

North Carolina



Wildlife Habitat Evaluation Program

Learning and Activity Guide

January 2009

Revised by:

Renee Strnad

Environmental Educator

College of Natural Resources

Department of Forestry and Environmental Resources

North Carolina State University

Dr. Chris Moorman

Fisheries and Wildlife Program Coordinator

College of Natural Resources

Department of Forestry and Environmental Resources

North Carolina State University

January 2009 – 4th Edition

Based on original Tennessee edition by Drs. James Byford and Tom Hill, 1991

AND

National Edition Revised by National WHEP Revision Committee, 2008

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Introduction

The National 4-H Wildlife Habitat Evaluation Program (WHEP) is designed to teach youth about the fundamentals of wildlife science and management. The National WHEP Invitational is open only to senior division 4-H members. Junior division 4-H members are eligible to compete at county, regional, and state events, and the practice gained during these years is invaluable. 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.

In this program, youth learn that management for wildlife includes management of habitat and populations. The information found in the North Carolina WHEP Learning and Activity Guide is provided to help youth learn about wildlife habitat management concepts in North Carolina and to prepare participants for 4-H natural resources competitive events. The handbook and activities are focused not only on increasing knowledge in the wildlife management field, but also in developing skills in applying that knowledge.

The National Invitational addresses these concepts with the four activities:

1. Wildlife Identification and general species knowledge
2. On-site recommendation of wildlife management practices
3. Written wildlife management plan
4. Oral defense of written plan

The North Carolina WHEP State Contest activities are described in more detail below and in the Activities section of this guide. They are:

1. Wildlife Identification and General Wildlife Knowledge
2. Identifying Wildlife Foods
3. Aerial Photography
4. On-site Wildlife Management Practices

Before making recommendations on habitat management, one must know all possible information about the life requirements of the specific animal(s) for which the area is being managed. The Concepts and Terms, and Wildlife Species sections of this guide can help participants learn the life requirements of some wildlife species.

A wildlife manager must be able to inventory and evaluate the present condition of the habitat and explain the condition to landowners and other interested parties. Aerial photography is a useful tool and can be used to develop an understanding of this inventory and evaluation process.

Once the inventory is complete, the manager decides which management practices can be applied to improve the habitat for specified wildlife species and land owner objectives. The on-site management recommendation activity gives the participant some experience with this decision-making process.

About the NC WHEP Learning and Activity Guide

The NC WHEP Learning and Activity Guide has been developed to aid North Carolina coaches and teams prepare for the state contest. Most materials have been taken from the National WHEP Manual < <http://www.whep.org/coach/manual.html>> but it also contains information that only applies to the NC WHEP State Contest.

The guide is a resource for volunteer leaders and WHEP coaches, as well as a place for participants to go for needed information. Questions and activities in the NC WHEP State Contest will be based upon the information provided in this guide.

Leaders and participants should first learn the wildlife habitat concepts and terms, move onto the wildlife species and foods, and finally, the wildlife management practices. A solid understanding of concepts and the needs of the selected wildlife species will make understanding WMPs easier.

*****For the NC WHEP State Contest, the information for the Eastern Deciduous Forest and Southeast Mixed/Outer Coastal Plain Forest have been combined. Urban and Wetland regions will not exclusively be used for the state contest.**

The guide is divided into the following major sections:

Wildlife Management Concepts and Terms introduces basic wildlife management principles. These concepts are the basis for the remainder of the handbook. Participants should be familiar with these concepts as they will be applied in all contest activities.

Regions identifies the areas in North Carolina that have distinctly different habitats and wildlife, based on the national WHEP manual. This section gives a brief description of the habitats found in the regions, explains typical stages of plant succession, lists wildlife species to be used in state and national events. For the purposes of the NC WHEP State Contest, North Carolina will be considered one region. However, management practices for wildlife species may vary depending on the location of the state contest.

Wildlife Species provides information about habitat requirements and practices used in managing habitat for the various species. The foods each species utilizes are listed here as well.

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

The Activities section of the manual refers to the competitive components of NC WHEP State Contest and provides resources to help contestants and coaches prepare for the state WHEP contest. This section also contains information on how the state contest will be scored.

**Information on the National WHEP Invitational can be found on the national WHEP web site < <http://www.whep.org> > and in the National WHEP Manual found at < <http://www.whep.org/coach/manual.html> >.

Glossary defines some of the technical words used in the handbook and explains the various food categories referred to on the foods charts in each region.

Preparing for Contests

Participants should first read and understand the Concepts and Terms section of the handbook. Leaders should explain the concepts and when needed, show local examples to clarify any misunderstandings. This section is important because the activities require understanding of these concepts and terms. 4-Hers will constantly refer to these terms and concepts during contest.

Once the concepts are understood, the leader should review the appropriate regional information with the participants. *Again, this NC WHEP Learning and Activity Guide has reduced the information only to what applies to North Carolina.* Leaders have the flexibility to use any of the information about regions that they feel is appropriate. Participants and leaders should review plant succession processes, special habitats such as riparian, common plants, wildlife species, and management practices. Specific information about habitat requirements and recommended management practices are found in the Wildlife Species section where wildlife species are listed in alphabetical order by the accepted common name. 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.

Following the above exercises, leaders can introduce participants to the various activities found in the handbook. Conducting practice sessions using aerial photographs and outdoor sites will be helpful. Start with only two or three wildlife species, adding more as participants become more knowledgeable. Obtain several aerial photographs (local Natural Resource Conservation Service office or internet resources) and discuss their features. Explain to participants how these features are important to wildlife. Identify the habitat requirements that are available for the animals selected. Then ask participants to identify what needs are missing.

Coaches and team leaders are encouraged to take advantage of free programs offered at state and local parks, as well as Educational State Forests. There may even be wildlife biologists or foresters in your community that can help clarify and demonstrate many of the concepts and practices demonstrated in this guide. Videos, textbooks and other teaching materials may be used to further learning. Extension Wildlife Specialists, state wildlife agencies, and Cooperative Extension offices have information regarding the availability of such materials. Creating flash cards have been successful for past teams. Local and state events may use different wildlife species and activities from those recommended in the national handbook. *However, in the national event all activities and only the wildlife species and wildlife management practices listed in this handbook will be used.*

Though the information and some aspects of the contest can be difficult for Junior 4-Hers, they must understand each activity and attempt to complete the scorecards to the best of their ability. Please inform state and national contest leaders if arrangements need to be made for those with any learning disabilities, and they will try their best to accommodate. Participants in the national invitational (14 to 19 years old as

of January 1 of the invitational year) will be asked to perform all of the activities in the National WHEP Manual.

General Rules and Guidelines

The information below pertains to the NC WHEP State Contest. Coaches, volunteers leaders, 4-H agents, and youth participating in the National Invitational are asked to review the National Rules and Guidelines in the National WHEP manual (section 1, pgs A3-A4). In addition, the National Invitational event will comply with all Policies and Guidelines for National 4-H Competitive Events.

I. Contestants and Eligibility:

A. Each county may enter as many Junior and Senior teams as they would like. If counties cannot form a full team, they are encouraged to see if a neighboring county has a team they may join, or they may enter the youth(s) as individuals. A team will consist of no less than three and no more than four official entrants who are 4-H members in North Carolina during the current year.

B. All Senior contestants must be at least 14 years of age as of January 1st of the year of the contest and must not be older than 19 years of age as of December 31st of the contest year. Junior contestants must be at least 9 years of age as of January 1st of the contest year.

C. 4-Hers may compete at the state level as many times as they would like. However, an individual may enter the National 4-H Wildlife Invitational event only once during his/her 4-H career.

D. The top scoring Senior team participating at the NC State WHEP contest will have the opportunity to represent the state at the National Invitational. The team of contestants must be certified as the official state entry by the State Extension Director or by a person designated by the Director (ie WHEP Program Leader). Team coaches traveling to the National WHEP Invitational will be required to obtain medical authorizations and additional paperwork for participants and accompanying adults.

E. Contestants in the National WHEP Invitational must not have participated in official post-secondary (university, college, junior college, or technical school) competitive events of a similar nature in the same subject matter area. Neither can participants be a member of a post-secondary team undergoing training in preparation for an event. For example, a contestant who has competed in an official collegiate wildlife contest, on or off campus, is ineligible to compete.

II. General Contest Rules and Information:

The date of the state WHEP contest will be in April. The location will be announced no later than the end of January of the contest year. Locations are selected on a rotating basis around the state (coastal, piedmont, mountains). Registration information will be shared with county 4-H agents and on the state WHEP web site < <http://www.ces.ncsu.edu/forestry/4hprogramming.htm> >.

The dates, location, and the contest eco-region(s) for the National Invitational will be announced no later than May 1st after the 4-H WHEP National Committee's spring

meeting. When wetlands or urban areas are designated as the contest eco-region, the animal and fish species from the eco-region in which the contest is being held will also be eligible to be used. The state WHEP leader will work with the coaches, volunteer leaders, and 4-H agents of the team representing North Carolina to become officially registered for the National WHEP Invitational. They are encouraged to review the General Contest Rules and Information in section 1 (beginning on pg A3) of the national WHEP manual before attending the National Invitational.

On Contest Day:

- A. All Contestants must provide their own pen or pencil and clipboard.
- B. No electronic devices of any kind are allowed at the contest site. This includes, but is not limited to cell phones and pagers.
- C. No use of alcohol, tobacco, or drugs will be allowed during the event. Contestants will be required to adhere to the state's 4-H Code of Conduct.
- D. Absolutely no talking by contestants will be allowed during the contest except when asking the state WHEP leader a question, or when in a 'holding' area upon completion of the event.
- E. Anyone caught cheating will be disqualified.
- F. All adults, except contest officials, will be separated from contestants at all times while the contest is in progress. Adults may observe contest activities from a distance, as determined by the state WHEP leader.
- G. Contestants will work independently on all activities. Scorecards will be turned in immediately after each event.
- H. The team score will be the sum of the three highest accumulative scores in each of activity.
- I. After the event, individual and team scores will be made available to the teams. Contest score sheets will also be distributed.
- J. Distribution of awards is determined by the state WHEP leader. Those recognized will be:
 - First Place Team (Junior and Senior)
 - Second Place Team (Junior and Senior)
 - Third Place Team (Junior and Senior)
 - First Place High Individual (Junior and Senior)
 - Second Place High Individual (Junior and Senior)
 - Third Place High Individual (Junior and Senior)

Wildlife Management Concepts and Terms

Before an individual can evaluate wildlife habitat and make management recommendations, some basic concepts about habitat and its relationship to different wildlife species should be understood. In this section, some of the basic concepts are described. Since most of the contest will be based on these concepts, it is important 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 to meet your goals and objectives.

Look up the definitions of words or terms you do not understand in a dictionary or in the glossary found at the back of this handbook.

Concept 1 - Habitat Requirements

Wildlife species have life requirements that must be supplied by the habitat to ensure their well being. These are known as habitat requirements. The four basic habitat requirements are food, water, usable space and cover (shelter, protection from predators, severe weather, etc). Usable space is the area required to accommodate necessary movements of an animal including breeding range, brood range, fall feeding area, etc.

Each species has its own set of specific requirements. For example, the gray squirrel uses acorns for food, while the woodpecker eats insects. Mallards use thick grass and forb cover for nesting, while brown thrashers nest in shrubs. Habitat requirements for wildlife change during the seasons of the year. The food they eat in the winter may be much different than what is eaten in the summer. For example, white-tailed deer eat leafy herbaceous plants in the summer and switch to woody stems, buds, and acorns in winter. The cover deer need for rearing their young may be much different than the cover needed for protection from a winter storm.

Concept 2 - Featured Species

There are two basic goals in wildlife habitat management; 1) provide the best habitat possible for a particular featured wildlife species and 2) provide habitat for as many different wildlife species as possible in an area (explained more under Concept 3 – Species Richness).

When evaluating habitat for featured species, one must first decide which species are to be favored. This can be done in several ways. Landowners may have specific objectives for certain wildlife species, or the general public may have concerns about a particular

game or endangered species. Once the species are selected, identify the habitat requirements for each particular species and evaluate the capability of the habitat or landscape to provide the requirements. If one or more of the habitat requirements is in short supply or lacking, than different habitat management practices may be used to improve the area's ability to supply the needed requirements. Occasionally, the desired species may be totally incompatible with the available habitat and management goals must be changed. For example, a farm with 100 acres of crop and hay fields would not be suitable habitat for managing for gray squirrels that require mast producing trees in mature forests or woodlots.

It is usually best to select management practices that provide the habitat requirements that are most lacking and thus are limiting factors to the wildlife population. 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 American woodcock, wild turkey, deer, and rabbits who utilize similar cutover areas for habitat, while populations of species like ovenbirds, wood thrushes, and worm-eating warblers, which prefer unbroken mature deciduous forests, may decline.

Concept 3 - Species Richness

Species richness is the number of different kinds of wildlife species that are found in an area. Lands that are high in species richness usually have some of the following characteristics:

1. A mixture of different habitat types in various successional stages.
2. A balance of edge with unbroken blocks of vegetation in one successional stage. (see Concepts 6 & 7)
3. Unfragmented blocks of habitat at least 10 to 40 acres in size.
4. Edges with low contrast. (see Concept 7)
5. Diverse vertical layering. (shrub layer, mid-story layer, lower canopy, upper canopy, etc. (see Concept 5)

These characteristics can be used to estimate the relative number of different wildlife species that may be present in separate areas. They can also be used to identify management practices that could increase species richness. By creating a variety of successional stages within an area you will provide the habitat requirements for many different wildlife species as well as attract more species. For example, consider an area that is in stage 6 of plant succession. It has been proposed to improve the habitat by harvesting the trees and by clear-cutting 1/2 of the area. Clear-cuts of 40-acres that leave adjacent unharvested areas of 40 acres in size would be desirable. Strips or corridors of trees that link the larger unharvested areas together could be left uncut and clear-cuts could be designed with irregular. However, if species which require lots of edge and mixed age classes are desired, then a plan could be designed to harvest

several 10 acre clear-cuts well distributed throughout the area to maximize the edge effect. Remember, when managing habitat for species richness, the goal is to provide some habitat for as many species as possible.

Concept 4 - Plant Succession and Its Effect on Wildlife

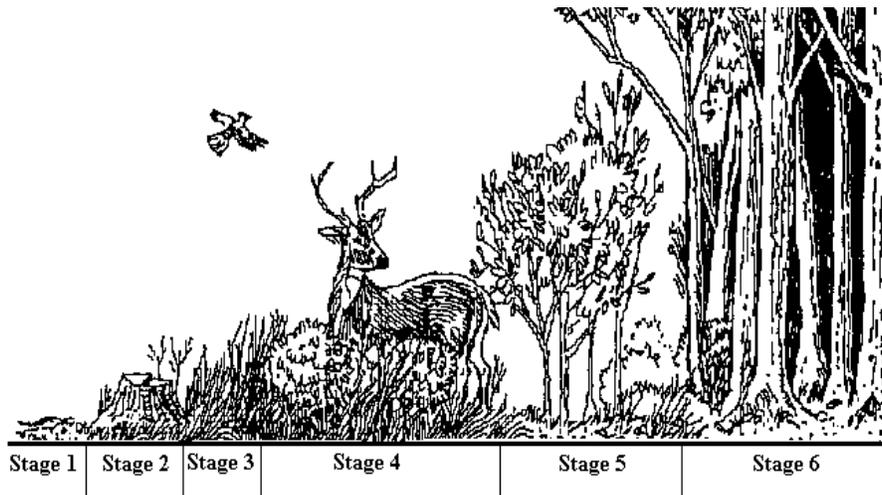
Vegetation and water form the critical components of wildlife habitat. Every acre of soil and water has a definite sequence in plant cover that occurs over time. The different stages of this sequence are called “successional stages”. We can generally predict the type of vegetation that will occur in each stage until a final or “climax” stage is reached. If not disturbed, the climax vegetation will remain the same for long periods of time. However, if people or nature disturb the vegetation, soil, or water level, then succession may be set back to an earlier stage and the cycle will continue forward from the new starting point. Different wildlife species are often associated with the different stages of plant succession. Not all species require the climax stage. In fact, most species require two or more successional stages to meet all of their life requirements.

In this handbook, areas in different stages of plant succession are often referred to as areas with different vegetation types or habitat types. In general, the stages of plant succession that occur on land are as follows:

- Stage 1 Bare ground**
- Stage 2 Annual forbs and/or grasses**
- Stage 3 Perennial forbs and grasses**
- Stage 4 Shrubs**
- Stage 5 Young woodland or trees**
- Stage 6 Mature woodland or trees**

In some regions, natural factors such as the soil or the climate will prevent succession from proceeding past a certain stage. For instance, in the Great Plains Shortgrass Prairie Region, lack of precipitation often prevents succession from proceeding past stage 3. In this case, stage 3 would be considered the climax stage. Many wildlife species found in this region do not require trees.

Descriptions of typical successional stages found in different regions of the United States can be found in the Regions section of the National WHEP Manual. A description of the typical successional stages occurring in relation to water can be found in the Wetland Region description.



The Stages of Plant Succession (From Bare Ground to Woodland)

A single step in plant succession may take weeks, months, years, or even centuries depending on a variety of natural and human-caused factors. If vegetation is disturbed, succession will revert to an earlier stage and begin again. Some wildlife species require periodic habitat disturbance to create conditions needed to survive. Disturbance can be caused by natural factors such as insect or disease outbreaks, tornadoes, ice storms, hurricanes, avalanches, or lightning fires.

However, succession is more frequently altered by humans through a variety of habitat management practices: plowing (agriculture), prescribed burning, harvesting trees, grazing, and clearing shrubby areas, all of which may mimic natural disturbances in many cases. Nature never gives up. Even abandoned concrete parking lots are eventually taken over by plants. Plants begin growing in the cracks and around the edges; if left alone for a long time, a concrete parking lot will eventually become “habitat” for some wildlife species.

Concept 5 - Vertical Structure (Layering)

Vegetation can be classified by how it grows. Grasses and forbs generally grow close to the ground and make up the ground (herbaceous) layer (up to 3 ft above the ground). The next higher level is usually composed of woody shrubs and is called the shrub layer (3 ft to 10 ft above ground). The next layer is called the mid-story and is comprised of small diameter trees and larger shrubs (10 ft to 30 ft above ground). The tallest stratum is composed of trees and is called the tree canopy layer. This layer can sometimes be further delineated as the lower canopy (trees that are not the dominant trees in the stand) and the upper canopy (trees that are dominant with their entire crowns receiving sunlight).



Vertical Structuring of Vegetation Layers

How the different layers of vegetation are arranged in relation to each other is important to many wildlife species. For instance, some species may require an herbaceous layer for food but also need a tree canopy for cover. Not all areas in a single stage of succession are alike. For example, one woodland in stage 6 of succession may have a variety of vertical layers comprised of grasses, forbs, shrubs, and trees, while another stage 6 woodland may have only one distinct layer of tall trees. Also, the trees may be widely spaced or close together, with or without a shrub layer.

Concept 6 - Arrangement and Interspersion

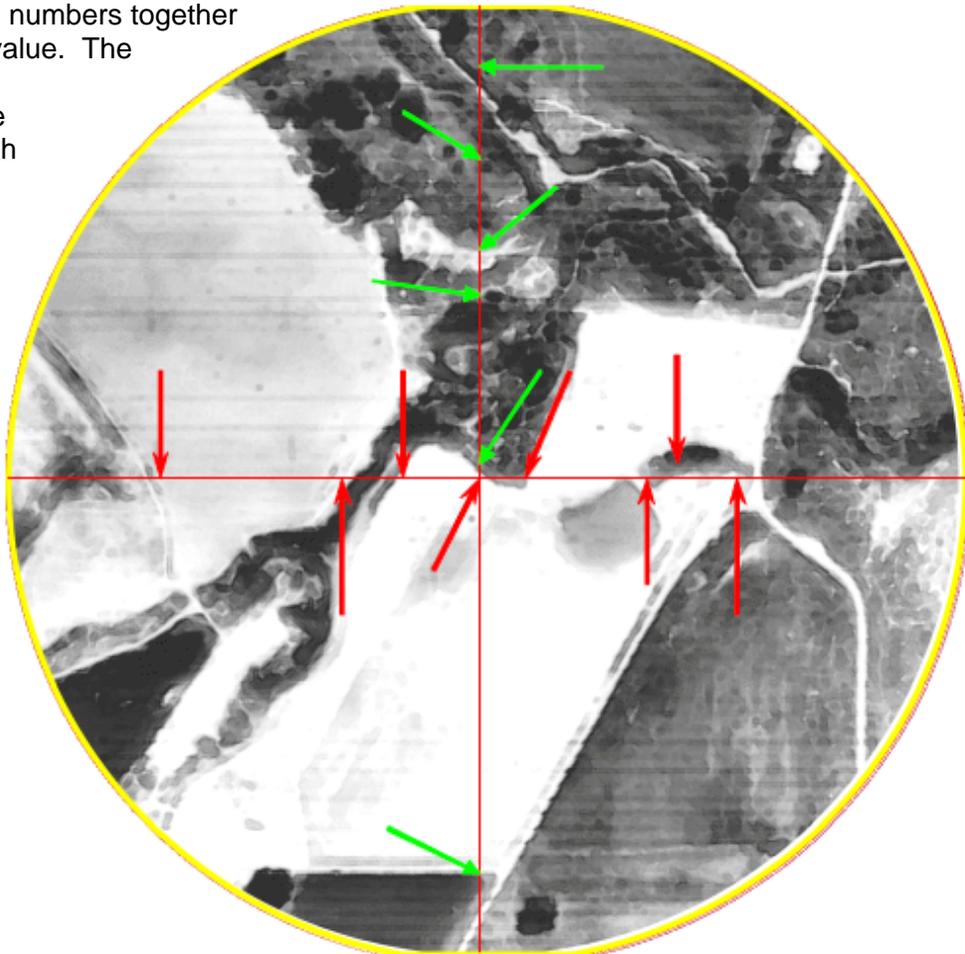
How different successional stages or vegetation types are situated in relation to each other (for example, size, shape, distribution of habitats) is often referred to as horizontal arrangement or juxtaposition. While some wildlife species obtain all their habitat requirements from only one successional stage many wildlife species need more than one successional stage to provide all their habitat requirements. For example, wild turkeys utilize mature woodlands (stage 6) for feeding, roosting at night, and living in most of the year, but they often nest in or at the edge of dense brushy cover (stage 4 & 5) created by clear-cuts. They also need grassy fields or grass/forb habitat (stage 2 & 3) for brood rearing and insect foraging.

To be of value to wildlife species, the required successional stages must be close to each other (within the species home range, Concept 9) or linked by corridors that allow for safe travel to and from the different habitats. Managing for areas of different successional stages within a landscape is called "interspersion." Usually, more interspersion supports a greater variety of wildlife.

One way of measuring the amount of interspersion of an area is to apply the "interspersion index" principle. This can be done using aerial photographs and by counting the number of times the habitat changes along an imaginary north-south line across the widest part of the area, then along the widest east-west line. Add these two numbers together to get the interspersion index value. The higher the value, the better for quail, rabbits, and other wildlife species that like areas with high interspersion.

The interspersion indexes for the photo shown to the right are: A to B = 6; C to D = 8; $AB + CD = 6 + 8 = 14$. Thus, your interspersion index value for the aerial photo seen here is **14**.

The size and shape of different successional stages also influences the amount of edge habitat created and the stage's usefulness for wildlife (see Concept 7).



Concept 7 - Edges and Contrast

The boundary where two or more types of vegetation or successional stages meet is called "edge." Edges attract many different wildlife species because the variety of food, cover, and other habitat requirements associated with each stage are arranged close together.

Sometimes there is an abrupt change where one type of vegetation stops and another begins (see Figure 1). Where abrupt changes occur, the edge is narrow.

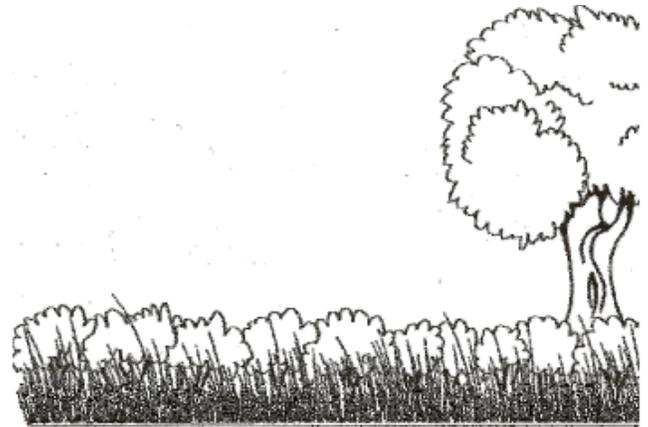


Figure 1. Narrow Edge

Additionally, edges that are produced when extremely different successional stages of vegetation meet are defined as having high contrast and are referred to as "hard edges". There is high contrast where an area in stage 2 (annual forbs and grasses) meets an area in stage 6 (tall mature trees) of plant succession.

Often, the change can be less distinct, with a gradual transition from one stage to another (see Figure 2). In places where a gradual change occurs, the edge is wide and has characteristics of multiple successional stages or vegetation types.

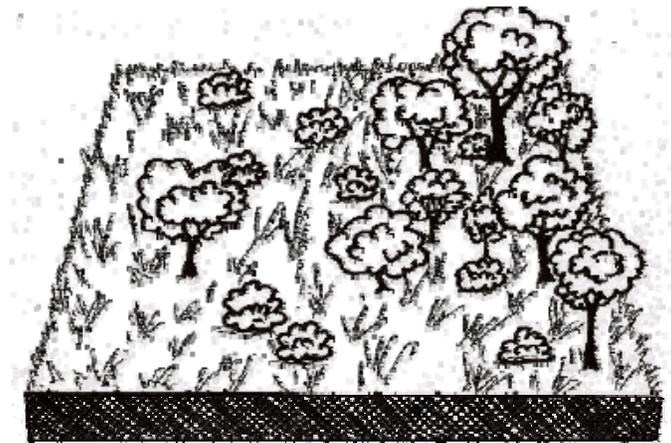


Figure 2. Wide Edge

An edge between stages 2 and 3 has low contrast and is called a "soft edge" because one stage gradually transitions into the other. Edges with low contrast may have more different species (species richness) of wildlife than edges with high contrast. Edges with low contrast will benefit those wildlife species that need interspersions of several successional stages. In general, edge may benefit wildlife species that have low mobility and do not require large areas. However, creation of edge may be detrimental to some wildlife species, particularly area sensitive species (see Concept 8) or species requiring large tracts of unfragmented habitat in one successional stage.

Concept 8 - Area Sensitive Species

Fragmentation is the disruption of areas of large, continuous habitat types either by man-made or natural processes. Some wildlife species need large, unbroken (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 of vegetation in one successional stage are desirable, and edge is not desirable or beneficial. A forest or rangeland in one successional stage that has at least 100 acres of unfragmented area is considered to be the minimum requirement for many area sensitive species. However, some species may require 1,000 acres or more at a minimum.

Concept 9 - Migration and Home Range

Some wildlife species travel during different seasons of the year and times of day. These actions are called daily or seasonal movements and occur within a given species' home range. Deer and bear move, but they don't migrate. Ducks, geese, some songbirds, and American woodcock migrate. Daily and seasonal movements should not be confused with migration. Wildlife are considered to migrate when they move from one type of habitat to a completely different type of habitat. Migration distances may be short or very long depending on the species. This requires that necessary habitats are available along the route. For many species, corridors that provide areas for safe travel are very important during migration. Two examples of migration are:

1. Hummingbirds fly from the East Coast of the United States down to South America for the winter months.
2. Ducks that nest in the northern United States must fly south to warmer climates to find food sources and wetlands that are not frozen during winter.

Other animals reside in the same area all year. The area of constant use is referred to as an animal's home range. For example, in average habitat, a northern bobwhite spends most of its life on an area of approximately 80 acres. If the habitat requirements of a species are met in a smaller area (i.e., the habitat is better) in a given locale, then the home range would be smaller.

Concept 10 - Carrying Capacity

There is a limit to how many animals can live in a habitat. That limit is called the habitat's carrying capacity. The quantity and quality of food, water, cover, and space determines the carrying capacity. If one of these basic requirements is in short supply, the carrying capacity is lowered. By adding the missing ingredient, a manager can increase the habitat's carrying capacity.

Carrying capacity varies from year to year and from season to season. It is usually greatest from late spring through fall when plant vegetation, insects, and other food supplies and cover are most abundant. This is when most young are born and grow. With the coming of winter or summer drought, food and cover gradually diminish, as does the habitat's carrying capacity. More animals are produced each year than will survive to the next. Surplus animals are generally lost to starvation, disease, and/or predation. Young wildlife and animals in poor health experience the highest death rates. Harvesting of game or fish for human consumption is one way to utilize the annual surplus. The obvious way to increase the number of animals is to increase the number born and reduce the number that die. However, if the habitat cannot support any more animals, those efforts will fail. A long-term increase in population can be accomplished only by increasing the habitat's carrying capacity.

In more urban areas, the carrying capacity may be able to support a given number of animals, however the human factor may demand that the population of a given wildlife species be lower because of wildlife damage issues. For example, white-tail deer populations can thrive in urban areas and thus the biological carrying capacity is very high because deer have adapted to feed successfully on ornamental plant material. However, home owners have low tolerance for deer feeding on expensive landscape

plants and therefore the population of deer must be reduced to limit the damage. In this case, the cultural carrying capacity is much lower than the biological carrying capacity (see Concept 12, Wildlife Damage Management).

Concept 11 - Pond Dynamics and Balance

A properly managed pond can provide excellent fishing and can be a benefit to 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, the bluegill sunfish is the prey species and the largemouth bass the predator species. In coldwater ponds, the trout is usually the predator species and insects and small fish are the prey. Balance between predator and prey is achieved by establishing an adequate food chain for the prey species and controlling the prey and predator species numbers through fishing.

Phytoplankton (microscopic algae) are the base of the pond food chain. Zooplankton and aquatic insects feed on phytoplankton and they in turn are eaten by small fish. Small fish are eaten by larger fish and so on. 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 blooms cannot be established. Excessive exchange of water through the pond prevents adequate phytoplankton blooms due to dilution of fertilizer additions.

Low water levels can cause significant problems as well. Improperly constructed or damaged spillways can lead to excessive erosion to the dam. Low water levels, due to either damaged spillways or improperly sloped banks, can lead to excessive aquatic vegetation along the margins.

Concept 12 - Wildlife Damage Management

Professional wildlife biologists often have to manage wildlife to reduce or eliminate damaging behaviors or health hazards. Increasingly, wildlife damage management is most common in urban and suburban areas, where frequent interactions between humans and wildlife are due to their close proximity to each other. Examples of wildlife damage are coyotes that prey on livestock or pets, raccoons in chimneys or bats in attics, deer eating ornamental plants or colliding with vehicles, skunks under the house, snakes in the house, bird strikes at airports, herons eating catfish fingerlings at a fish farm, or starlings sitting in urban trees or dairy barns and defecating, creating a health hazard. Wildlife damage management may be recommended in addition to the practice of increasing bag/creel limits if individual animals are causing damage or health hazards.

Wildlife damage management practices are divided into 2 general categories – lethal and non-lethal. Lethal practices are intended to kill wildlife in a manner that is quick and does not cause suffering. Lethal management practices include body-gripping traps, trapping and euthanizing (humanely putting to death), shooting, and poisoning.

Non-lethal management practices are intended to reduce or eliminate wildlife damage or wildlife-caused health hazards using management practices that do not kill. Non-lethal management practices include noise-making harassment techniques (for example, propane cannons), visual harassment techniques (for example, eye-scare balloons or predator decoys), or techniques that combine both noise and visual harassment (for example, dogs). Exclusion methods like fencing and chimney caps, taste and odor repellents, live trapping and relocation, habitat modification and changing human behaviors that attract damage-causing wildlife are also considered non-lethal forms of wildlife damage management.

There are advantages and disadvantages to using lethal and non-lethal management techniques. One advantage of lethal management practices is that they can permanently decrease the numbers of animals in a population that are causing damage or health hazards, thereby reducing the amount of damage. In some cases, one or a few animals are causing the problem, and lethal management can then eliminate the damage once the individuals causing the damage are killed. Non-lethal management techniques typically force the animals causing the problems to move to other locations. Although non-lethal techniques may reduce or eliminate the problem at the first location, the animals causing the problems may relocate and cause the same problems at a different location. One advantage of non-lethal techniques is that they are generally more accepted by the public than lethal techniques are, and they can be used in areas with high human density.

Some examples:

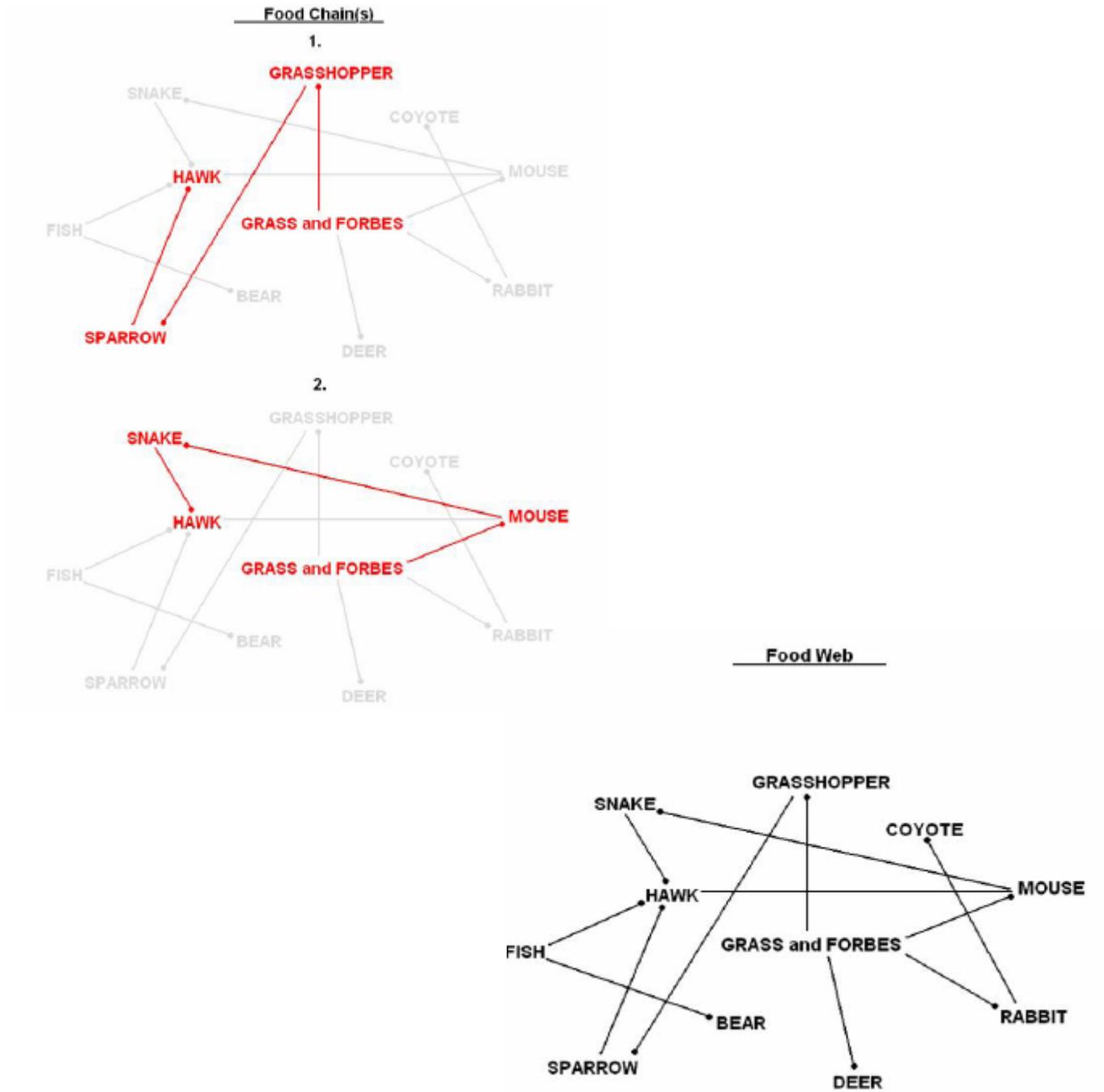
- Predator control techniques like relocation, trapping, toxicants on livestock collars, and selectively shooting only problem animals are commonly used and are effective.
- Non-lethal methods of predator control include livestock confinement and herding, use of guard dogs, and the use of exclusion fences.
- Methods of controlling herbivores (deer, rabbits, etc.) include exclusion, taste and odor repellents, harassment techniques, habitat modification, changing human behaviors that attract problem-causing wildlife, and shooting. Trapping and relocating large animals like deer and elk is not cost effective.
- Methods of bird control include exclusion, taste and visual repellents, harassment techniques, habitat modification, changing human behaviors that attract damage-causing wildlife, trapping and relocating or euthanizing, and shooting.

More information regarding wildlife damage management can be found in the National WHEP Manual.

Concept 13 - Food Webs

A food web is a network of interconnected food chains, which are the step-by-step passage of matter and 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.



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 - Riparian Buffers

A riparian buffer is an area of trees, shrubs, forbs and grasses located adjacent to streams, lakes, ponds and wetlands. Riparian buffers are important for providing habitat and protecting water quality in streams and wetlands. The recommended minimum width is 100 feet, however the width may vary based on various factors including the size and order of stream, as well as topography.

Riparian buffers provide shade for summer cooling and cover in the stream or wetland. They provide corridors for wildlife to move from one habitat to another as well as providing nesting cover. Buffers slow overland flow of water and help maintain water quality. They provide structural diversity both adjacent to and within the stream. As trees die then fall into the stream, the large woody debris helps create pools and riffles and provides cover for fish and other aquatic life. Leaves, stems, branches and large woody debris fall into streams, providing nutrition and habitat for aquatic insects, a major food source for fish and amphibians. Insects from the trees fall into the stream and provide a food source for fish, amphibians and other aquatic life. Tree roots improve soil and stream bank stability.

When implementing management techniques to create habitat, especially those that create openings, consider leaving vegetation near bodies of water and / or promoting growth of existing vegetation near water. Additionally, practices such as planting grasses, forbs, shrubs and trees may be implemented along streams and wetlands to develop a riparian buffer. Fencing off riparian areas will allow succession to advance, creating a riparian buffer over time.

Region

Areas of the country can be separated into regions having similar climate, vegetation, and wildlife. They are described in very general terms. For the NC WHEP State Contest, the information for the Eastern Deciduous Forest and Southeast Mixed/Outer Coastal Plain Forest have been combined. The other fourteen regions can be found in the National WHEP Manual < <http://www.whep.org/coach/manual.html> >.

Below is a description of the two regions being used for NC WHEP State Contest. This information is important as it describes, in general terms, the habitat, dominant vegetation, and successional stages. This information will help determine what wildlife management practices should be used. Additionally, this information can be included in the General Wildlife Knowledge portion of the contest.

At the national contest, only the appropriate region descriptions, species, and wildlife management practices listed in the National WHEP Manual.

Regions Included in the National WHEP Manual:

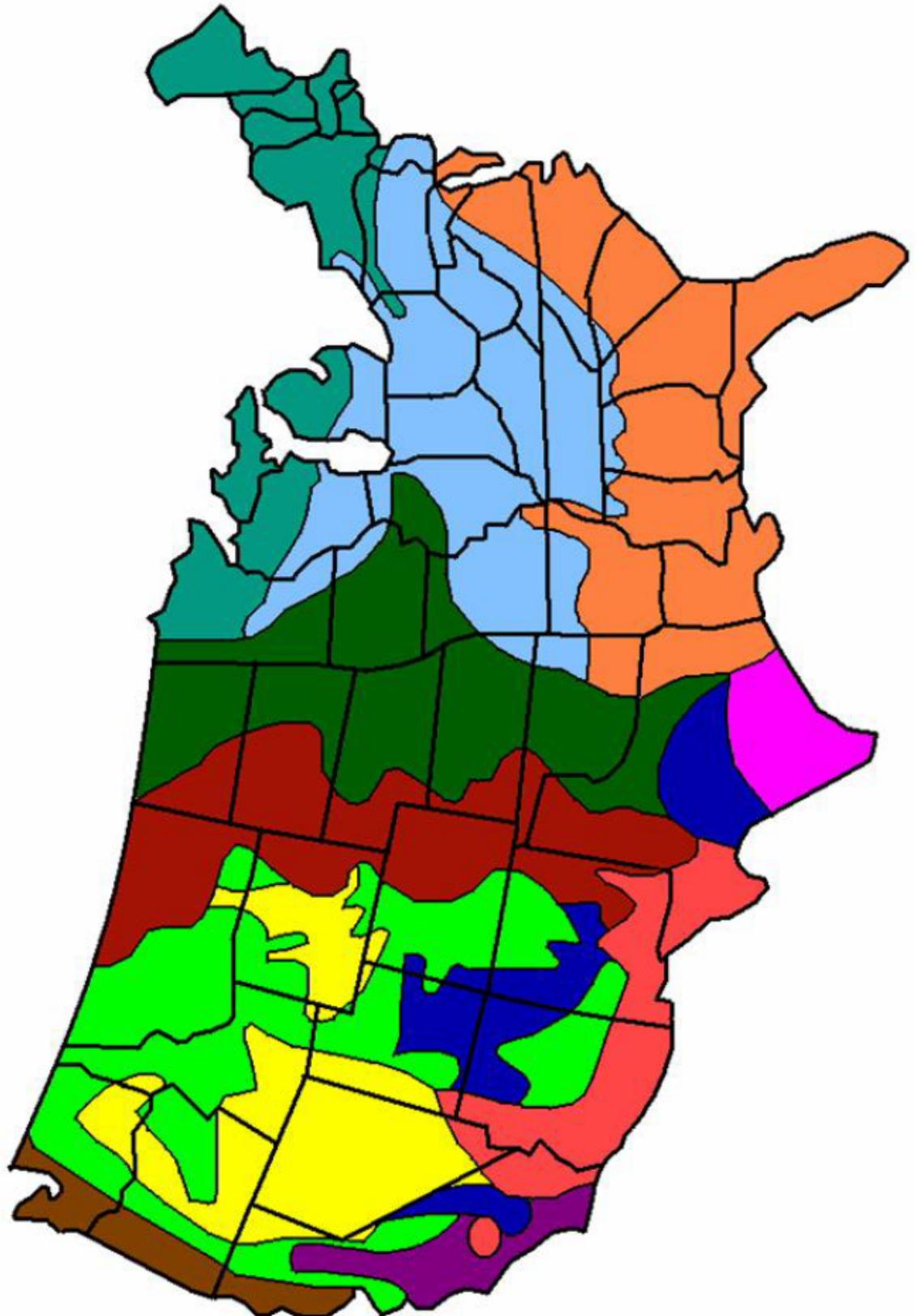
Eastern Deciduous Forest
Great Plains Grassland - Shortgrass Prairie
Great Plains Grassland - Tallgrass/Mixed Prairie
Hot Desert
Intermountain - Foothills Zone
Intermountain - Montane Zone
Intermountain - Sagebrush Zone
Intermountain - Subalpine Zone
Mediterranean Zone
Northeast Mixed Forest
Prairie Brushland
Pacific Coastal Forest
Southeast Mixed and Outer Coastal Plain Forest
Urban Areas
Wetlands

For the NC State WHEP Contest, the information for the Eastern Deciduous Forest and Southeast Mixed/Outer Coastal Plain Forest have been combined.

Map of Regions

- Great Plains Grassland-Tallgrass/Mixed Prairie
- Northeast Mixed Forest
- Pairie Brushland
- Mediterranean Zone
- Southeast Mixed and Outer Coastal Plains Forests
- Woodland

- Eastern Deciduous Forest
- Great Plains Grassland-Shortgrass Prairie
- Hot Desert
- Intermountain-Foothills; Montane; Subalpine
- Intermountain-Sagebrush
- Pacific Coastal Forest



Southeast Mixed and Outer Coastal Plain Forest



Southeast Mixed and Outer Coastal Plain Forest

Physical Description:

The terrain is rolling hills to mostly flat. Marshes, lakes, and swamps are numerous on the coastal plains. 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:



Photo Courtesy of
USDA NRCS

The final successional stage of vegetation usually consists of deciduous trees such as oak, hickory, beech, blackgum, red maple, redbay, southern magnolia, laurel oak, American holly, and winged elm, or occasionally coniferous trees such as loblolly pine. Pines such as loblolly, longleaf, and shortleaf are common on sites where prescribed burning is used; pines likely were the most common trees in these regions before the days of fire suppression. Planted loblolly pine is widespread over much

of the region. Lower-story trees can include American hornbeam, redbud, shadbush, dogwood, and hawthorns.

Forbs and grasses are common understory plants. Vines such as Virginia creeper, trumpet creeper, grape, greenbriar, and dewberry or shrubs such as sumac, viburnum, haw, and blueberry are also common especially in the third or fourth successional stages.

Gum and cypress trees are dominant on moist areas along the Atlantic Coast and Gulf Coastal Plain.

Farming and Ranching:

Many wetlands along major river courses have been drained and forests cleared to grow crops such as tobacco, cotton, soybeans, corn, and other grain crops. Large areas of forests have also been cleared and planted to grasses and legumes to provide forage for livestock.



Photo Courtesy of
USDA NRCS

Plant Succession Stages:

Stage 1 — bare ground; Stage 2 — annual forbs and grasses; Stage 3 — perennial grasses and forbs; Stage 4 — shrubs; Stage 5 — young woodland; Stage 6 — mature woodland, usually deciduous.

Species Recommended for Judging:

- American kestrel
- Black Bear
- Bluegill
- Brown thrasher
- Coyote
- Eastern bluebird
- Eastern cottontail
- Eastern gray squirrel
- Great horned owl
- Hairy woodpecker
- Largemouth bass
- ~~Lark Bunting~~
- Mallard (winter habitat)
- Mourning dove
- Northern bobwhite
- Raccoon
- Red-eyed vireo
- White-tailed deer
- Wild turkey
- Wood duck



Photo Courtesy of
USDA NRCS

Eastern Deciduous Forest



Eastern Deciduous Forest

Physical Description:

Most of the terrain is rolling except for the Appalachian and Ozark Mountains, which can be steep. The average annual precipitation ranges from 35 to 70 inches and is well distributed throughout the year. Summers are hot and dry. Winters are cold.

Dominant Vegetation:



Mature Eastern Deciduous Forest
Craig Harper

The final successional stage of vegetation usually consists of deciduous trees, such as various oaks and hickories, beech, blackgum, red maple, redbay, southern magnolia, American holly, and winged elm. Loblolly and shortleaf pine may also be found

in the final successional stage. Where prescribed fire is still used, longleaf pine communities can still be found. This is a most important community within this region, harboring many threatened and endangered plants and animals. However, 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 this 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. Mid-story 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, yellow jessamine, grape, and



Oak Savannah, John Gruchy

greenbriar, are common. Shrubs include sumacs, viburnams, elderberry, wild plum, blueberry, blackberry, hawthorns, wax myrtle, and others.

Farming and Ranching:

Large areas of this region have been cleared of trees or native grasses, forbs, and shrubs for the production of crops and livestock forage. Depending on how croplands are managed, some species of wildlife benefit from farming.

Plant Succession Stages:

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

Species Recommended for Judging:

- Black bear
- Bluegill
- Bobcat
- Box turtle
- Brown thrasher
- Eastern bluebird
- Eastern cottontail
- Eastern gray squirrel
- Great horned owl
- Largemouth bass
- Mourning dove
- Northern bobwhite
- Ovenbird
- Ruffed grouse
- White-tailed deer
- Wild turkey
- Wood duck



Native Grasses & Forbs
Craig Harper

Wildlife Species

This section of the NC WHEP Learning and Activity Guide contains information on the species featured in the North Carolina WHEP State Contest. Wildlife species from other regions in the National WHEP Manual are not listed here. Therefore, teams that would like to learn more, or that are representing North Carolina at the national invitational, will need to refer to the National WHEP manual.

NOTE: In the National WHEP Manual, the lark bunting is listed as occurring in the Southeast Mixed and Outer Coastal Plain Region. This is incorrect, and changes in the national manual do not reflect this error. The lark bunting will not be included in the NC WHEP State Contest.

There are three sections: birds, mammals and other species. The species are listed alphabetically in each section. The information here will be used directly in Aerial Photos, General Wildlife Knowledge Quiz, and the On-site Wildlife Habitat Management Practices portions of the NC WHEP State Contest.

Each species has specific information on habitat requirements, including diet, water, and cover. Key management practices that are used in some regions are also discussed here. Management practices for species vary from region to region, and not all the management practices listed for the species will be applicable to all habitats and regions. It is important to integrate the information given about the regions into the information provided in this section to get a broad picture of the management practices for each species.

This section contains all the information you need for the WHEP contest; however, additional reading and research can add depth to your understanding. Knowing specific details of the species listed in this section will lead to greater success in all portions of the WHEP contest. 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 note cards very helpful. Collecting pictures of the species from several different sources will help with the identification portion of the test.

BIRDS

American Kestrel

General Habitat Preference:

American kestrels are found year-round throughout all of 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: 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:

Manipulation of Succession: brush chop, chain, or roller beat small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 4 (shrubs) vegetation; prescribed burning. Grazing management should leave enough herbaceous canopy to support insects and small rodents. Manage livestock grazing to maintain trees in riparian areas.

Establish Native Grasses and Forbs: to provide habitat for rodent prey. Maintain areas of stage 5 and 6 vegetation interspersed with stage 2 and 3 vegetation.

Forest Management Techniques: Clear-cut small areas in large expanses of stage 5 and 6 woodlands.

Plant Trees and Plant Shrubs (create hedgerows): in large open areas (irrigate if necessary) on idle lands.

Nesting Structures: provide kestrel nesting boxes in areas lacking adequate nesting cavities. Boxes can be placed on fence posts in open areas.

Brown Thrasher

General habitat preference:

Brown thrashers occur in the eastern two thirds of the country. They require stages 3 and 4 of plant succession. Brown thrashers are normally found in shrub thickets, hedgerows, shelterbelts, young forests, forest edges and brushy riparian areas. Brown thrashers forage on or near the ground for food. They in bushes or small trees 1-10 feet above the ground. They have adapted to suburban gardens and plantings.

Habitat requirements:

Diet: Invertebrates and plant seeds are the principal foods, but fruits, berries and nuts are also eaten. Brown thrashers forage primarily on the ground, and use their bills to turn over leaves and debris looking for food. More food is available when there is substantial ground litter. The management practices listed under "Cover" will usually supply sufficient food.

Water: Water requirements are not known.

Cover: Nesting and hiding cover are supplied by dense shrubs with some trees, stages 3 and 4 of plant succession. Brown thrashers will use areas that have only shrubs. They need a minimum of 2.5 acres of woody vegetation to support a breeding population.

Wildlife Management Practices:

Manipulation of Succession: Mowing, chaining, roller beating and/or controlled burning can be used to maintain and rejuvenate areas of stage 4 vegetation when habitat quality begins to decline. Grazing management should exclude livestock from riparian areas and other woody areas to allow shrubs and trees to regenerate and ground litter to develop.

Plant Trees and Plant Shrubs (create hedgerows): Promote stage 4 and create additional cover for nesting/foraging.

Forest Management Techniques: Timber harvest methods can be implemented to improve vegetation structure for nesting and foraging and stimulate additional stage 4 vegetation within large areas of stage 6 forest where regeneration is needed. Timber Stand Improvement practices in stage 5 and 6 can improve habitat by stimulating understory development.

Eastern Bluebird

General habitat preference:

Bluebirds are found in open 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 interspersed hedgerows, fencerows, and woodlots may not receive as much use by bluebirds as those areas with more structural diversity.

Habitat requirements:

Diet: Bluebirds primarily eat insects and spiders. **Earthworms** and small amounts of fruit may also be eaten. Bluebirds forage in open areas, but typically near trees, shrubs or a fence that provide perches.

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

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

Wildlife Management Practices:

Manipulation of Succession: Mowing, chaining, roller beating, controlled burning, disking, and chemical application should be used to maintain and rejuvenate areas of stages 2 – 4 when habitat quality begins to decline. Grazing management should prevent livestock from damaging trees and shrubs planted to benefit bluebirds.

Establish Native Grasses and Forbs: when less than 75 percent of the area is comprised of stages 2 – 4 and where non-native grasses and forbs dominate stages 2 – 3.

Nesting Structures: 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 Trees and Plant Shrubs (create hedgerows): where needed to provide perches for bluebirds. Hedgerows may be established across open fields larger than 4 acres.

Retain Snags and Down Woody Material: when harvesting timber or implementing timber stand improvement practices.

Forest Management Techniques: Timber harvest will create foraging habitat for bluebirds 1 – 3 years after harvest as the stand regenerates. This practice should be recommended in large areas of stage 6 forest where regeneration is needed.

Remember, this practice is not intended to create “openings” and some mature trees may provide cavities for bluebirds.

Great Horned Owl

General habitat preference:

The great horned owl is found throughout North America in a wide variety of habitats, but mainly 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. The 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. Great horned owls rarely consume carrion.

Water: These birds obtain necessary water from their diet.

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

Wildlife Management Practices:

Manipulation of Succession: Mowing, chaining, roller beating, controlled burning, disking, chemical application, and grazing should be used to maintain and rejuvenate areas of stages 2 – 4 when habitat quality begins to decline for a number of prey species.

Establish Native Grasses and Forbs: when less than 25 percent of the area is comprised of stages 2 – 4 and when non-native grasses and forbs dominate stages 2 – 3.

Plant Trees and Plant Shrubs (create hedgerows): where less than 25 percent of the area is comprised of stages 4 – 6.

Retain Snags and Down Woody Material: when regenerating stands with Timber: harvest and when implementing Timber Stand Improvement practices.

Forest Management Techniques: timber harvest should be implemented to regenerate stands in large areas of stage 6 forest and provide additional cover for a variety of prey species. TSI will encourage understory development and enhance habitat for a variety of prey species.

Wildlife damage management: may be necessary in some if owls begin to depredate free-ranging poultry.

Hairy Woodpecker

General Habitat Preference:

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

Habitat Requirements:

Diet: Hairy woodpeckers feed primarily on insects such as ants, beetle larvae, caterpillars, and adult beetles. The diet is supplemented with fruits and nuts. 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.

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

Cover: Hairy woodpeckers are cavity nesters; holes are excavated in mature and dying trees and snags for nesting. Management efforts related to cover should focus on maintaining or creating areas with large mature and dying trees, especially in open areas. Within wooded areas, create or maintain at least one large snag per acre.

Wildlife Management Practices:

Plant Trees and Plant Shrubs (create hedgerows): Primarily softwood trees. Establish corridors.

Manipulation of Succession: Grazing management for livestock should be done in riparian areas to maintain trees. Grazing when woody vegetation is not growing rapidly (fall and winter) usually does less damage to woody vegetation than at other times of the year.

Mallard (Winter Habitat)

General Habitat Preference:

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. Mallards are an example of a dabbling duck. 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. Unlike diving ducks, they feed in much shallower water and will not dive under to obtain food.

Habitat Requirements:

Diet: Mallards feed on a variety of plant and animal matter; preferred foods include waste grain from agriculture, aquatic plants, and invertebrates. Mallards will fly long distances to feed; however, the closer the food is to protective cover the more valuable and useful it becomes.

Water: Mallards use water as described above.

Cover: Mallards rest on open water bodies such as streams, rivers, and warm-water sloughs that are not frequently disturbed. They also rest on the ice in the middle of lakes.

Wildlife Management Practices:

Tillage Management: eliminate fall tillage so as to provide waste grain in the winter.

Grain: Leave Unharvested: Especially near wetland areas

Water Level Manipulation Techniques: Small dikes for temporary flooding of grain fields, planted food plots, and oak woodlands in winter.

Plant Food Plots: Planting food plots is beneficial if adequate moisture is available.

Ponds: Construction: reservoirs, and warm-water sloughs.

Water Developments for Wildlife: Dugouts and catchment ponds constructed for livestock drinking are also used for resting.

Manipulation of Succession: Livestock should be managed so that some cover is retained in shallow areas. Keep human disturbance to a minimum.

Mourning Dove

General Habitat Preference: 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 roosting.

Habitat Requirements:

Diet: Mourning doves often use agriculture areas for feeding and a variety of grass and forb seeds. They will forage on waste grain from cropland and livestock feed lots. In addition, small areas of bare ground are also beneficial for the birds to obtain grit (small gravel) to help in digesting food.

Water: Mourning doves require water daily. They prefer shorelines and banks without vegetation.

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

Wildlife Management Practices:

Establish Native Grasses and Forbs: Provide forb seeds for food.

Grain: Leave Unharvested: A variety of small grain crops such as wheat, barley, millet, milo, or oats should be left.

Harvest Timing of Crops: Delay harvest of crops in the spring to avoid nest destruction

Manipulation of Succession: Disk areas to provide bare ground. Brush chop, chain/roller beat small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 4 vegetation. Prescribed burn small areas (40 acres maximum, 10 to 20 acres preferred) in large areas of stage 4 and 5 of plant succession. Livestock grazing management can be used to keep some areas in stage 2 and 3 vegetation.

Plant Trees and Plant Shrubs (create hedgerows): in large areas of stage 2 and 3 of plant succession or in agricultural areas having few trees or shrubs. Plant on field borders, along fence rows, or on any other idle land area.

Plant Food Plots: in areas lacking grain.

Retain/Create Snags and Down Dead Woody Material to create perching sites.

Tillage Management: Tillage of cropland may be delayed in spring to allow the use of standing stubble for nesting. Tillage may be eliminated in the fall to allow wildlife access to waste grain.

Water Developments for Wildlife: Where water is limited or absent, development of water sources is desirable. Some examples are: catchment ponds, guzzlers, windmills.

Northern Bobwhite

General Habitat Preference: Stages 2, 3, and 4 of plant succession interspersed. Ideally, habitat components are made up of scattered patches of shrubby cover with diverse native stands of grass and forbs. Bunch grasses such as bluestems are used for nesting cover, while more recently disturbed sites that are rich in forbs and insects are used for brood rearing. In some parts of the country savannah habitat provides excellent habitat. This savannah forest (stage 5 or 6) should consist of very few trees with an understory of grass and forbs maintained by frequent fire (2-4 years). This savannah may be pine (as in the Southeast Mixed and Outer Coastal Plain Forest), or oak (as in the Cross Timbers portion of the Great Plains). Some agricultural crops can provide seasonal food for bobwhite quail, but they are no 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, and small grains.

Water: Bobwhites do not require free-standing water. They obtain all water from native vegetation.

Cover: Thick shrubs for hiding and roosting cover; dense perennial grasses for nesting.

Wildlife Management Practices:

Establish Native Grasses and Forbs: if they are absent. Often, the use of fire will release native seeds so that reseeding is not necessary.

Grain: Leave Unharvested: Leave some grain unharvested in agricultural areas.

Harvest Timing of Crops: Time haying to protect nesting areas in May and June.

Manipulation of Succession: Prescribe burn small areas (40 acres or less) in large expanses of stage 3 and 4 vegetation. Annual burning in stage 5 and 6 woodlands is also beneficial to create savannah habitat. Prescribed burning is the most important tool for quail management and should be used if possible. Disk small areas in large expanses of stage 3 and 4 to encourage annual forbs and grasses used by bobwhite. Disking should be avoided in native rangelands. Fire will encourage similar plant communities without soil disturbance and at a lower cost. Brush chop, chain, root plow, or roller beat small areas (40 acres or less) in large expanses of stage 4 vegetation.

Keep livestock from grazing planted food plots. Ample amounts of herbaceous vegetation used for food by quail should be left in appropriate areas. This is especially important in riparian areas. Livestock grazing also can be used to revert or maintain vegetative succession in stages 2 and 3 vegetation. Livestock management should be used to encourage a uniform structure of plants across the landscape so that all the seasonal needs of quail are met. 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. Manage livestock grazing to maintain dense shrub and herbaceous cover in some areas. However, up to 1/3 of an area can be grazed more intensively to encourage annual forb production for brood habitat assuming that the same areas are not repeatedly grazed the same way. In other words, grazing pressure should be rotated over time.

Plant Food Plots: Plant 1/8 to 1/4 acre perennial food plots in areas with too little permanent food and cover, again, one plot per 15 acres maximum.

Plant Trees and Plant Shrubs (create hedgerows): in areas where cover is scarce. If shrub patches are within 30-75 m of each other, additional shrub cover is not needed.

Tillage Management: Eliminate fall tillage.

Forest Management Techniques: Clear-cut small areas (small 40 acre patches or strips) in large expanses of stage 5 and 6 woodland. Selective-cut stage 6 woodlands.

Ovenbird

General habitat preference:

Ovenbirds frequent mature deciduous and mixed forests throughout the eastern third of the U.S.

Habitat requirements:

Diet: Ovenbirds eat primarily insects (ants, caterpillars, and beetles), slugs, snails, and earthworms. Seeds and fruits are also occasionally eaten.

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

Cover: Ovenbirds are ground-nesting birds. They construct a nest of grasses and forbs that is arched over in the shape of a Dutch oven, hence the name. The nest is usually well hidden in herbaceous vegetation on the forest floor. An herbaceous understory is also important for cover as ovenbirds forage along the forest floor.

Wildlife Management Practices:

Manipulation of Succession: Livestock grazing management is critical to avoid grazing in stage 6 forest.

Plant Trees and Plant Shrubs (create hedgerows): in areas where less than 75 percent C21 of the area is in stages 5 or 6 forest.

Forest Management Techniques: Timber Stand Improvement will encourage increased groundcover important for nesting and foraging cover.

Red-eyed Vireo

General Habitat Preference

Associated with stages 5 and 6 of plant succession. The red-eyed vireo inhabits open deciduous and mixed forests with dense understory of saplings, in wooded clearings, or borders of burns. It is found in both upland and river bottom forests and sometimes in residential areas where abundant shade trees provide a continuous canopy. It is seldom found where conifers make up 75 percent or more of the basal area.

Habitat Requirements:

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

Water: They obtain necessary water from diet.

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

Wildlife Management Practices:

Forest Management Techniques: Selective-cut forest management in large expanses of stage 6 woodland can increase the amount of insects.

Manipulation of Succession: Livestock grazing has little or no effect on this species.

Plant Trees and Plant Shrubs (create hedgerows): in large areas of stage 3 and 4 of plant succession.

Ruffed Grouse

General habitat preference:

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

Habitat requirements:

Diet: Primary foods of ruffed grouse vary with location. Primary foods include buds, acorns, beechnuts, soft mast, insects and other invertebrates, and leaves of forbs.

Water: Obtain the water they need from the foods they eat.

Cover: Ruffed grouse nest in a variety of forest types and age classes. Ruffed grouse prefer 6- to 20-year-old stands (stage 5), but readily use mature stands (stage 6, especially with a dense midstory) in close proximity for foraging.

Wildlife Management Practices:

Manipulation of Succession: Prescribed burning can be used to maintain and rejuvenate areas of stage 4 and improve brooding cover in stages 5 and 6. Livestock grazing management is critical to avoid grazing in stages 5 and 6 and protect trees and shrubs planted for grouse.

Plant Trees and Plant Shrubs (create hedgerows): where additional soft mast is needed and to develop thickets and hedgerows in fields and other areas where stage 4 and 5 cover is lacking.

Retain Snags and Down Woody Material: Provide adequate drumming sites.

Forest Management Techniques: Timber harvest methods within stage 6 forest will stimulate regeneration that will provide optimum cover for grouse within 6 years. Timber Stand Improvement practices can be used to stimulate desirable structure and stem density within stages 5 and 6 forest and enable crowns of desirable trees to grow and produce additional mast.

Wild Turkey

General habitat preference:

Wild turkeys are found in a wide variety of forest types across the U.S. They are limited only by tree cover for roosting. Optimum habitat composition may be one third to one half in stage 6 forest containing an abundance of hard- and soft-mast producers, well interspersed with stages 2, 3, and 4.

Habitat requirements:

Diet: Wild turkeys eat a wide variety of acorns, nuts, miscellaneous seeds, insects and other invertebrates, soft mast, and waste grain (especially corn and wheat).

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

Cover: Wild turkeys nest in mature forest, regenerating forest, brushy thickets, and old-fields with rank cover. The nest is a shallow depression on the ground lined with leaves and/or grass. It is usually well concealed amongst vegetation or against some object (e.g., a tree, log or brush). Wild turkeys roost in trees or tall shrubs (if no trees are present) at night.

Wildlife Management Practices:

Decrease / Increase Harvest: Harvest levels may need to be adjusted depending on population status and management objectives.

Manipulation of Succession: Mowing, chaining, roller beating, controlled burning, disking, chemical application, and grazing should be used to maintain and rejuvenate areas of stages 2 – 4 when habitat quality begins to decline. Livestock grazing management should prevent livestock from degrading habitat by overgrazing and damaging trees and shrubs planted to benefit wild turkeys.

Establish Native Grasses and Forbs: where less than one quarter of the area is comprised of stages 2 and 3 and where non-native grasses and forbs dominate stages 2 and 3.

Grain: Leave Unharvested: Wild turkeys can glean waste grain from the field (especially corn). This is especially important during years of poor mast production.

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

Plant Trees and Plant Shrubs (create hedgerows): where additional soft mast is needed and to develop hedgerows across fields greater than 4 acres. Plant mast trees where stages 5 and 6 represent less than one third of the area considered and where stages 5 and 6 contain few or no mast-producing trees.

Tillage Management: Eliminate in the fall to provide additional waste grain, especially adjacent to stages 5 and 6 cover.

Forest Management Techniques: Timber harvest methods in large areas of stage 6 can enhance nesting habitat, provide additional brood cover, soft mast, and miscellaneous seed for 2 – 3 years after harvest. Timber Stand Improvement practices can be used to improve the structure of the understory for nesting and brood rearing, increase production of soft mast and miscellaneous seed, and enable the crowns of desired trees to grow and produce additional mast.

Water Developments for Wildlife: Useful when there is little or no free-standing water on the property.

Wildlife damage management: may be necessary in rare instances when wild turkeys (waiting for correction/completion in national WHEP manual)

Wood Duck

General habitat preference:

Wood ducks are primarily found along rivers and large creeks within bottomland hardwoods forests, stage 3 wetlands and swamps with emergent woody vegetation adjacent to stage 2 wetlands, and shallowly flooded stage 5 and 6 hardwood forest.

Habitat requirements:

Diet: Acorns are the primary diet item of wood ducks in fall and winter. They also eat other nuts, various miscellaneous seeds and fruits, as well as waste grain (especially corn), all depending upon availability. Insects and other invertebrates are most important for wood duck chicks and hens prior to and during the nesting season.

Water: Wood ducks spend most of their lives in water, drink regularly, and obtain water through their diet.

Cover: Wood ducks nest in tree cavities in stage 6 hardwood forest. Usually, nest sites are within or adjacent to flooded timber; however, wood ducks have been known to nest up to 1 mile from water. Cavity availability is critical. Thus, artificial cavities are readily used by wood ducks and have been, most likely, the number one reason for the increase in wood duck populations over the past 50 years. Nest boxes for wood ducks should be at least 100 yards apart and should not be placed within sight of each other if possible.

Wildlife Management Practices:

Grain: Leave Unharvested: Provides additional food source for wood ducks. This is especially important in fields that can be flooded and those adjacent to a water source used by wood ducks.

Manipulation of Succession: Prevent livestock from overgrazing in woodlots and protect trees and shrubs planted for wood ducks.

Nesting Structures: nest boxes should be erected where suitable habitat for wood ducks exist or where planned.

Plant Trees and Plant Shrubs (create hedgerows): where there is a lack of emergent woody vegetation in open areas that can be flooded to create more usable space for wood ducks. Plant mast trees adjacent to or within open areas that are suitable for flooding if there is a lack of mast-producing trees in areas that can be flooded.

Retain Snags and Down Woody Material: when implementing Timber Stand Improvement to provide potential cavity nesting sites.

Forest Management Techniques: Timber Stand Improvement practices in bottomland hardwoods that can be flooded can lead to larger crowns of favored trees and increased mast production. Woody stem density should increase following TSI and improve cover for wood ducks in those stands that can be flooded.

Water Level Manipulation Techniques: Water control structures should be installed in existing dikes if there are none present.

Water Developments for Wildlife: Shallow impoundments should be created where topography allows to create feeding and nesting space for wood ducks.

MAMMALS

Black Bear

General Habitat Preference:

Black bears are found in the forested portions of North America (although they have been extirpated from some parts of the central and eastern U.S.). They are generally secretive animals who prefer to avoid human contact; however, bears are highly adaptable and may occur in and around human dwellings. Preferred habitat is mature deciduous or mixed deciduous/coniferous forest, often with some interspersed grassy herbaceous openings, cutover timber areas, riparian corridors, shrub thickets and dense early successional brushy cover. Throughout North America black bears hibernate in the winter (even in warm climates like Florida and Louisiana). Bears use a variety of den sites that range from rock crevices, brush piles, excavations, hollow trees, dense mountain laurel/ rhododendron thickets and even under human dwellings (crawl spaces, porches, etc). Bears require stages 2, 3, 4, and 6 of plant succession. Black bears are primarily nocturnal but may be seen at anytime during the day.

Habitat Requirements:

Diet: Bears are omnivorous, however over 90% of their diet consists of vegetative matter. Spring food sources are typically scarce and consist of early developing plants such as skunk cabbage, squaw root, grasses, and insects (ants, grubs, bee hives, etc.). Occasionally, bears will feed on deer fawns and young livestock (calves and lambs). When natural foods are scarce bears often feed on bird seed, dog/cat food, garbage, etc. making them unwelcomed guests around human residences. During summer and early fall black bears feed on a variety of fruits and berries such as blackberry, blueberry, juneberry, black cherry, pokeweed, sassafras, etc. During late fall bears will feed heavily on oak acorns, beechnuts, hickory nuts and other hard mast fruits, as well as field corn, soybeans, etc. which are all highly nutritious as the bears prepare for hibernation. During winter hibernation bears don't feed but live off their stored body fat reserves.

Water: Bears utilize numerous sources for water such as streams or creeks, ponds, lakes, rivers, waterholes and spring seeps. In summer they will often lounge in shallow water sources to cool off and get away from biting insects, hence the term "bear wallows".

Cover: As mentioned above black bears use hardwood or mixed hardwood/conifer forests for habitat. Within these habitats black bears utilize large home ranges (several square miles). The size of a bears home range will vary based on sex and age of the animal and/or time of the year (for example: breeding season, fall foraging areas, denning habitat, etc.). In general, adult male bears use home ranges that are much larger than females (up to 50 sq. mi.), while solitary females and females with cubs use home ranges that are considerably smaller (15 sq. mi.).

Wildlife Management Practices: Mature hardwood or hardwood/conifer forests provide the essential elements of black bear habitat. However, within these areas bears will utilize dense brushy areas as escape cover and feeding sites (production of soft mast fruits and berries, insects, etc). Generally, water sources are not a concern because bear are very mobile. Denning sites also are quite variable and generally not a problem.

Decrease / Increase Harvest: This practice will influence how the bear population in an area will grow. Typically, it is the responsibility of the respective state wildlife agency to set the length of the hunting season and the season bag limit to control bear harvest. However, landowners can choose to take the maximum allowed or something less than that depending on their personal management objective. Three population objectives can be achieved through the controlled harvest of bears: increase, stabilize or decrease the population. However, liberalizing or restricting the harvest of female bears will also influence population growth and the rate of that growth. Regulation of bear population densities will be influenced by tolerance of the public toward bear/ human conflicts, property damage, livestock and agricultural damage and the desire to see bears in an area. Access to public and private land for bear hunting will also influence bear harvests in an area.

Grain: Leave Unharvested: This practice, while not widely used, can provide an additional food source for black bears. Where farmers are currently planting crops such as corn or soybeans, strips of these crops should be left standing to provide a food source close to cover. Plots should be large (2 acres) in size and well dispersed throughout the habitat.

Manipulation of Succession: Prescribed burning can stimulate understory grasses and forbs on which bears will feed. This practice, if hot enough, will also kill some overstory vegetation thereby stimulating development of understory shrubs and sprouts.

Plant Food Plots: This practice is not widely used but can provide an additional food source for black bears. Soil fertility may dictate whether this practice is feasible, since poor soils will require significant fertilizer and lime to produce abundant crops. This practice will require expenditure of money and use of farm equipment. Food plots should be large (2 acres) in size and well dispersed throughout the habitat. Plants that are high in protein such as alfalfa, clover, and soybeans, or grains high in energy such as corn, should be preferred seeds to plant.

Plant Trees and Plant Shrubs (create hedgerows): within forest openings can provide additional food sources for black bears. Fruit species such as apple, pear, cherry, peach as well as other soft mast species like autumn olive, crab apple, hawthorn, dogwood, etc. will create abundant food sources.

Retain Snags and Down Woody Material: Retention of den trees within forest stands while doing timber stand improvement or clearcutting will create potential den sites for bears and many other forest wildlife species.

Forest Management Techniques: Timber Stand Improvement or Timber harvest, Selective Cut practices in small amounts in Stage 5 and 6 can improve habitat by allowing the growth of dense understory cover, while enhancing the growth on many fruit and nut species. Thinning forest stands can also increase the hard mast (acorn, hickory, beech) production thereby improving fall food sources. Den sites may also be created by brushpiles of tree limbs. Clear-cut within the forest habitat can create dense escape and loafing cover for bears. These cutover areas typically create an abundance of soft mast food (grape, pokeweed, blackberry, sassafras, etc.), which bears utilize from spring to fall. Cuts should be widely dispersed throughout the forest and be no larger than 25 acres in size and have an irregular design. This practice is also useful in regenerating hard mast trees (oak, hickory, etc) when the mature trees are beginning to die out. Den sites may also be created by brushpiles of tree limbs.

Wildlife Damage Management Techniques: May need to be employed if bear-human conflicts occur in agricultural or urban settings.

Bobcat

General habitat preference: Bobcats occur throughout the U.S. except for some areas in the northern Midwest states where intensive agriculture occurs or in areas lacking rugged or rocky mountainous terrain or extensive bogs and swamps. Lynx occur in the northernmost forest of the U.S. and into Colorado and Nevada. Both occur in a wide variety of habitats and are often associated with rocky outcrops (stage 1) and canyons. They are also found in semi-open farmland (stage 2 and 3), brushy areas (stage 4), heavily wooded uplands and bottomland forests (stage 5 and 6). Both the bobcat and lynx are carnivorous predators and are seldom active in the daytime. They are classified as furbearer game species in many states.

Habitat requirements:

Diet: Bobcats prey primarily upon rabbits, rodents (squirrels, chipmunks, voles, rats, and mice), opossum, raccoons, skunks, snakes wild turkeys and other birds. Bobcats may also prey upon pronghorns and deer. Bobcats have been found a significant source of mortality to pronghorn fawns, but are not considered a major source of mortality for deer. Bobcats will also prey upon domestic poultry and other livestock.

Water: The water requirements of bobcats and lynx are not well known, but they do drink free standing water.

Cover: Bobcats use dense cover, rocky outcrops and ledges, hollow logs and other sheltered spots for denning. They forage where prey is most numerous.

Wildlife Management Practices:

Decrease/ Increase Harvest: Harvest levels may need to be adjusted accordingly depending on population status.

Manipulation of Succession: Mowing, chaining, roller beating, controlled burning, disking, chemical application and grazing can be used to maintain and rejuvenate areas of stages 3 and 4 when habitat quality begins to decline for desired prey in those habitats. Livestock grazing management should prevent overgrazing that would degrade habitat quality for rabbits, rodents and other prey.

Plant Trees and Plant Shrubs (create hedgerows): in areas where additional stage 4 is needed to attract prey and provide security cover for bobcats. Hedgerows across relatively large open fields will provide more useable space for bobcats and prey.

Retain Snags and Down Woody Material: Provides denning sites and habitat for prey.

Forest Management Techniques: Timber harvest will provide increased dense cover for additional prey within large areas of stage 6 forest where regeneration is needed. Timber Stand Improvement practices can provide enhanced understory development that can lead to increased prey populations.

Wildlife damage management: May be necessary if bobcats become problematic where poultry or other livestock occur.

Coyote

General Habitat Preference: Coyotes are found throughout the continental United States. Coyotes have also been observed in large cities and urban areas. Stages 2, 3, and 4 are primary coyote habitats, particularly grasslands and areas where timberlands have been cleared for agriculture. They may occasionally be seen in woodlands. Coyotes den in a wide variety of places, including brush-covered slopes, steep banks, rock ledges, thickets, and hollow logs. Coyotes may be active throughout

the day but tend to be more active during the early morning, around sunset, and at night. Coyotes live in packs, alone, or in mated pairs depending on the time of year.

Habitat Requirements:

Diet: Coyotes eat, insects, rodents, birds, rabbits, deer, small mammals, carrion, and fruit. Livestock and wild ungulates (deer, elk, pronghorn) are represented in coyote stomachs PRIMARILY as carrion. However, in some cases, coyotes have been shown to prey heavily on deer and pronghorn fawns; limiting reproductive success. In 16 studies, coyotes were responsible for 82% of all sheep losses that were due to predators, but it is important to stress that only a few flocks typically showed sizeable losses. Often it is individuals that cause large livestock losses and control of that individual is warranted. It is also important to consider that coyote predation is not the major cause of loss in many cases.

Water: Water requirements for coyotes are not well documented. Much of their water requirements should be met in their diet.

Cover: This species is highly adaptable and is found in varied habitats and plant succession states. However, they do tend to favor areas dominated by grasses and shrubs (stages 2-4). This is probably due to higher prey densities in these areas. Den sites for raising pups are often selected in banks, ledges, or under abandoned buildings.

Wildlife Management Practices:

Establish Native Grasses and Forbs: Provides cover for the prey base for coyotes.

Manipulation of Succession: Manage livestock grazing so that adequate cover for prey is retained.

Plant Shrubs (create hedgerows): Plant shrubs where cover is sparse.

Forest Management Techniques: Small clear-cuts can increase prey abundance.

Wildlife Damage Management Techniques: In some instances the predatory habits of the coyote can be a problem for wildlife managers and livestock producers; therefore wildlife damage management may be necessary.

Eastern Cottontail

General Habitat Preference: As their name implies, Eastern Cottontails occur in the eastern half of the country. They prefer stages 3 and 4 of plant succession. Ideally, habitat components made up of 1/3 grassland, 1/3 cropland, and 1/3 shrub cover all interspersed together. Eastern cottontails may live in urban areas as well, and may be found in parks, golf courses, and stream corridors.

Habitat Requirements:

Diet: A variety of forbs and grasses are eaten from spring through fall. In winter bark of shrubs and trees are often eaten. They will also eat buds, soft mast, grain, and leaves and twigs.

Water: Necessary water is obtained from diet.

Cover: Cottontails use thick shrub or herbaceous vegetation (stages 3 & 4) for hiding and resting cover.

Wildlife Management Practices:

Decrease/Increase Harvest: Harvest levels may need to be adjusted accordingly, depending on the population status.

Establish Native Grasses and Forbs: Provides cover and food.

Grain: Leave Unharvested: This is useful to provide additional grain sources.

Harvest Timing of Crops: Delaying the harvest of crops may reduce destruction of nests.

Manipulation of Succession: Brush chopping, chaining/roller beating and prescribed burns can be used to maintain or rejuvenate small areas of stage 3 and 4 vegetation. In areas dominated by mesquite, root plowing combined with the seeding of grasses and legumes may be the best way to maintain small areas in stage 3 vegetation. Manage livestock grazing to avoid use of food and cover plots, and leave ample amounts of herbaceous vegetation in other areas used by cottontails for food and cover.

Plant Food Plots: Plant 1/8 to 1/4 acre annual food plots (grain sorghum is good) in areas with too little cropland; one plot per 15 acres maximum. Plant 1/8 to 1/4 acre perennial food plots (grass and clover) in areas with too little grassland, again, one plot per 15 acres maximum.

Plant Shrubs (create hedgerows): Plant shrubs in large areas of stage 2 and 3 of plant succession, or in agricultural areas having few trees or shrubs. Plant along field borders, fence rows, or other idle land areas. This is also appropriate for open areas in urban settings.

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

Forest Management Techniques: Clear-cut small areas (10 acres maximum) in large expanses of stage 5 and 6 woodlands.

Wildlife Damage Management Techniques: When overabundant, they can cause damage to ornamental/landscaping and garden plants and may require wildlife damage management techniques to be employed.

Eastern Gray Squirrel

General habitat preference: The eastern gray squirrel lives primarily in stage 6 deciduous forests and woodlands. They also forage along the edge of crop fields, especially harvested cornfields. These squirrels have adapted to parks and other urban areas where mature trees are available.

Habitat requirements:

Diet: Squirrels eat a variety of acorns, nuts, miscellaneous seeds, grains, buds, and mushrooms. Squirrels spend most of their time foraging on the ground, but also forage in trees where they collect fruits, nuts, bark, and buds that haven't yet fallen to the ground. They will also eat eggs.

Water: Water requirements are generally met through the food consumed; however, squirrels will drink free-standing water.

Cover: Squirrels den in tree cavities and build nests out of leaves and twigs. Nests are generally more than 30 feet aboveground.

Wildlife Management Practices:

Decrease/Increase Harvest: Harvest levels may need to be adjusted accordingly depending on population status.

Grain: Leave Unharvested: Squirrels can glean waste grain from the field (especially corn). This is especially important during years of poor mast production.

Manipulation of Succession: Livestock grazing management should protect trees and shrubs planted for squirrels and protect woods from overgrazing.

Nesting Structures: Provides places for squirrels to birth and raise young.

Plant Food Plots: Provides additional food and cover

Plant Trees and Plant Shrubs (create hedgerows): Create hedgerows across large fields and in “odd areas” of crop fields that are not planted to crops. Plant mast trees where stages 5 and 6 represent less than 50 percent of the area considered and where stages 5 and 6 forest contain few or no mast-producing trees.

Retain Snags and Down Woody Material: when implementing Timber Stand Improvement practices.

Tillage Management: Eliminate tillage in the fall, especially in cornfields adjacent to stage 5 and 6 forest.

Forest Management Techniques: Timber Stand Improvement will encourage larger crowns of mast-producing trees and enable oaks, hickories, beech, and others to produce more mast.

Wildlife damage management: May be required if squirrels become a nuisance around houses.

Raccoon

General Habitat Preference: Raccoons are very common throughout most of the United States except in certain parts of the Rocky Mountains, Nevada, Utah, and Arizona. Raccoons are most abundant near water, riparian areas and lands adjacent to wetlands. They are also found in urban areas. They prefer areas interspersed with different successional stages. Riparian areas in stages 5 and 6 of plant succession are ideal. Raccoons nest in hollow trees, underground dens, 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. In such instances, the management objectives may be to make the habitat less suitable for raccoons. They are also major predators of quail and turkey nests in the southeast. Wildlife damage management may be necessary.

Habitat Requirements:

Diet: Raccoons eat a wide variety of foods consisting of garbage, birds, worms, eggs, fish, small mammals, insects, crayfish, frogs, lizards, snakes, carrion, grains, seeds, fruits, nuts, and foods prepared for human and pet consumption.

Water: Raccoons require water frequently during warm seasons.

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

Wildlife Management Practices:

Grain: Leave Unharvested: Leave small areas of grain crops adjacent to woodlands unharvested.

Manipulation of Succession: Prescribed burns and brush chopping can be used to rejuvenate old decadent wetland vegetation. These practices along with chaining, roller beating and root plowing can be used to revert succession from stages 5 and 6 vegetation to stages 2, 3, and 4 in appropriate regions. Grazing management: Manage livestock grazing to maintain healthy vegetation along the banks and shores of streams, rivers, and other wetlands. In some regions this may include the development of

livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas.

Plant Food Plots: Plant annual food plots to grains.

Plant Trees and Plant Shrubs (create hedgerows): Plant and maintain large deciduous trees especially in riparian areas and areas adjacent to wetlands. Maintain corridors. Riparian buffers.

Timber Management Techniques: Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 vegetation. Selective-cut timber management.

Water Developments for Wildlife: Provide a source of drinking water and areas for foraging for food.

Water Level Manipulation Techniques: Control water levels with water control structures. Provide areas in wetland with water less than 2 feet deep where aquatic emergent vegetation can grow. Provide shallow water areas in existing ponds and wetlands where emergent vegetation can grow.

Wildlife Damage Management: May be necessary if raccoons invade garbage cans, occupy residences or buildings, or cause depredation of poultry. Exclusion is a cost-effective management practice. Harassment can be effective. Cultural modification like using wildlife-proof trash cans is very effective. Trap and relocate or trap and euthanize is effective for problem raccoons.

White-tailed Deer

General Habitat Preference: White-tailed deer occur in the eastern two-thirds of the country. They prefer stages 3, 4, and 5 of plant succession, all interspersed together. White-tailed deer can be a nuisance when their habitat and home range overlap areas occupied by people. Therefore, wildlife damage management techniques apply in some cases.

Habitat Requirements:

Diet: White-tailed deer prefer a variety of shrubs, forbs, grasses, and waste grain. Acorns and nuts from mast trees are favorite foods. In the northern parts of the range for white-tailed deer, they will browse on conifer trees in the winter.

Water: White-tailed deer drink free water when it is available. They obtain most of their water from food items. Water developments are especially important in more arid regions.

Cover: White-tailed deer use woodlands and tall shrubs for hiding and travel cover. They also use tall emergent aquatic vegetation in riparian areas and brushy upland drainages for cover in the Great Plains Grassland Region.

Wildlife Management Practices:

Establish Native Grasses and Forbs: in fields in large expanses of stage 4, 5, and 6 vegetation.

Grain: Leave Unharvested: Effective in small areas of cropland adjacent to woodlands.

Harvest Timing of Crops: so that fawning sites are not disturbed.

Manipulation of Succession: Prescribed burning at three-year intervals in stage 5 pine woodlands or periodically in stage 3 and 4 vegetation. Brush chop, chain/ roller beat small areas to maintain stage 3 and 4 vegetation. In areas dominated by mesquite, root plowing combined with the seeding of grasses and legumes may be the best way to

maintain small areas in stage 3 vegetation. Livestock grazing management should be used to leave some forbs, grasses, shrubs, and trees available for food and cover. This is particularly important in riparian areas in the Great Plains Grassland Region.

Plant Food Plots: Plant several one acre perennial food plots of grass and clover in large expanses of stage 5 and 6 woodland. Plant annual food plots to grain.

Plant Trees and Plant Shrubs (create hedgerows): in ravines, along field borders, and other idle land areas. Provide corridors for travel lanes in open areas.

Tillage Management: Eliminate fall tillage of grain crop residue adjacent to woodlands.

Forest Management Techniques: Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 woodlands. Selective-cut timber management of stage 5 and 6 woodlands.

Water Developments for Wildlife: Provide an external water source for drinking.

Wildlife Damage Management Techniques: Deer can seriously degrade habitat when overpopulated. Increasing or Decreasing Harvest is essential for proper management. Other damage management techniques such as fencing may be helpful.

OTHER

Bluegill

General Habitat Preference: Ponds, lakes, and slow moving rivers.

Habitat Requirements:

Food: Bluegill eat a variety of zooplankton (microscopic animal life), insects, tadpoles, small minnows, and crayfish.

Cover: Bluegill are often found near submerged rocks, stumps, shrubs, and near aquatic vegetation where small fish (used for food) hide.

Water: Fish need water of a certain quality. Some of the basic requirements are: dissolved oxygen - minimum of 4 parts per million (ppm); carbon dioxide - should not exceed 20 ppm; pH should range between 6.5 and 9.0; and water temperature should reach at least 70 degrees Fahrenheit sometime during the summer (one foot below surface in shade). Test the water to see if it meets requirements. Aerate pond to increase oxygen and decrease carbon dioxide.

Management Practices:

Decrease/Increase Harvest: Based on seine sample results.

Fish or Wildlife Survey: Determine pond balance.

Manipulation of Succession: Manage livestock grazing to maintain thick herbaceous vegetation surrounding the pond and in the watershed that drains into the pond. Develop livestock watering facilities away from pond or allow access to only a small part of the pond.

Ponds: Construction: Artificial reefs constructed of rock piles, sections of plastic or cement pipe (a minimum of 6 inches in diameter and 18 inches long), and brush piles and tires (sunk with weight) can be used for additional cover. These practices are recommended for ponds larger than 10 surface acres in size.

Ponds: Deepen Edges: Deepening the pond edges to 2 feet deep or more discourages rooted aquatic vegetation growth.

Ponds: Fertilize: In clear water, fertilizer may be added to increase or promote phytoplankton. Lime ponds (agricultural limestone) to increase soil pH if total alkalinity is below 20 ppm.

Ponds: Reduce Turbidity: Prevent or clear up muddy water (brown or gray color). Muddy water blocks sunlight needed in producing phytoplankton. Maintain a green color in pond water (green enough that a white disk cannot be seen 24 inches deep). The color is caused by phytoplankton (microscopic plant life-algae). Reseed watershed to establish thick herbaceous vegetation surrounding the pond in the watershed that drains into the pond.

Ponds: Repair Spillway: Repair the spillway if needed and remove trees near the dam or dikes. Stop other pond leaks if and when they occur.

Ponds: Restock: Determine pond balance using a minnow seine and catch records. A bass to bluegill ratio of 3 to 6 pounds of bluegill to one pound of bass is considered a good fish population balance. If restocking is necessary, remove existing fish and restock at the appropriate rate.

Water Level Manipulation Techniques: Add water control structures if needed.

Box Turtle

General Habitat Preference: Found throughout most of the eastern and central portions of the U.S. Depending on subspecies, this animal is found in forest or grasslands with a dense understory and diverse plant community. They are not aquatic, but are often found near water.

Habitat Requirements:

Diet: The diet of this omnivore is highly diverse and includes insects, fruit, mushrooms, berries, various vegetation, and carrion.

Water: This species likely obtains most of its water requirements from food.

Cover: This species prefers to construct nest in open areas (stages (2-4) that are warmer due to increased sunlight. In forested areas, this may be at forest edges or within open areas of the forest.

Wildlife Management Practices:

Manipulation of Succession: Prescribed burning can maintain a dense herbaceous understory of plants provided the frequency of fire is at the correct interval for that site. Livestock grazing management can be used maintain adequate herbaceous vegetation for this species.

Establish Native Grass and Forbs: in areas with too little herbaceous matter will be beneficial.

Forest Management Techniques: Timber harvest or Timber Stand Improvement can create more herbaceous vegetation that box turtles feed upon.

Largemouth Bass

General Habitat Preference: Ponds, lakes, and slow moving rivers.

Habitat Requirements:

Diet: Young bass eat insects and other invertebrates (worms, crayfish, and zooplankton). These invertebrates depend on phytoplankton for food. Adult bass eat other small fish such as bluegill and a variety of minnows, tadpoles, and crayfish, and even ducklings.

Cover: Bass are often found near submerged rocks, stumps, shrubs, and near aquatic vegetation where small fish (used for food) hide.

Water: Fish need water of a certain quality. Some of the basic requirements are: dissolved oxygen - minimum of 4 parts per million (ppm); carbon dioxide - should not exceed 20 ppm; pH should range between 6.5 and 9.0; and water temperature should reach at least 70 degrees Fahrenheit sometime during the summer (one foot below surface in shade). Test the water to see if it meets requirements. Aerate pond to increase oxygen and decrease carbon dioxide.

Wildlife Management Practices:

Decrease/Increase Harvest: Based on seine sample results.

Fish or Wildlife Survey: Determine pond balance.

Manipulation of Succession: Manage livestock grazing to maintain thick herbaceous vegetation surrounding the pond and in the watershed that drains into the pond. Develop

livestock watering facilities away from pond or allow access to only a small part of the pond.

Ponds: Construction: Artificial reefs constructed of rock piles, sections of plastic or cement pipe (a minimum of 6 inches in diameter and 18 inches long), and brush piles and tires (sunk with weight) can be used for additional cover. These practices are recommended for ponds larger than 10 surface acres in size.

Ponds: Deepen Edges: Deepening the pond edges to 2 feet deep or more discourages rooted aquatic vegetation growth.

Ponds: Fertilize: In clear water, fertilizer may be added to increase or promote phytoplankton. Lime ponds (agricultural limestone) to increase soil pH if total alkalinity is below 20 ppm.

Ponds: Reduce Turbidity: Prevent or clear up muddy water (brown or gray color). Muddy water blocks sunlight needed in producing phytoplankton. Maintain a green color in pond water (green enough that a white disk cannot be seen 24 inches deep). The color is caused by phytoplankton (microscopic plant life-algae). Reseed watershed to establish thick herbaceous vegetation surrounding the pond in the watershed that drains into the pond.

Ponds: Repair Spillway: Repair the spillway if needed and remove trees near the dam or dikes. Stop other pond leaks if and when they occur.

Ponds: Restock: Determine pond balance using a minnow seine and catch records. A bass to bluegill ratio of 3 to 6 pounds of bluegill to one pound of bass is considered a good fish population balance. If restocking is necessary, remove existing fish and restock at the appropriate rate.

Water Level Manipulation Techniques: Add water control structures if needed.

Wildlife Management Practices

In this section, various wildlife management practices (WMPs) used to manage habitat are described in further detail. They are listed in alphabetical order. The descriptions are brief and general and are not meant to be comprehensive. For simplification, the only management practices included in the NC WHEP Learning and Activity Guide are the WMPs used in the state contest. The numbers correspond to the WMPs in the National WHEP Manual. Teams proceeding onto the national event, or those that would like a deeper understanding, should refer to the National WHEP Manual for the complete list of WMPs.

It is always wise to learn as much as possible about any practice before implementing it. Additional reading, research, and guidance from other wildlife resources and wildlife management professionals is suggested.

Some of the practices may seem contradictory. For example, Practice 13 - Ponds, Deepen Edges discourages the growth of emergent aquatic vegetation, while Practice 25 - Water Level Manipulation Techniques encourages growth. Landowner objectives, shared on the field condition sheet or verbally, will determine which practices you recommend. **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.**

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 in the desired condition. In this handbook, costs and budgets are not considered when recommending practices. However, in actual situations, wildlife managers must consider economics when planning and recommending management practices.

Possible WMPs for the species used in the NC WHEP State Contest are listed in Table 1. Field conditions and landowner objectives will determine which WMPs will be used.

Table 1. Wildlife Management Practices

<i>Wildlife Management Practices</i>	American Kestrel	Black Bear	Bluegill	Bobcat	Box Turtle	Brown Thrasher	Coyote	Eastern Bluebird	Eastern Cottontail	Eastern Gray Squirrel	Great Horned Owl	Hairy Woodpecker
1. Decrease Harvest		X	X	X			X		X	X		
2. Increase Harvest		X	X	X			X		X	X		
3. Establish Native Grasses and Forbs	X			X			X	X	X		X	
4. Fish or Wildlife Surveys	X	X	X	X	X	X	X	X	X	X	X	X
5. Grain: Leave Unharvested		X								X		
6. Harvest Timing of Crops												
7. Manipulation of Sucession	X			X		X		X	X		X	
8. Nesting Structures	X							X		X		
9. Plant Food Plots		X							X			
10. Plant Trees		X								X		
11. Plant Shrubs (create hedgerows)	X	X		X		X	X	X	X	X	X	X
12. Pond Construction			X									
13. Ponds: Deepen Edges			X									
14. Ponds: Fertilize			X									
15. Ponds: Reduce Turbidity			X									
16. Ponds: Repair Spillway			X									
17. Ponds: Restock			X									
18. Retain Snags & Down Woody Material	X	X		X	X			X		X	X	
23. Tillage Management												
24. Forest Management Techniques	X	X		X	X	X	X	X	X	X	X	
25. Water Level Manipulation Techniques			X									
26. Water Development for Wildlife												
27. Wildlife Damage Management		X		X			X		X	X	X	X

Table 1. (continued) Wildlife Management Practices

Wildlife Management Practices	Largemouth Bass	Mallard (winter)	Mourning Dove	Northern Bobwhite	Ovenbird	Raccoon	Ruffed Grouse	Red-eyed Viero	White-tailed Deer	Wild Turkey	Wood Duck
1. Decrease Harvest	X	X	X	X		X	X		X	X	X
2. Increase Harvest	X	X	X	X		X	X		X	X	X
3. Establish Native Grasses and Forbs	X	X	X	X		X			X	X	
4. Fish or Wildlife Surveys	X	X	X	X	X	X	X	X	X	X	X
5. Grain: Leave Unharvested		X	X	X		X			X	X	X
6. Harvest Timing of Crops				X						X	
7. Manipulation of Sucession			X	X		X	X		X	X	
8. Nesting Structures											X
9. Plant Food Plots		X	X	X					X	X	
10. Plant Trees					X		X		X	X	X
11. Plant Shrubs (create hedgerows)			X	X	X	X	X	X	X	X	X
12. Pond Construction	X	X	X								X
13. Ponds: Deepen Edges	X										
14. Ponds: Fertilize	X										
15. Ponds: Reduce Turbidity	X										
16. Ponds: Repair Spillway	X	X	X								X
17. Ponds: Restock	X										
18. Retain Snags & Down Woody Material							X		X		X
23. Tillage Management				X						X	
24. Forest Management Techniques			X	X	X	X	X	X	X	X	X
25. Water Level Manipulation Techniques	X	X				X					X
26. Water Development for Wildlife			X						X	X	X
27. Wildlife Damage Management						X			X	X	

1. Decrease Harvest

Bass:

Needed when seine samples and fishing records of the pond reveal these situations:

- 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 pond reveal these situations:

- Many recently hatched bluegill.
- Very few medium-sized bluegill.
- Bass less than one pound and in condition.
- No young bass.

Game birds and mammals:

Regulated hunting is the primary tool used to keep game species within the carrying capacity of the habitat. However, when harvest data, observation data and animal health indicates species populations are low, it is sometimes necessary to decrease harvest levels. Used when surveys show a continual population decline or when hunting success has continued to decline over a long period of time. Refer to Concept 10, Carrying Capacity.

Note: The provided field condition sheet or wildlife biologist will provide clues as to whether or not this practice is necessary.

2. Increase Harvest

Bass:

Needed when seine samples and fishing records of pond reveal these situations:

- Many recently hatched bluegill.
- Very few medium-sized bluegill.
- Bass less than one pound and in poor condition.
- Few or no young bass.

Increase bass harvest cautiously. Target the bass less than one pound. Spread the harvest over the entire summer.

Bluegill:

Needed when seine samples and fishing records of pond reveals these situations:

- No recent bluegill hatch.
- Many medium-sized bluegill in poor condition.
- Bass few, large, and in good condition.
- Target medium-sized bluegill, using seine harvest or shoreline rotenone.

Game birds and mammals:

Needed when animals show signs of stress and overpopulation, such as any of the following:

- Increase in prevalence of diseases and parasites.
- Destruction of habitat by overgrazing or overbrowsing.
- Poor body condition and weight loss.
- Poor reproduction.

- Few young animals in bag.
- Higher percentage of older animals than young in fall population.

Regulated hunting is the most effective and efficient practice to remove surplus animals and keep wildlife populations in balance with their habitat. When scientific data indicates animals are above carrying capacity, it is often necessary to increase harvest. Refer to Concept 10, Carrying Capacity.

Note: The provided field condition sheet or wildlife biologist will provide clues as to whether or not this practice is necessary.

3. Establish Native Grasses and Forbs

General Description:

Native grasses and forbs are recommended primarily to provide nesting and escape cover for small game, especially quail and rabbits. They also serve as bedding cover for white-tailed deer, nesting cover for wild turkeys and several songbirds, and as a haven for many small mammals. Warm-season grasses grow during the warm growing season. Cool-season grasses make primary growth in the spring and fall and often go dormant during the summer.

Introduced grasses (e.g., tall fescue, orchardgrass, bermudagrass) are not recommended because they do not provide suitable habitat structure, and their competitive nature keeps native grasses and forbs from becoming established. Native grasses may be planted, or can be established, by killing existing non-native cover — especially tall fescue, johnsongrass, and crabgrass — with selective herbicides (e.g., imazapic) and allowing seeds lying dormant in the seedbank to germinate. If planted, native legumes (e.g., partridge pea, roundhead lespedeza, and Illinois bundleflower) may be sown with the native grasses. Seed from these legumes are relished by quail and other birds during fall and winter. These plantings should be burned or disked occasionally (every two-to-five years) to prevent deterioration of the vegetative structure through litter buildup and excessive woody plant succession. It is good to have fields or sections of fields that are burned/disked each year to provide a diversity of habitat types to serve the different needs of wildlife. Usually burning/disking are conducted just prior to spring green-up, so that nests and young wildlife are not disturbed. Ideally, native grasses should not be mowed. If used for grazing or haying, paddocks of native grasses should be rotated and not clipped below 6 to 8 inches.

Effect on Habitat:

- Fields of native grasses are particularly useful for wildlife in areas with little acreage in stages 2 and 3 and in areas where the majority of early successional habitat is in hayfields or pastures of non-native forages (e.g., tall fescue, orchardgrass, etc.).
- Fields of native grasses enhance habitat for many wildlife species (e.g., rabbits and quail) by providing winter, nesting and/or roosting cover. Ground-nesting birds usually build their nests at the base of a native grass bunch/clump.
- Fields of native grasses also provide food, through the various forbs present, for many species.

- Fields of native grasses that are burned provide an open structure at ground level, which is excellent brooding habitat for young quail and turkeys, who can walk about easily between the bunches of grasses, picking invertebrates off the vegetation and seed from various forbs off the ground.
- Fields of native grasses that are burned or disked on a two-to-five year rotation provide dead, dry vegetative material that birds use for building nests.
- Grasses and forbs can be established to help develop a riparian buffer

4. Fish or Wildlife Survey

Fish surveys

Population balance is first established in ponds by stocking the correct number of fish. After the first year, check pond balance during early summer by seining at intervals around the pond. Four to five seine sweeps in an average pond is usually enough.

Balance is determined by comparing age groups, condition, and numbers of bass and bluegill caught in the seine and from fishing records. Recent reproduction of both bass and bluegill in the seine indicate that 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 that the pond needs to be poisoned (with Rotenone) or drained.

Seining is usually not effective for collecting fish in streams. Fish in streams are usually collected by fishing or are electro-shocked. Electro-shocking involves running a small electrical current between two conducting rods which are moved up and down the stream. Fish that are stunned float to the surface and the age, condition, and numbers are recorded to determine the stream balance. The fish are then revived and returned to the stream.

Wildlife surveys

Monitoring wildlife for trends of increasing or decreasing populations or body weights of animals is important for wildlife managers. Data on whitetailed deer, black bear, wild turkeys, ruffed grouse, bobwhite quail, mourning doves and many songbirds are routinely collected by wildlife biologists using infrared triggered cameras, roadside counts, call counts, check stations, transects and questionnaires. These data are then used to prescribe future harvesting or land management strategies.

Note: While fish/wildlife surveys are always important, they should not be recommended if it is stated on the field condition sheet indicates that a survey has recently been completed.

5. Grain: Leave Unharvested

General description:

Strips or blocks of grain or other crops (e.g., soybeans) can be left unharvested. This is especially valuable if the strips are left adjacent to cover. This practice should be recommended only if there is an unharvested crop present. It is not applicable to grain food plots.

6. Harvest Timing of Crops

General description:

When wildlife is the primary objective, it is often necessary to avoid harvesting crops or hay during nesting and fawning seasons to reduce nest destruction and mortality.

7. Manipulation of Succession - Mechanical, Fire, Livestock, and Chemical

General description:

Succession is the orderly predictable series of changes in plant species composition through time and occurs in all natural communities. Wildlife habitat is most often managed by setting back succession in an effort to retain successional stages beneficial for the intended wildlife species. Each of these techniques is applicable for manipulating succession in different habitats for various species.

I. Succession Management - Mechanical

A. Mowing/Mulching – Mowing is most often done 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 cover, mowing should not be conducted until late winter/early spring. When used to manage fields, mowing should be prescribed only when it is apparent that woody species are encroaching in the field. In other words, mowing grassy fields is unnecessary. When possible, prescribed burning and disking should be implemented instead of mowing.

Effect on Habitat:

- Helps keep vegetative succession in stages 2 or 3.
- Sometimes reverts succession from stage 4 to stage 3. Helps remove competition from some kinds of shrubs, allowing grasses and forbs to grow better. Sometimes helps keep vegetative succession in stage 4. Maintains low shrub growth with certain species of shrubs by encouraging resprouting. In stages 2, 3 and 4, helps rejuvenate grasses, forbs and shrubs, which improves nesting habitat for many species of birds.
- May be used to reduce weed competition in forage food plots.
- May be used in wetlands to increase interspersed cover by reducing vegetative cover.
- Causes thatch build-up, which reduces availability of invertebrates and seed to young quail, grouse and turkeys and other ground feeding birds. Thatch build-up also reduces the ability of these animals to move through the field and suppresses the seedbank.

B. Chaining/Roller Beating - Chaining utilizes a large chain strung between two bulldozers running parallel to each other (50 to 100 feet apart) to knock down shrubs and small trees. Roller beating utilizes bulldozers pulling a roller with large, sharp metal blades to 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 or mulcher. This practice is not used to manipulate understory vegetation in woodlands. Prescribed fire is the preferred method to maintain the desired vegetative composition and structure within woodlands.

Effect on Habitat:

- Helps remove competition of some kinds of shrubs, allowing grasses and forbs to grow better.
- Sometimes helps keep vegetative succession in stage 4. Maintains low shrub growth with some kinds of shrubs by encouraging resprouting.
- In stage 5 causes succession to revert back to stage 4.

C. Disking - Disking mixes the upper soil layer and incorporates organic material into the soil, facilitating decomposition and stimulating the seedbank. Disking is a highly preferred, relatively inexpensive and effective management practice for releasing grass-bound fields, creating bare ground, and encouraging germination and growth of forbs. Areas in successional stages 2, 3 and 4 can be disked to maintain/promote growth of annual and perennial forbs and grasses. Disking should be performed on a rotational basis, usually in winter. In planted pines, diskings can be used in stages 5 and 6 to reduce unwanted woody stems and encourage herbaceous growth. Similar to controlled burning, timing of diskings and diskings intensity strongly 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 diskings is often used to create firebreaks to facilitate controlled burning, it should not be recommended in order to burn. Disking should not be prescribed for fields of perennial non-native grasses (i.e. tall fescue, orchardgrasses, bermudagrass). Fields with these grasses should be converted to native grasses and forbs using herbicides.

Effect on Habitat:

- In stages 2 and 3, maintains herbaceous vegetation.
- Promotes fresh herbaceous growth and enhances foraging habitat for many wildlife species.
- In stage 3, causes succession to revert to stage 2.
- In stage 4, causes succession to revert to stage 2 or 3.

D. Chainsawing, feller-bunching, clipping and

other mechanical methods of tree removal such as lop-and-scattering may be used to kill and / or remove trees in forests, savannahs, and woodlands where trees are not needed or additional areas of early succession are needed by the species to be managed.

Effect on Habitat:

- Implementing this practice implies that once the trees are removed, the area is to be maintained indefinitely in the earlier successional stages.

Note: Do not recommend forest management techniques such as clearcut to achieve this management goal.

II. Succession Management - Fire (Prescribed Burning)

Prescribed burning can be the most effective and efficient practice for managing one or more habitat types for most wildlife species. Prescribed fire is encouraged to maintain stages 2 – 4 and to influence understory composition and structure within stages 5 and 6 of the Southeast Mixed and Outer Coastal Plain and Eastern Deciduous Forests. Timing of burning and frequency of burning strongly influence vegetation composition and structure. Prescribed fire should be used in fields instead of mowing/mulching whenever burning is possible. Although a very beneficial practice, prescribed burning may not be applicable in all locations. Sites in close proximity to urban areas, hospitals or busy

roadways may not be suitable for burning due to safety and smoke management concerns. **Burning should be conducted only when danger of wildfire is low (i.e., when the wind, temperature and humidity allow a controlled burn) and should be conducted under the close supervision of forestry or wildlife professionals experienced with prescribed fire.**

Effect on Habitat:

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

III. Succession Management - Grazing Management

This practice is for managing the use of vegetation by livestock to enhance wildlife habitat. Only recommend this practice when evidence of livestock use is present or information on livestock usage is provided. Grazing management may be used to exclude livestock from sensitive areas or to manipulate successional stages to benefit wildlife by adjusting stocking rate, season of use, or grazing system. Livestock may be used to manipulate the height and structure of native warmseason grasses providing excellent wildlife habitat. Grazing should not be used to manipulate nonnative forage pasture (e.g. 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 and/or rotational grazing can be used to alter the vegetation structure and composition to favor wildlife.
- Reducing livestock use of riparian areas may improve the habitat for many wildlife species. Fencing can help reduce siltation, turbidity and stream bank erosion, while reducing stream and pond pollution from livestock wastes.

IV. Succession Management – Chemical

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

Effect on Habitat:

- In many habitats, hardwood brush reduces vegetative diversity and limits many plants that are important for wildlife.
- Mowing/mulching and chaining/roller beating stimulate resprouting.
- Proper herbicide applications control unwanted woody growth and encourage more herbaceous groundcover.
- Many areas are covered with non-native grasses and forbs that provide little food or cover for wildlife and exhibit a growth pattern that prevents many wildlife species from using the area. These areas can be sprayed to eradicate the undesirable species and promote desirable native species from the seedbank or desirable species can be seeded if not present in the seedbank.
- Each succession manipulation technique is applicable for manipulating succession in different habitats for various wildlife species. In some instances, more than one technique may be applied. Refer to Concepts 4, 5, 6 and 7.

Note: For the written and oral segments of the national contest, you should specify which practice(s) should be used and why that practice is applicable.

8. Nesting Structures

General description:

Some species den, nest and/or roost in cavities they don't excavate themselves (e.g., bluebirds, wood ducks, screech owls). If natural cavities are not available, artificial cavities (nest boxes) can be used. Many species need a certain kind of cavity (e.g., diameter of hole, depth, area) in a certain location (field, woods or water) and at a certain distance above the ground (height in feet). The particular design and placement of nest boxes often determines which wildlife species will use the structures. Contact your county Extension office for specific designs of nest boxes and other artificial nesting/ roosting structures. Note: Nesting structures for Canada geese or mallards are not recommended in many areas because resident Canada geese have become too numerous and are a nuisance. In addition, nesting structures are not recommended for mallards; instead, creation of quality nesting habitat (native warm-season grasses) is required to impact population recruitment. Nest boxes should be monitored to ensure use by targeted species.

Effect on habitat:

- In open areas (stages 2, 3 and 4) nest boxes are useful for bluebirds unless an abundance of nesting cavities in trees or fence posts are present. Nest boxes for bluebirds should not be placed any closer than 80 yards apart to prevent excessive territorial fighting between males.
- Near water sources, nesting structures provide secure nesting sites for wood ducks where trees with cavities suitable for nesting are absent. Nest boxes for wood ducks should not be placed any closer than 100 yards apart and ideally, should not be visible from one box to another, to prevent dump-nesting by females not incubating a particular nest.

9. Plant Food Plots

General description:

Planting grain and forage food plots can be beneficial for many wildlife species (game and nongame, 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. Food plots should be well dispersed throughout the property being managed. Generally, 1 to 5 percent of a property being managed for wildlife may be in food plots. Food plots may be long and narrow (300 to 400 feet long and 15 to 20 feet wide) or blocky in shape (depending on wildlife species managed for and the type of food plot planted), preferably located at an edge between two or more habitat types (e.g., between a woodlot and an old-field, perhaps near a creek). If possible, food plots should be located adjacent to natural cover (e.g., brushy fencerows, hedgerows and other thicket-type areas). Exclusion cages should be erected in all forage plots to monitor planting success and amount of grazing pressure.

Food plots are not planted for upland wildlife only (e.g., rabbits, quail, turkeys and deer), but also for waterfowl. Plots of millets, corn, rice, or grain sorghum may be flooded a few inches deep during the fall to provide an additional food source for ducks through the winter. For information on recommended plant species, seeding rates, seeding depth and soil type, visit your county Extension office.

Effect on Habitat:

- In areas where row-cropping (corn, grain sorghum, soybeans, etc.) is scarce, grain food plots can supply high-energy foods through fall and into late winter.
- In areas where little herbaceous vegetation is present (e.g., large areas of stages 4, 5 and/or 6) and/or where herbaceous vegetation is of no value to wildlife (e.g., fields of tall fescue, orchardgrass, bermudagrass, etc.), forage plots can supply high-protein foods, especially during late summer and through winter and spring.

Note: Food plots should be considered supplemental to the 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 (e.g., late summer and winter). In addition, food plots are often used to facilitate harvest of some wildlife species. Plots should not be placed within view of property lines or public roads.

10. Plant Trees

General Description:

Trees are planted to benefit many species of wildlife and can provide food (hard or soft mast) and/or cover. Trees should be planted in winter while they are still dormant. For specifics about what, when, and how to plant mast trees, contact your county Extension office.

Effect on Habitat:

- A wide variety of tree species may be planted; depending on landowner objectives, region, and site.
- A diversity of hard/soft mast producers are recommended where mast is limited.
- Provides additional nesting, perching, denning and roosting cover for many wildlife species.
- Used to help develop riparian buffers

11. Plant Shrubs (create hedgerows)

General Description:

When properly located, various shrubs can benefit many species of wildlife. In large open areas, planting multiple rows of shrubs is beneficial for those species requiring additional shrub cover. Fruiting shrubs are especially good when planted in fencerows, hedgerows, field/woods borders, odd areas (e.g., field corners and gullies) and any other areas where soft mast may be lacking. Establishing hedgerows of shrubs to break-up fields is very beneficial, especially when planted adjacent to native grasses and/or a good food source. Plant shrubs in winter while they are still dormant.

Effect on Habitat:

- Can provide additional food and cover for many of shrubs are lacking.
- Shrubs are an important component of travel lanes, which allow wildlife to move safely across open fields between two areas of cover.
- Establishing hedgerows by planting shrubs may be used to increase interspersed cover types.
- Shrub plantings may be useful in some urban settings where desirable cover and/or soft mast are lacking.
- Hedgerows allow animals to find suitable habitat for feeding, nesting or cover.
- Establishing hedgerows increases the amount of edge and creates smaller fields in close proximity that can be managed differently to meet the various food and cover requirements for different wildlife species.
- Used to help develop riparian buffers

12. Ponds: Construction

General Description:

Ponds can be created using dams, dikes, and levees to provide permanent water for fish and wildlife. The design varies, depending on the purpose for constructing the pond and the region where it is constructed. For example, steep sloping sides benefit fish and gentle sloping banks benefit several wildlife species, such as wading birds. Contact your local Cooperative Extension Service or Natural Resource Conservation Service office for design details.

Effect on Habitat:

- Suitable habitat for fish is created by constructing a new pond.
- Although many wildlife species may use ponds for various reasons, this practice is intended primarily for fish habitat. When additional water or wetland habitat is needed for various wildlife species, water developments for wildlife should be marked. Refer to Concept 11.

Note: This practice should be recommended for creating **new** ponds with permanent water.

13. Ponds: Deepen Edges

General Description:

In ponds with excessive aquatic vegetation along the margins of a pond, the edges should be deepened to a minimum of two to three feet with steep side slopes. If the ponds can be drained, this can be accomplished with a bulldozer or tractor with a rear blade. If the pond can not be drained, a backhoe can be operated from the top of the pond bank. Soil can be removed from the site or piled around the bank and then smoothed out and planted to native grasses and forbs. Refer to Concept 11.

Effect on Habitat:

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

14. Ponds: Fertilize

General description:

Ponds can be fertilized to increase available natural food organisms and prevent rooted aquatic weeds from becoming established. However, not every pond should be fertilized. Fertilization should **not** be used in ponds infested with weeds, ponds with excessive water flow, turbid (muddy) ponds, or ponds that will not be fished heavily. Fertilization is needed in fish ponds with water clear enough that you can see your hand clearly with your arm underwater at elbow depth (18"). Before beginning a fertilization program, have the total alkalinity and pH of the pond water tested. Ponds that are 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 degrees Fahrenheit. For ponds with moderate hardness (50 – 100 mg/l calcium hardness) apply at the rate of 15 pounds of 12-52-4 (or its equivalent) powder, one gallon of 11-37-0 liquid fertilizer, or 15 pounds of granular (0-46-0) per acre at two-week intervals, or until a good green color (phytoplankton bloom) develops in the pond. Make

additional applications of fertilizer (at the same rate per surface acre) every three to four weeks, or when the water clears (becomes less green). Fertilization may be continued until water temperatures drop below 60 degrees Fahrenheit in the fall. Methods for applying fertilizers vary with the type of fertilizer selected. 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. Refer to Concept 11.

15. Ponds: Reduce Turbidity

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, activities of cattle watering in the pond, feeding activities of bottom-dwelling fish such as carp or buffalo fish, or negatively charged clay particles suspended in the water column. Most events of turbidity are caused by temporary introductions of sediments from the watershed (erosion) or the pond bottom (cattle or fish) and will usually clear in a relatively short period of time. Reducing erosion in the watershed is best accomplished by reseeding the watershed immediately around the watershed where there is evidence of erosion. Turbidity due to pond sediments can be controlled by restricting cattle to a small area of the pond and eliminating bottom-dwelling fishes. Turbidity from suspension of negatively charged clay particles is a more difficult problem. The addition of positively charged compounds such as limestone, gypsum, or alum crystals can cause the clay particles to settle. However, the choice of which product and how much to use has to be based on effectiveness, availability, cost, and the ability of the pond owner to apply the product correctly. Refer to Concept 11.

Effect on Habitat:

- Removes/settles silt in the water and allows sunlight to stimulate phytoplankton.
- Improves water quality and provides nesting, brooding, and winter cover for some wildlife.

16. Ponds: Repair Spillway

General Description:

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 washing away during heavy rains. In special cases, leaks around the spillway or levee structure can be stopped with the addition of special clays or plastic liners (this is expensive). Refer to concept 11.

Effect on Habitat:

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

17. Ponds: Restock

General Description:

Restocking a pond is a drastic measure and should only be considered after other management approaches have been attempted. Ponds containing wild fish species such as carp, shad, green sunfish, or bullhead catfish should be restocked with a balanced predator / prey combination. Restocking should be done only after all fish in the pond have been removed, either by draining or applying a fish toxicant. In warmwater ponds, bluegill fingerlings should be stocked in the late fall, and bass fingerlings are stocked the following June. Although various states have different stocking recommendations, typical stocking rates are 1000 bluegill and 100 bass per surface acre if the pond is to be fertilized or 500 bluegill and 50 bass per surface acre if the pond will not be fertilized. Refer to Concept 11.

Effect on Habitat:

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

18. Retain Snags and Down Woody Material

General Description:

Snags are standing dead trees. They provide cavities used by many birds and mammals. In forested habitat, snags and down logs of various species with remaining limbs, bark and stumps should be retained for habitat diversity. In the absence of any snags and when managing for species that use snags and down woody material, it may be necessary to create snags by killing some existing trees by girdling the tree with a hatchet or chainsaw and applying herbicide to the wound. In streams, woody material creates stream diversity and structure that may be used as cover.

Effect on Habitat:

- Snags provide roosting and perching sites for many bird species.
- Snags provide woodpeckers with sites for cavity construction. Later, other species (e.g., bluebirds, owls, gray squirrels, and wood ducks) may use these cavities for nesting and roosting.
- Snags provide foraging sites for many species.
- Down woody material provides sites for feeding, reproducing, hiding and resting that are important to numerous species of terrestrial wildlife.
- Down logs provide denning sites for bobcats.
- Down logs provide a rich food source for insect and fungi-eating animals, which may increase available prey for bobcats.
- As down logs decompose, they can hold more moisture, providing an essential cool, moist microhabitat for many species of reptiles, amphibians and small mammals.
- Down logs provide drumming sites that are important for the mating rituals of ruffed grouse.
- Dead and down material provides sites for regeneration of some tree and shrub species.
- Dead and decaying logs serve as sites for nitrogen fixation by some bacteria.
- Logs, large limbs and smaller branches in and near water provide shade, cover and food for aquatic organisms, some of which are food for young fish.

23. Tillage Management

General Description:

Tillage of cropland may be delayed in spring to allow the use of standing stubble for nesting. Tillage may be eliminated in the fall to allow wildlife access to waste grain. When fall tillage is necessary, avoid inversion tillage (soil is turned over and covers up crop residue), such as moldboard plowing or disking. Instead, till with implements such as chisel plows that can be used without turning the soil over.

Effect on Habitat:

- Increases supply of waste grain, which is a food source used by rabbits, squirrels, quail, turkeys, deer and many other wildlife species.

Note: Recommend this practice only if a grain crop is present.

24. Forest Management Techniques

Timber Harvest

General Description:

Timber management and wildlife management are inseparable partners in forested habitats. Harvesting timber is one method of enhancing wildlife habitat. Several silvicultural methods are used to regenerate forest stands. The method recommended for a given stand varies greatly depending on forest type and composition and the objectives of the landowner.

- **Clearcut** regeneration method harvests all the trees on a given site. More sunlight is allowed in to the forest floor with this method than with any other. Clearcutting generally releases shade intolerant species (e.g., 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 (6 to 8 years), the remaining overstory (shelterwood) is removed as the regeneration becomes developed.
- **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 seeds. The seed trees are usually harvested after the crop of new trees becomes established. Pines are often planted after harvest to establish a new stand. Hardwood stands are almost always regenerated naturally and are not planted. Whatever the method used, forested land to be harvested should be chosen so that food and cover for wildlife are in close proximity. Tracts harvested should have adjacent unharvested stands to provide travel corridors and space for wildlife that do not use young stands.

Effect on Habitat:

- Harvesting timber generally sets back succession and produces new forest growth with a greater stem density. According to the site and regeneration method, timber harvest reverts stage 6 forest to stages 3 and 4, which will grow into stage 5 within a few years.
- Enhances cover for many prey species, which provides food for predators.

- According to the site and regeneration method, harvesting timber can stimulate forb growth, providing additional food (forage, seeds and insects) and cover many species.
- Retaining snags and cavity trees when harvesting timber provides nesting, roosting, denning and perching sites for those species that use them.

Note: Harvesting timber should be recommended as a silvicultural tool to regenerate stands — not merely to create “openings.” Regenerated forests result in new forests, not fields. Where additional fields of native grasses and forbs are needed, ‘Forest Management: Timber Harvest’ should NOT be recommended automatically. ‘Manipulation of Succession’ should be considered to reach this management objective.

Timber Stand Improvement (TSI)

General Description:

Timber Stand Improvement (TSI) may involve any of several techniques used to improve the quality and composition of forest stands by shifting resources (sunlight and nutrients) toward production of desired products, which include timber and/or wildlife. TSI most often involves some type of **thinning**, which reduces stand density to influence stand growth. Thinnings may be pre-commercial or commercial. Pre-commercial thinnings are conducted before the trees have sale value. Commercial thinnings involve removing at least part of the trees for a useful product. Removing trees increases the amount of sunlight entering the forest canopy and is used to promote increased growth of the remaining trees through changes in stand composition and structure (cover) in the understory and midstory to favor food producing plants, both woody and herbaceous.

Effect on Habitat:

- Increased herbaceous growth in the understory improves brooding habitat cover and provides additional forage.
- Increased woody stem density in the mid story improves cover for certain species, such as ruffed grouse.

Note: For the written and oral segments of the National WHEP Contest, you should specify which practice(s) should be used and why that practice is applicable.

25. Water Level Manipulation Techniques

Water Control Structures

General Description:

Various structures made out of concrete, pipes, wood, etc., are used to control the water level in wetlands and ponds. They usually are combined with dams and shallow dikes for water control.

Note: Recommend only when inadequate or no structures are present on an existing dam or dike.

Small Dikes for temporary flooding

General Description:

In the fall and winter, small dikes are used to temporarily flood potential feeding areas for waterfowl by holding rainwater on a field or woods. Grain fields (e.g., corn, millets and

grain sorghum), in stage 6 hardwood stands are examples of feeding areas that can be flooded to attract waterfowl. In spring and summer, existing wetlands and forested areas can be flooded to provide nesting and brooding habitat for various waterfowl, such as redheads and wood ducks. This practice is recommended in areas where there are potential sites for waterfowl feeding and nesting. A watercontrol device in the dike allows the water level to be manipulated. The water is removed from the field prior to spring (similar to letting the water out of a bathtub) so the field can be planted again.

Effect on Habitat :

- Water level manipulation techniques are used to create or improve habitat for wildlife whereas water developments for wildlife are constructed to provide a source of drinking water for wildlife
- Temporary flooding can improve existing wetlands for nesting and brooding for some waterfowl species, such as redheaded ducks, and can improve existing forested areas for nesting and brooding wood ducks.
- Allows management of water levels to increase or decrease the amount and type of aquatic vegetation. Useful for creating a desirable mix (interspersed) of open water and emergent aquatic vegetation.
- Can be used to create shallow water areas.
- Can be used to manage the quality of water and for control of unwanted fish.
- Can be used to control water levels in flooded timber, drawing water down to prevent tree mortality.

Note: When this practice is recommended, it is assumed that adequate water control structures are included and should not be an additional recommendation.

26. Water Developments for Wildlife

General Description:

Creating a source of drinking water for wildlife is critical consideration when little or no water source is available. Many different types of water sources are possible, depending on the area and local needs of wildlife.

- **Guzzlers:** Built by covering an area with an apron of fiberglass or some other material that sheds rain. The water is collected in a storage tank and slowly released into a trough from which wildlife can drink.
- **Dugouts:** Basins (dug out with bulldozers or backhoes) designed to collect water from runoff and/or precipitation. Side slopes should be gentle to provide easy access for wildlife.
- **Shallow Impoundments:** Earthen dikes are constructed to retain water (usually run-off water from precipitation) in natural drainage areas. Placement of the dike is critical to avoid damage from floods and also to collect sufficient water. These impoundments are also used by waterfowl for nesting and brood habitat when flooding occurs in spring and summer. Crop fields (e.g., corn, millets, grain sorghum) can be flooded in the fall and winter to provide areas for waterfowl and other wetland species to feed and rest. A watercontrol device in the dike allows the water level to be manipulated. When this practice is recommended, it is assumed that adequate water control structures are included and should not be an additional recommendation.

- **Birdbaths and Backyard Ponds:** Small ponds can be constructed in backyards and other urban areas to provide water for a variety of wildlife. Birdbaths are also useful for providing water in urban settings.

Effect on Habitat:

- Provides drinking water for wildlife.
- Provide winter food resources if flooding occurs
- Provides a source of prey for many predators

27. Wildlife Damage Management Techniques

General Description:

Wildlife managers often have to exclude, trap, relocate, frighten, repel, poison, shoot or otherwise kill individual animals in order to reduce or eliminate damaging behaviors and/or health hazards presented by some wildlife species. Examples of wildlife damage include woodpeckers hammering on the side of the house, squirrels nesting in the attic, deer eating ornamental plants in the yard or feeding in soybean fields, bobcats/ coyotes/owls preying on livestock, rabbits/ raccoons eating vegetable gardens, beavers killing trees, red-winged blackbirds eating crops, and Canada geese loitering on lawns and golf courses. In additions, starlings roosting in urban trees and defecating on sidewalks can create a health hazard. Wildlife damage management may be recommended in addition to the practice of increasing harvests if special problems exist on the area being evaluated.

- Direct control techniques like shooting, trapping and the use of toxicants to reduce problem animals are commonly used and effective.
- Non-lethal methods of predator control including habitat modification, repellents and the use of exclusion fences or guard dogs are also commonly used.
- Methods of controlling herbivores (deer, rabbits, etc.) include shooting, exclusion fences, taste and area repellents, and scare tactics (such as propane cannons).
- Methods of bird control include frightening devices, exclusion devices and shooting. Refer to concept 12, Wildlife Damage Management.

WHEP Activities and Scoring

The activities section of the WHEP manual describes activities I – IV which will be used in the North Carolina WHEP State Contest. These events have been modified from the national WHEP contest. National WHEP events can be found in the National WHEP Manual < <http://www.whep.org/coach/manual.html> >.

Teams participating in the National WHEP Invitational should study the activities in the national manual. The activities at the state contest have helped you prepare for these activities, but special attention and work should be done on the written management plan (activity III-A) and the oral defense of the written plan (activity III-B) as these activities are not part of the state contest.

Individual Activities

All activities at the state event will be scored on an individual basis. The top three individual scores for each individual activity will count toward total overall team score. For teams of four members, the lowest score will be dropped. For teams of three members, all scores will count. The maximum individual score is 100 points. For teams, the maximum team score is 300 points.

- Activity I: Wildlife Identification and General Wildlife Knowledge (20 points)
- Activity II: Identifying Wildlife Foods (20 points)
- Activity III: Interpreting Aerial Photographs (30 points)
- Activity IV: On-site Wildlife Management Practices (30 points)

Contest Day Schedule of Events (subject to change)

- 9:30am Registration
- 10:00 Activity I (Wildlife Identification and General Wildlife Knowledge)
- 11:00 Activities II & III (Wildlife Foods and Aerial Photos)
- 12:00pm Lunch
- 1:00 Activity IV (On-site Wildlife Management Practices)
- 2:15 Contest ends and grading
- 4:00 Awards

Activity I

Wildlife Identification and General Wildlife Knowledge

20 points

Activity I covers identification of wildlife species native to North Carolina. Wildlife managers must be able to identify various wildlife species when conducting surveys.

All of the information necessary to succeed in this activity is in this manual. Participants should learn to identify the species listed in Table 2. This table includes species from the Regions used for the NC State WHEP contest, as well as additional species that are common and important in North Carolina. Participants should be familiar with the male and female of the species, as well as the juvenile and adult stage. Photos of the species are readily available from a number of sources, including many field guides and web sites. General knowledge questions will test participant understanding on the concepts and information provided in the NC WHEP Learning and Activity Guide.

This portion of the contest may be administered in presented as a PowerPoint presentation, with live and mounted specimens, a written/hard-copy form, or some combination thereof.

Completing Activity I Scorecard

Each wildlife species will be assigned a number and contestants will write the name of the species in the space provided on the answer sheet. Capitalization does not matter except in the case of proper nouns and cardinal directions (ie American, Eastern, Southern, etc). Writing must be legible. If the judges cannot read the intent of the contestant, the answer will be considered incorrect.

General wildlife knowledge questions will be in a multiple choice or true-false format.

Scoring Activity I

Each correct answer is worth one point. For the wildlife identification portion, Senior level participants must spell and capitalize all wildlife species correctly. Junior level participants will be judged easier on spelling and capitalization, as determined by the state WHEP leader. For the general wildlife knowledge portion, participants will need to put the letter of the correct answer in the correct numbered blank on the scorecard.

Sample General Wildlife Knowledge Questions

Eco-Region: Southeast Mixed and Coastal Plain Forest

1. Final stages of plant succession could typically include:
 - A. Tulip Poplar, Red Cedar, White Pine, Linden
 - B. Oak, Hickory, Beech Red Maple
 - C. A mix of dense coniferous and deciduous forest
 - D. Salal, Vine Maple, Salmonberry and Scrub Oak

Answer (B)

2. Terrain of the Southeast Mixed and Coastal Plain Forest is:

- A. Rolling hills and mostly flat
- B. Steep slopes
- C. Ridge and valley zones
- D. All of the above

Answer (A)

3. Annual precipitation in this eco-region is:

- A. Less than 10 inches
- B. More than 100 inches, received during the monsoon season
- C. 10 – 20 inches, mainly during the winter
- D. 40 – 60 inches

Answer (D)

4. Brown thrashers forage for food in:

- A. the ground layer
- B. the shrub layer
- C. the mid-story
- D. the canopy

Answer (A)

5. One type of non-lethal wildlife damage control is:

- A. Body-gripping traps
- B. Trapping and euthanizing
- C. Poisoning
- D. Exclusion methods including fencing and chimney caps

Answer (D)

Table 2. Selected Wildlife Species for Identification

BIRDS:	Green-winged Teal	Timber Rattlesnake
American Goldfinch	Hooded Merganser	Copperhead
American Robin	Mallard	Cottonmouth
American Woodcock	Pied-billed Grebe	Coral Snake
Blue Jay	Ring-necked Duck	Black Rat Snake
Brown Thrasher	Wood Duck	Banded Water Snake
Carolina Chickadee	Brown Pelican	Corn Snake
Eastern Bluebird	Cattle Egret	Eastern Garter Snake
Northern Cardinal	Great Blue Heron	Hognose Snake
Ovenbird	MAMMALS:	Ringneck Snake
Red-eyed Vireo	Fox Squirrel	Scarlet King Snake
Ruby-throated Hummingbird	Eastern Gray Squirrel	American Alligator
Tufted Titmouse	Southern Flying Squirrel	Eastern Box Turtle
Hairy Woodpecker	Eastern Chipmunk	Snapping Turtle
Pileated Woodpecker	Groundhog	Yellowbelly Slider
Red-bellied Woodpecker	Eastern Mole	Green Anole
Red-cockaded Woodpecker	Short-tailed Shrew	Fence Lizard
Red-headed Woodpecker	Eastern Cottontail	Five-lined Skink
Mourning Dove	Raccoon	American Toad
Northern Bobwhite	Striped Skunk	Bullfrog
Ruffed Grouse	Virginia Opossum	Green Treefrog
Wild Turkey	Beaver	FISH:
Black Vulture	Mink	Largemouth Bass
Turkey Vulture	Muskrat	Smallmouth Bass
American Kestrel	River Otter	Striped Bass
Bald Eagle	Long-tailed Weasel	Bluegill
Osprey	Gray Fox	Green Sunfish
Broad-winged Hawk	Red Fox	Shellcracker
Red-tailed Hawk	Bobcat	Black Crappie
Barn Owl	Coyote	White Crappie
Barred Owl	Black Bear	Brook Trout
Eastern Screech Owl	White-tailed Deer	Channel Catfish
Great Horned Owl	REPTILES & AMPHIBIANS:	INSECTS:
Canada Goose	Eastern Diamondback Rattlesnake	Monarch Butterfly

Activity I
Scorecard

*Common Wildlife Species Identification and
General Wildlife Knowledge*
20 Points

Contestant _____

County _____ **JR** _____ **SR** _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

SCORE for Activity I _____

Activity II

Identifying Wildlife Foods

20 points

To prepare for Activity II, study Table 3, which lists some common foods eaten by selected wildlife species. Table 3 lists only the foods commonly eaten by wildlife. Under certain circumstances, most wildlife species will eat unusual things. Here are some other important points to remember about the food preferences of wildlife species:

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

The following information about a few of the food categories listed in Table 3 will let you know what to expect when you see these foods during the program.

NOTE: This activity is not a stand-alone activity at the National WHEP Invitational. However, knowing about wildlife foods is invaluable when managing for wildlife. Strong knowledge of wildlife foods will prepare Senior Teams for the general wildlife knowledge quiz, written management plan, and oral defense of the written plan at the National WHEP Invitational.

- **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. For the purpose of this contest only examples from the following genera will be considered: Algae (various genera), American lotus (*Nelumbo lutea*), Arrowhead/duck potato (*Sagittaria spp*), Big duckweed (*Spirodela spp*), Bladderworts (*Utricularia spp*), Bulrushes (*Scirpus spp*), Burreeds (*Sparganium spp*), Cattails (*Typha spp*), Coontail (*Ceratophyllum spp*), Cordgrass (*Spartina spp*), Duckweed (*Lemna spp*), Floating hearts (*Nymphoides spp*), Naiads (*Najas spp*), Pondweed (*Potamogeton 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:** This is defined as stinking, rotting flesh. To be considered in this group the item must have a definite odor of decomposition, be presented in a plastic bag, or have the words this stinks on the display. A dry bone, a dry skin, or other body part does not represent carrion, but will represent other food groups. Maggots are a natural sequence in decomposition and may be present on the carrion.
- **Centipedes & Millipedes:** elongated arthropods having many body segments
Millipedes have pairs of legs.
- **Crayfish:** small freshwater decapod crustacean that resembles a lobster. Regionally they have many names including crawdads, and crawdaddys.
- **Earthworms:** terrestrial worm that burrows into and helps aerate soil; often surfaces when the ground is cool or wet; used as bait by anglers.
- **Eggs:** Only the eggs of vertebrate species (mammals, birds, reptiles, amphibians, fish) are considered in this category. Invertebrate eggs (insect and spider) will represent the group of 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, ie., 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:** This food group may be represented by the organism 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, and that lack chlorophyll.
- **Grains:** Are to be the cereal grains and include only wheat, oats, rye, barley, rice and corn. These may be represented on the test by only the seed, 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 the entire plant including the seed head, or by a single leaf or group of leaves.

- **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, that are more or less obviously segmented.
- **Leaves & Twigs:** For the purpose of 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 mammal that is representative of the class mammals such as teeth, bones, antlers, horns, 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, or by just 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 in a venomous sting.
- **Seeds:** 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.
- **Spiders:** arachnid that usually has silk-spinning organs at the back end of the body; they spin silk to make cocoons for eggs or traps for prey.
- **Tubers:** Will be represented by either the nutlet of the yellow nut sedges (chufa) or by potato.

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

Completing Activity II Scorecard

Each food item in the event will be assigned a number. To complete the Activity II scorecard, mark an "X" in the appropriate box for each wildlife group that may eat the numbered food item. More than one food item may be listed for each animal. Remember, if any species in a wildlife group commonly eats any species in one of the food groups shown, mark the box below the food item number and beside the wildlife species.

Scoring Activity II

Activity II will be scored individually based on the following:

$$\text{Total Score} = [(320 - \text{total incorrect}) / 320] \times 20$$

All boxes are counted in the scoring. Participants are given points for:

1. Putting an "x" where appropriate. Keep in mind that during a contest, all "x's" marked in the book may not be used, as the correct answers are dependant on the information provided in the filed conditions sheet and the conditions present on site at the time of the contest.
2. Leaving boxes blank where no "x" is indicated. Regardless of the scenario and field conditions, boxes that are not marked in the manual should not be marked during the contest as these practices have been determined to be inappropriate for those species in a given region

Answers will be incorrect if:

1. Boxes that should be marked are left blank
2. Boxes that should not be marked are marked

If a contestant marks a block that is not supposed to be marked, it is counted as an incorrect answer. Likewise, if a contestant does not mark a block that is supposed to be marked, it is counted as an incorrect answer.

No negative scores will be assigned. Minimum individual score on Activity II is zero.

Example: The judge has brought a persimmon with a tag numbered 7. The persimmon is a fruit. Below # 7 an "X" should be marked beside all wildlife groups that eat fruit whether or not they actually eat persimmons.

Table 3. Wildlife Foods

<i>Wildlife Foods</i>	Bass	Bats	Beaver	Bluebirds	Bluegill	Butterflies	Deer	Doves	Ducks	Foxes	Frogs	Grouse	Hawks	Lizards	Mink	Moles
Aquatic Plants			X				X		X							
Bark			X				X									
Birds	X									X			X	X	X	
Buds			X				X					X				
Carrion										X			X			
Centipedes and Millipedes																X
Crayfish	X				X				X	X	X		X		X	
Earthworms	X			X	X				X	X	X	X				X
Eggs										X				X	X	
Ferns							X									
Fish	X				X				X				X		X	
Forbs			X				X					X				
Frogs and Salamanders	X								X	X	X		X			
Fruit and Berries (soft mast)		X		X		X	X		X	X		X				
Fungi							X									
Grain							X	X	X			X				
Grass							X					X				
Insects	X	X		X	X				X	X	X	X	X	X	X	X
Leaves and Twigs			X				X					X				
Lichens							X									
Lizards										X			X	X		
Mammals	X									X			X	X	X	
Mussels																
Nectar						X										
Nuts (hard mast)							X		X			X				
Scorpions														X		
Seeds				X			X	X	X			X				
Snails	X								X		X			X		X
Snakes	X									X	X		X	X		
Spiders	X			X	X						X	X		X		
Tubers									X							
Turtles	X										X					

Table 3. (Continued) Wildlife Foods

<i>Wildlife Foods</i>	Otter	Owl	Quail	Rabbits	Salamanders	Shrews	Snakes	Sparrows	Squirrels	Thrashers	Trout	Turkeys	Turtles	Warblers	Woodpeckers	Wrens
Aquatic Plants													X			
Bark				X					X							
Birds	X	X					X						X			
Buds				X				X	X			X				
Carrion													X			
Centipedes and Millipedes					X							X				X
Crayfish	X						X				X		X			
Earthworms			X		X	X	X	X		X	X	X		X		X
Eggs	X						X		X		X					
Ferns																
Fish	X						X				X		X			
Forbs			X	X				X				X	X			
Frogs and Salamanders	X					X	X									
Fruit and Berries (soft mast)			X	X				X	X	X		X	X		X	
Fungi									X			X				
Grain			X	X					X			X			X	
Grass				X								X				
Insects		X	X		X	X	X	X	X	X	X	X	X	X	X	X
Leaves and Twigs				X					X			X				
Lichens																
Lizards		X														
Mammals	X	X				X	X									
Mussels	X												X			
Nectar																
Nuts (hard mast)			X						X			X			X	
Scorpions																
Seeds			X	X				X	X	X		X			X	
Snails					X	X					X	X				
Snakes		X					X					X				
Spiders			X					X		X	X	X	X	X	X	X
Tubers												X				
Turtles							X									

Activity II Scorecard

Wildlife Foods
20 Points

Contestant _____

County _____ JR ____ SR ____

Instructions: For each wildlife species below, mark an "X" in the appropriate box for all food items which may occur in its diet. Some wildlife species will not eat any of the food items shown.

Wildlife Species	Food Items									
	1	2	3	4	5	6	7	8	9	10
Bass										
Bats										
Beaver										
Bluebirds										
Bluegill										
Butterflies										
Deer										
Doves										
Ducks										
Foxes										
Frogs										
Grouse										
Hawks										
Lizards										
Mink										
Moles										
Otter										
Owls										
Quail										
Rabbits										
Salamanders										
Shrews										
Snakes										
Sparrows										
Squirrels										
Thrashers										
Trout										
Turkeys										
Turtles										
Warblers										
Woodpeckers										
Wrens										
Total Incorrect										

Score = [(320 – total incorrect) / 320] X 20

SCORE _____

Activity III

Interpreting Aerial Photographs

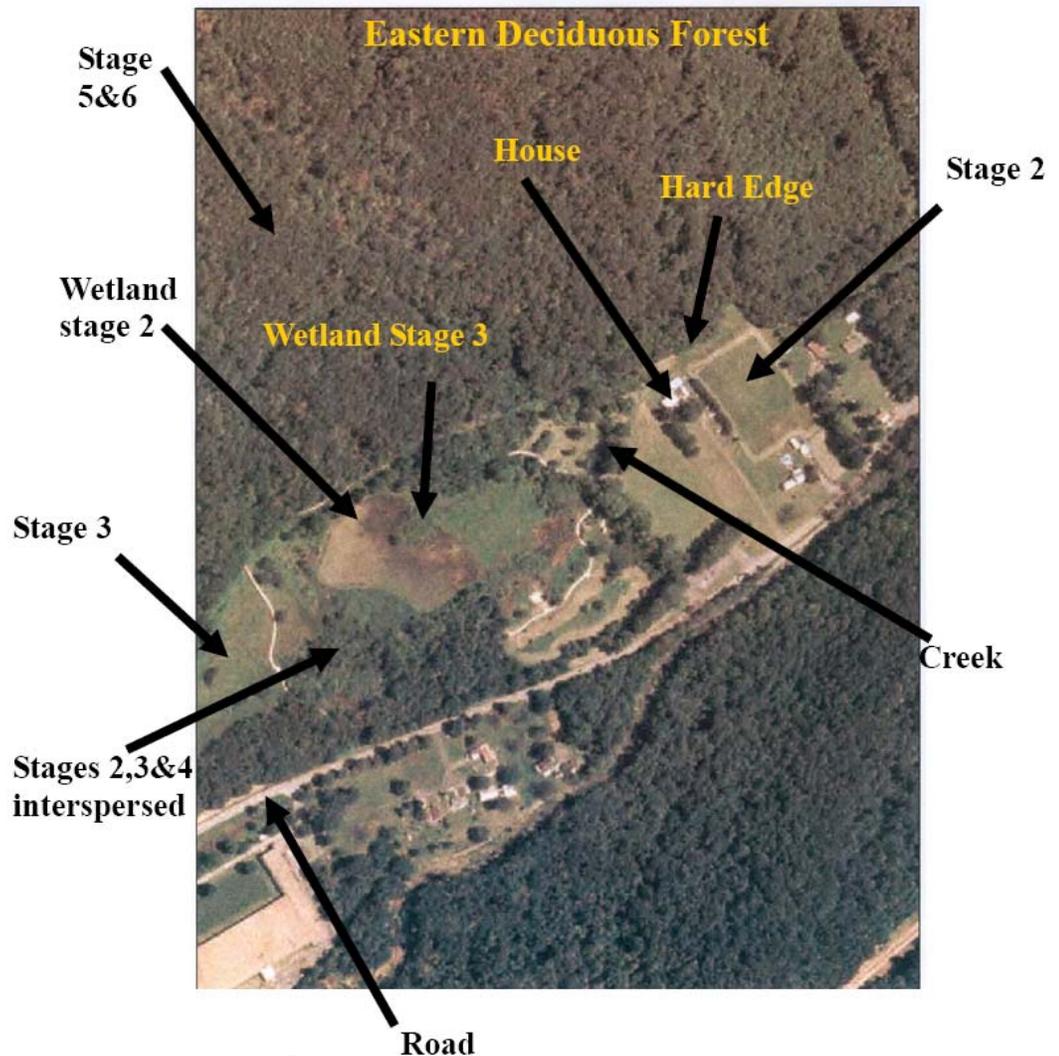
30 points

To prepare for Activity III, participants need to have a basic understanding of aerial photographs and how to read them. Using aerial photographs (black and white, color, or infrared) to judge the quality of an area of land for different wildlife species is sometimes used by wildlife managers as a way to get an overview of general habitat types in that area. It is not used as a substitute for evaluating the site on the ground.

Imagine how the countryside would look if you were a bird flying over it. If you have flown in an airplane, you know how it looks. The way a bird or pilot sees land is the way it appears on an aerial photograph. For example, a silo appears round, buildings look like squares or rectangles, woods are rough, and fields are smooth. It will be helpful for contestants to be able to identify certain features on an aerial photo, such as rivers/streams, ponds/lakes, structures (houses, barns, commercial buildings), various successional stages, agricultural land, pasture land, hard edge, soft edge, residential/urban areas, roads, power lines, etc.

Sample Features on Aerial Photos

When you read an aerial photograph, hold it so that shadows of objects fall toward you; otherwise, valleys appear as ridges, and vice versa. All objects are small, but you can determine what they are by comparing their size with the size of a known object. Other clues are tone (shade of gray), shape, and shadow (the length of shadow indicates the height of an object).



Now, color aerial photos are easy to find by using internet resources include Google Earth, Mapquest, or Terraserver. Your local Natural Resources Conservation Office or government planning office may also be able to provide you with sample aerial photos. Always pay attention to the scale of the photo. For the state contest, grayscale or color photos may be used.

NOTE: Interpreting aerial photographs is not a stand alone activity at the national WHEP contest. However, the skills gained through interpreting aerial photos can be useful when studying the location of the national contest, and in the general wildlife knowledge section.

Completing Activity III Scorecard

To complete Activity III, judge the quality of four areas, shown in four aerial photos, for each chosen wildlife species. One species at a time, judge the habitat value of the circled areas. Put an "X" in the box beneath the species of interest that best represents the ranking of the four photographs in order of quality from left to right, starting with the best. Do not consider the area's potential value; consider only its present quality. Also, do not consider surrounding areas.

Scoring Activity III

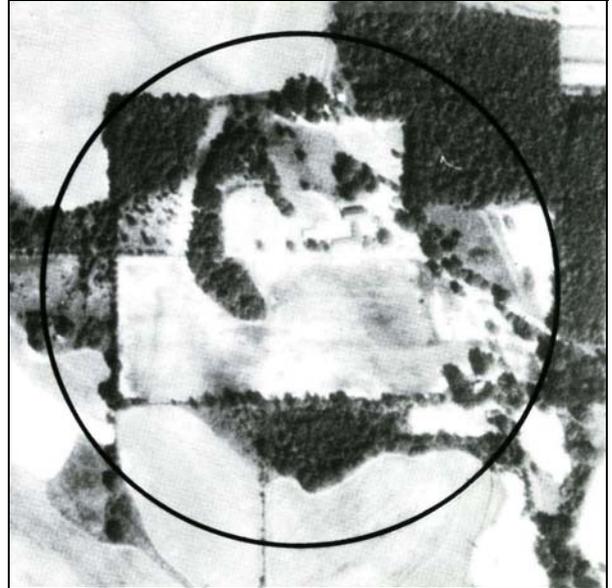
Scoring will follow the Hormel system, in which the fewest points are subtracted for answers similar to the correct answer. The state WHEP director will determine the official placing for each of the eight species, then establish by number the margin of difference between each of the three pairs of photographs. These numbers represent the penalties for switching the top, middle, and bottom pairs. The Hormel scale penalizes a contestant the amount of the margin between the two photographs involved for each incorrect decision.

Example: Using the four sample aerial photographs below, complete the scorecard for American kestrels, brown thrashers, Eastern bluebirds, mourning doves, Eastern cottontails, Northern bobwhite, and wild turkey, white-tailed deer, and wood ducks, and largemouth bass

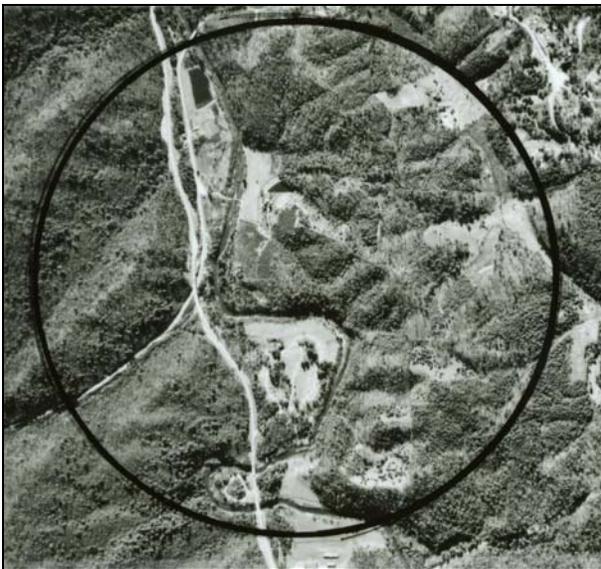
Aerial Photos



Aerial Photo #1



Aerial Photo #2



Aerial Photo #3



Aerial Photo #4

- *American kestrels*, the areas would be ranked 2, 3, 4, 1. These birds prefer large open areas in stages 2 and 3 of plant succession interspersed with areas in stages 4, 5, and 6. Area 2 fits this well. Area 3 also supplies this type of habitat, but has less area in stage 2 or 3 of plant succession. Area 4 has large open areas, but has little interspersed of other plant succession stages and is ranked third. Area 1 has few open areas and thus is ranked last.
- *Brown thrashers* would prefer the areas in the order 3, 2, 1, 4. Thrashers prefer dense shrub thickets. Area 3 supplies the greatest amount of this type of habitat. Area 2 has more area in stage 4 of plant succession than either area 1 or 4. Areas 1 and 4 are difficult to judge. In this instance, we would assume there is more shrub cover associated with the woodland area in Area 1 than what is shown in Area 4.
- *Eastern bluebirds* would prefer the areas in the order 2, 3, 4, 1. Just as kestrels, bluebirds like to nest in tree cavities adjacent to fields and prefer open fields for feeding.
- *Mourning doves* would prefer the areas in the order 4, 2, 3, 1. Because doves prefer fields for feeding, this rating order is based on the amount of open fields available.
- For *Eastern cottontails*, the area should be rated 2, 3, 4, 1. Area 2 is preferred because it has nearly the proper ratios of habitat components for rabbits (one-third grassland, one-third cropland, and one-third shrub cover), and they are well interspersed (mixed together). Area 3 has less shrub cover than area 2, but it has more habitat variety than area 4. Area 4 is lacking interspersed but has more cropland than Area 1.
- For *Northern bobwhite*, the areas would be ranked 2, 3, 4, 1. The rankings are the same as for rabbits for the same reasons. However, in some judging cases, areas may be rated differently for quail than for rabbits. Quail do not need quite as much shrub cover as rabbits.
- For *wild turkeys*, the areas would be listed 3, 2, 1, 4. Turkeys need 1/4 to 1/2 of their range open, and 1/2 to 3/4 as mature woodland. Area 3 is preferred because it has roughly 1/2 the area in woodlands, and nearly 1/4 of the area is open. Area 2 is second, because it is the only one of the remaining areas that has a near equal mix of open areas and forests. Area 3 is listed third because it has more timber than Area 4 and more cover in general.
- For *white-tailed deer* the areas would be rated 3, 2, 1, 4. Deer prefer woodland interspersed with areas in various stages of succession. Area 3 fits this well, because it includes three stages. Area 2 is selected over Area 1 because of the variety of successional stages it offers. Area 4 is too open, so Area 1 is listed third and Area 4 is listed last.
- *Wood ducks* would prefer the order 3, 4, 1, 2. Areas 3 and 4 have a dendritic (branchlike) drainage area indicating the possibility for pond building. However, the stream in Area 4 is not bordered by woodland and is of lower quality than the stream in Area 3. Area 1 and 2 show no evidence of ponds or streams.
- *Largemouth bass* and *bluegill* would prefer the areas in the order 3, 4, (1, 2) for the same reasons as wood ducks.

Activity III Scorecard

Habitat Evaluation of Aerial Photos 30 Points

Instructions: For each species, rank the areas outlined for their habitat value. Mark an "X" in the box with the appropriate ranking for each species. Consider only the area outlined on the photos in their current condition, not potential of the area.

Contestant _____

County _____ JR ____ SR ____

Wildlife Species

	1	2	3	4	5	6	7	8
Ranking								
1 2 3 4								
1 2 4 3								
1 3 2 4								
1 3 4 2								
1 4 2 3								
1 4 3 2								
2 1 3 4								
2 1 4 3								
2 3 1 4								
2 3 4 1								
2 4 1 3								
2 4 3 1								
3 1 2 4								
3 1 4 2								
3 2 1 4								
3 2 4 1								
3 4 1 2								
3 4 2 1								
4 1 2 3								
4 1 3 2								
4 2 1 3								
4 2 3 1								
4 3 1 2								
4 3 2 1								
Score								

SCORE _____

Activity IV

On-site Wildlife Management Practices

30 points

This activity addresses the use of wildlife management practices (WMP's) necessary to manipulate and improve an area for each of the wildlife species listed. *Consider each species separately.* For example, make management recommendations for deer as if you were managing for deer only; then make management recommendations for black bears and so on. Consider the habitat only in its *present condition*, rather than its potential in the future or how it might look years later.

Completing Activity IV Scorecard

Contestants should be prepared to individually read and interpret a field conditions sheet (management objectives provided by the landowner) and evaluate the habitat on site. Contestants will be required to clearly 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.

Assume that all of the species on the scorecard are present in the area, except for aquatic animals (bass, bluegill, and wood duck) when ponds, lakes, or streams are absent. Also, assume that this area is large enough to support all the species on the scorecard. Cost or other land management objectives should not be considered.

Contestants will have one (1) hour to complete activity. 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).

Scoring Activity IV

Activity I will be scored individually based on the following:

$$\text{Total Score} = [(184 - \text{total incorrect}) / 184] \times 30$$

All boxes are counted in the scoring. Participants are given points for:

1. Putting an "x" where appropriate. Keep in mind that during a contest, all "x's" marked in the book may not be used, as the correct answers are dependant on the information provided in the filed conditions sheet and the conditions present on site at the time of the contest.
2. Leaving boxes blank where no "x" is indicated. Regardless of the scenario and field conditions, boxes that are not marked in the manual should not be marked during the contest as these practices have been determined to be inappropriate for those species in a given region

Answers will be incorrect if:

1. Boxes that should be marked are left blank
2. Boxes that should not be marked are marked

If a contestant marks a block that is not supposed to be marked, it is counted as an incorrect answer. Likewise, if a contestant does not mark a block that is supposed to be marked, it is counted as an incorrect answer.

No negative scores will be assigned. Minimum individual score on Activity IV is zero.

Activity IV Scorecard

Contestant _____

County _____ JR ____ SR ____

On-Site Wildlife Management Practices 30 Points

Instructions: For each species, rank the areas outlined for their habitat value. Mark an "X" in the box with the appropriate ranking for each species. Consider only the area outlined on the photos in their current condition, not potential of the area.

	1	2	3	4	5	6	7	8
Wildlife Management Practices								
Decrease Harvest								
Increase Harvest								
Establish Native Grasses and Forbs								
Fish or Wildlife Surveys								
Grain: Leave Unharvested								
Harvest Timing of Crops								
Manipulation of Succession								
Nesting Structures								
Plant Food Plots								
Plant Trees								
Plant Shrubs (create hedgerows)								
Ponds: Construction								
Ponds: Deepen Edges								
Ponds: Fertilize								
Ponds: Reduce Turbidity								
Ponds: Repair Spillway								
Ponds: Restock								
Retain Snags and Down Woody Material								
Tillage Management								
Forest Management Techniques								
Water Level Manipulation Techniques								
Water Developments for Wildlife								
Wildlife Damage Management								
Total Incorrect								

Score = [(184 – total incorrect) / 184] x 30

SCORE _____

Glossary

aerate: to supply or expose water with 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 born from flowering parts in contrast to conifers which bear seeds in cones.

browse: to eat

butte: a hill that rises abruptly from the surroundings. The sides are steeply sloped or with cliffs, and the top is nearly flat.

cacti: plants adapted to dry conditions. Often store water in leaves and other parts of the plant. Usually have small leaves and thorns.

canopy cover: the amount of ground covered by the branches, leaves, and stems of plants. Can specify as herbaceous, shrub, tree, or all canopy cover. Expressed as a percentage.

coastal plain: large, nearly level areas of land near ocean shores.

conifer: usually refers to needleleaf trees that bear 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 and/or productivity.

deciduous: plants that annually shed their leaves. Usually trees and shrubs.

decomposition: the natural break-down and decay of dead plant and animal material

defecating: elimination of solid body waste by animals

detrimental: having harmful effects.

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

drought: the lack of normal precipitation for an extended period of time. 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. The surroundings of an organism, including other plants and animals, climate, and location.

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

evergreen: plants that do not lose all their leaves at one time. 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: n. refers to the vegetation eaten by animals; v. to search for food

forb: low growing herbaceous plants, both annuals and perennials. Can be shown with a flower as part of a plant. Sometimes referred to as weeds.

glean: to gather food in a systematic manner with a minimum of 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 cropland, parks, yards, etc., with water through the use of diversions, ditches, and pipes.

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

native: plant and animal species that have not been brought in from other countries; living or growing naturally in a particular region

nutrients: chemicals required for plants and animals to grow and exist.

omnivore - feeding on both animal and plant substance

perennial: a plant that lives for several years. Having a life span of more than two years.

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

plateau: an elevated, relatively level expanse of land. Sometimes called tableland.

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, allow the seed to begin growing (e.g. table mountain pine requires hot fire to open its pine cones)

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

sedge: grass-like plant with long narrow leaves, stems are round. Many species like wet areas.

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

senescent: the growth stage in a plant or plant part (like 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: having 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

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

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

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