parts, not in cones as in conifers.

browse: to eat

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 their seeds in cones. Spruces, pines, and firs are examples.

cover: vegetation and other land features that provide areas for wildlife to hide, sleep, feed, and reproduce.

decadent: declining in health, productivity, or both.

deciduous: plants, usually trees and shrubs, that annually shed their leaves

decomposition: the natural breakdown and decay of dead plant and animal material

defecation: elimination of solid body waste by animals

detrimental: having harmful effects

dominant: the plant or animal species that is the most noticeable and common in an area. Often a controlling force in the community where they occur.

drought: a long period with little or no rain

endangered species: a species that is in danger of becoming extinct.

environment: the surroundings that affect the growth and development of an organism; includes other plants and animals, climate, and location.

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

evergreen: plants that do not lose all their leaves at one time; usually conifer trees, but also some broadleaf trees, such as live oak.

excavate: to make a cavity or hole; to hollow out

exclusion: keeping something out of an area

fertile: rich in material needed to support plant growth

fingerling: a small fish, especially up to one year of age

fluctuate: to vary, or rise and fall irregularly

forage: (noun) the vegetation eaten by animals; (verb) to search for food

forb: low-growing herbaceous plants, both annuals and perennials. Sometimes referred to as weeds.

glean: to gather food in a systematic manner, minimizing waste and unnecessary effort

ground litter: layer of the forest floor consisting of decaying organic matter, such as leaves, branches, and dead plants

hardwood: deciduous or broadleaf trees

herbaceous: all grasses and forbs having soft rather than woody stems, including flowers, plants called weeds, and the nonwoody parts of trees (e.g., leaves)

herbicide: chemicals used to control the growth of or kill undesired plants

insecticide: chemicals used to control insects

invertebrate: animals lacking a backbone. Some examples are insects, spiders, mollusks, and crustaceans.

irrigate: to supply land with water through the use of diversions, ditches, and pipes.

legume: plants that bear seeds in a pod. Typically improve the fertility of the soil. Some examples are alfalfa, clover, soybeans, and peas.

native: plant and animal species that live or grow naturally in a particular region and have not been imported from other countries

nutrients: chemicals required for plants and animals to grow

omnivore: organism that eats both animal and plant substance

perennial: a plant that lives for more than two years

phytoplankton: microscopic floating and suspended aquatic plants; the first step of the food chain in many aquatic systems

regenerate: to replace lost or damaged parts with new tissue

rejuvenate: to stimulate and return to youthful health and vigor

riparian: on or near the bank of water areas; the land area that is influenced by the adjacent water.

savannah: grassland with scattered trees; maintained by both fire and grazing

scarifies: when fire causes the hard, protective coating on some seed varieties to split open and begin growing (e.g., table mountain pine requires fire to open its pine cones)

secluded: removed or screened from view of other areas and disturbances

sedge: grasslike plant with long narrow leaves. Stems are round. Many sedge species like wet areas.

seed bank: a reserve of seeds waiting to be released.

senescent: the growth stage in a plant or plant part (such as a leaf) from full maturity to death; old age

slash: the residue left on the ground after trees are harvested

softwood: usually refers to coniferous trees. Some deciduous trees, such as aspen, also have relatively soft wood.

stagnant: sluggish; not producing to potential

stocking rate: amount of land allotted to each animal for the entire grazeable portion of the year

subclimax: a stage in succession that is short of the climax stage, but further development is inhibited by some factor(s) other than climate

succulent: plant with thick, fleshy leaves that conserve moisture

terrain: the character, or topography, of the land

thatch build-up: the accumulation of dead plant material, such as leaves, twigs, bark, and grass, on the ground

transition: the process of changing from one form to another.

woody: plants that have hard, bark-like material; trees and shrubs; of or containing wood or wood fibers

zooplankton: microscopic animals that float or swim in water. Zooplankton consume phytoplankton and are an important part of the aquatic food chain.

Blank Wildlife Management Practices Sheets

Southeast Mixed & Outer Coastal Plain Forest	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	woodduck
Control non-native invasive vegetation																			
Decrease harvest																			
Delay crop harvest																			
Establish field buffers																			
Establish native grasses & forbs																			
Fish & wildlife survey																			
Forest management techniques																			
Increase harvest																			
Leave grain unharvested																			
Manage disturbance																			
Nesting structures																			
Plant/manage food plots																			
Plant shrubs																			
Plant trees																			
Ponds: construction																			
Ponds: deepen edges																			
Ponds: Fertilize/lime																			
Ponds: Reduce Turbidity/Reseed																			
Ponds: Repair spillway/levee																			
Ponds: Restock																			
Create snags																			
Tillage management																			
Water control structures																			
Water developments for wildlife																			
Wildlife damage management																			

Southeast Mixed & Outer Coastal Plain Forest **Food Groups**	American Kestrel	black bear	bluegill	coyote	Eastern bluebird	Eastern cottontail	Eastern gray squirrel	great horned owl	hairy woodpecker	largemouth bass	mallard	mourning dove	Northern bobwhiite	Northern raccoon	prothonotary warbler	red-eyed vireo	white-tailed deer	wild turkey	woodduck
Aquatic Plant																			
Bark																			
Birds																			
Buds																			
Carrion																			
Crayfish																			
Earthworms																			
Eggs																			
Fish																			
Forbs																			
Frogs/Salamanders																			
Fungi																			
Grain																			
Grass																			
Hard Mast																			
Insects & Spiders																			
Leaves & Twigs																			
Lizards																			
Mammals																			
Mussels																			
Seeds																			
Snails																			
Snakes																			
Soft Mast																			
Tubers																			

Judges' Scoring Sheet – Written Management Plan (Activity II)

Complete one form per team

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 Number_____ Room #_____

Judges 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: 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, what is lacking) based on management objectives and species to be managed	0	2	4	6	8	10

Part 2: 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. The team demonstrated knowledge of practices' effects on existing habitat and benefits to each species	0	2	4	6	8	10
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: 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: 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: Plan Content Subtotal_____

ACTIVITY II-A SUBTOTAL _____

Activity II-B (oral presentation; 60 points maximum).
(see Judges' Scoring Sheet for Oral Presentations: Activity II B)

Team member A A: 0 – 20 _____

Team member B B: 0 – 20 _____

Team member C C: 0 – 20 _____

Team member D D: 0 – 20 _____

ACTIVITY II-B SUBTOTAL _____

Use top 3 scores for team total

FINAL SCORE = Activity II-A Subtotal + Activity II-B Subtotal

= _____ + _____

= _____ (200 points maximum)

Judges' Scoring Sheet – Oral Presentation of Management Plan (Activity II-B)

Complete one form for each team member

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/Individual Number_____ A B C D
Room Number _____
Judges Initials _____

Part 1: Subject Matter (30 points maximum)

Understanding of species habitat requirements	0	2	4	6	8	10
Understanding of wildlife management practices and their implementation	0	2	4	6	8	10
Knowledge of appropriate terms and concepts (succession, edge, interspersion, etc.)	0	2	4	6	8	10

Part 1: Subject matter Subtotal_____

Part 2: Contestant (40 points maximum)

Poise (calm, confident)	0	2	4	6	8	10
Voice (Volume, clarity, enunciation)	0	2	4	6	8	10
Grammar	0	2	4	6	8	10
Body Language (eye contact, hand gestures, and other movements)						

Part 2: Contestant Subtotal_____

Part 3: Response to Questions (30 points maximum)

Accuracy of response	0	2	4	6	8	10
Logic, reasoning, and organization	0	2	4	6	8	10
Answered honestly and concisely	0	2	4	6	8	10

Part 3: Questions Subtotal_____

TOTAL_____
(100 points max)

FINAL SCORE = TOTAL x 0.2=_____

(transfer this value to Written Management Plan Judges' Scoring Sheet)