The Pennsylvania 4-H
Wildlife Habitat Evaluation Project (WHEP)

Originally Written By:
Edward L. Neilson, Jr. and Delwin E. Benson, Ph.D.

Adapted From the *4-H Wildlife Habitat Evaluation Program National Manual*
For Use in Pennsylvania by:
Sanford S. Smith, Ph.D, Margaret C. Brittingham, Ph.D. & Gary J. San Julian, Ph.D.
School of Forest Resources
Penn State Cooperative Extension, Penn State University

PENNSTATE
1855
College of Agricultural Sciences
Forest Resources Extension

18 U.S.C. 707

Table of Contents

Introduction.....3
A Real Life Project 3
About the Project Handbook.....4
Preparing for Events/Contests.....5
Project Completion Guidelines.....6

Wildlife Management Concepts and Terms.....7
The Eastern Deciduous Forest Region.....19

Wildlife Species.....21
Birds.....21
Mammals.....28
Other Species.....33

Wildlife Management Practices (WMP).....35

2012 PA WHEP Contest Activities and Scoring.....53
Activity I - Identification and Knowledge of Selected Wildlife Species.....53
Activity II - Understanding of Wildlife Habitat.....54
Activity III - On-Site Recommendation of Wildlife Habitat Management Practices (WMPs).....54
Activity III Scorecard.....55
Activity IV - Written Wildlife Management Plan - Team Activity.....56
Activity IV - Written Wildlife Management Plan –Judges' Shoring Sheet.....58

Introduction

The Pennsylvania 4-H Wildlife Habitat Evaluation Project is a project designed to teach youth about the fundamentals of wildlife management. Although it also includes a state-level competitive judging event (held in April), its primary function is educational. Wildlife biology and natural resources management are learned through participation in this project. Additional benefits come from the development of leadership capabilities, meeting other youth interested in wildlife, and interacting with wildlife professionals from across the state. For older 4-H'ers (14 years old as of January 1 of the current year) there are also opportunities to travel and compete at the national contest held in a different part of the United States each year (usually at the end of July).

In this project, youth learn that management for wildlife means management of wildlife habitat and providing for the needs of wildlife. While the information found in this handbook is provided for: 1) learning wildlife habitat management concepts, and 2) preparing participants for the state-level judging event, it is also the basis of the project itself. 4-H'ers should have a familiarity with wildlife before taking this project. The *Wildlife Is All Around Us* and *The Wildlife Ecologist* 4-H Books provide an excellent background.

The project addresses wildlife concepts and applies them to the four main activities below:

Activity I: Identification and Knowledge of Selected Wildlife Species
Activity II: Understanding of Wildlife Habitat
Activity III: On-Site Recommendation of Wildlife Habitat Management Practices
Activity IV: Written Wildlife Management Plan - Team Activity

A Real Life Project ...

The information in the handbook and the activities of the contest are arranged in the order used by wildlife managers when deciding how to manage areas for specific wildlife species. 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, Wildlife Species, and Foods sections of this handbook can help participants learn the life requirements of some wildlife.

Next, the manager must be able to inventory and evaluate the present condition of the habitat and explain the condition to landowners and other interested parties. The aerial photography section is designed to develop 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. The on-site management recommendation activity gives the participant some experience with this decision making effort.

Finally, so that others can clearly understand the proposed management decision, the wildlife manager must explain the decisions on paper and locate them on aerial photos or some other type of map. The management plan activities encourage participants to explain and illustrate their decisions so that others can understand and carry out the recommendations.

About the Project Handbook

The handbook is divided into the following major sections:

1. *Wildlife Habitat Concepts* introduces the 4-H'er to basic wildlife management principles. These concepts are the basis for the remainder of the handbook.

2. *Eastern Deciduous Forest* section gives a brief description of the main habitat type found in the state and explains typical stages of plant succession, lists wildlife species to be used in local and state events, and summarizes habitat management practices that are used for these species in Pennsylvania.

3. *Wildlife Species* provides information about habitat requirements and practices used in managing habitat for the various species.

4. *Wildlife Management Practices* explains the management practices discussed in the Wildlife Species section.

5. *WHEP Contest Activities and Scoring* describes the four activities participants undertake at Pennsylvania's state contest.

Preparing for Events/Contests

Participants should first read and understand the *Concepts* section of the handbook. Leaders should explain the concepts to 4-H'ers and when needed, provide local examples to clarify any misunderstandings. This section is important because many of the activities require understanding of the concepts.

Once the concepts are understood, the leader should review the appropriate *Eastern Deciduous Forest* information with the participants. Participants and leaders should review plant succession processes, special habitats such as riparian habitat, 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 learned knowledge. The use of field guides, wildlife books and the Internet to study pictures of the selected species in their native habitat is strongly encouraged as well.

Following the above exercises, leaders can introduce participants to the various activities found in the handbook. Conducting practice sessions at outdoor sites will be helpful. Start with only two or three wildlife species, adding more as participants become more knowledgeable. Explain to participants what habitat features are important to wildlife. Identify the habitat requirements that are available for the animals selected. Then ask participants to identify what wildlife needs might be missing. Review and practice writing management plans.

Videos, textbooks and other teaching materials may be used to further learning. The PA Game Commission and Cooperative Extension Offices all have useful information. Local events may use different wildlife species and activities than those selected in the handbook**. However, in the state event, all activities and only the wildlife species and wildlife management practices listed in this handbook will be used.**

The state event will be held on Saturday, April 20 (2013) at Rock Springs (Ag Progress Days Site) near State College, PA. It will run from 9:45 AM to 3 PM, please pre-register with your County Extension Office in advance.

Project Completion Guidelines

To “complete” this project a 4-H’er must study, prepare, compete at the state-level contest (event), and then develop a poster about what was learned during the project experience. This poster might include drawings, photos, wildlife items, and possibly even certificates of accomplishment from the state contest. Everything should be labeled clearly and neatly. There should be a title on the poster and the poster should depict one or several lessons learned through taking the project. Check with your County 4-H Agent for any poster size requirements that your county may have.

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 theback of this handbook.

Concepts
Habitat Requirements
Featured Species
Species Richness
Plant Succession and Its Effect on Wildlife
Vertical Structure (Layering)
Arrangement and Interspersion
Edges and Contrast
Area Sensitive Species
Migration and Home Range
Carrying Capacity
Pond Dynamics and Balance
Wildlife Damage Management
Food Webs

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 (the area required to accommodate necessary movements of an animal – for example: breeding range, brood range, fall feeding area), and cover (shelter or protection from predators, severe weather, 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. One is to provide the best habitat possible for a particular featured wildlife species. The other, which is explained later in this handbook under the concept of Species Richness, is to provide habitat for as many different wildlife species as possible in an area.

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 the population (limiting factors). For instance, if a species requires trees for cover with water nearby and the habitat you are evaluating has plenty of trees but no water, a management practice that supplies water will improve the habitat more effectively than planting trees. When determining which management practices to apply, remember that management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage habitat for any one species or group of species that require similar habitats without influencing other species in some manner. For example, if you plan a clear-cut in a deciduous forest area to benefit ruffed grouse, you may also benefit 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. One goal in wildlife habitat management may be to provide habitat for as many species and as many individuals within a species as possible, as contrasted to managing for a featured species as explained in Concept 2.

Lands that are high in species richness usually have many 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 "soft edges" in 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 (mature woodland - see Concept 4). 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 shapes (see Wildlife Management Practice 6 and 7). 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.

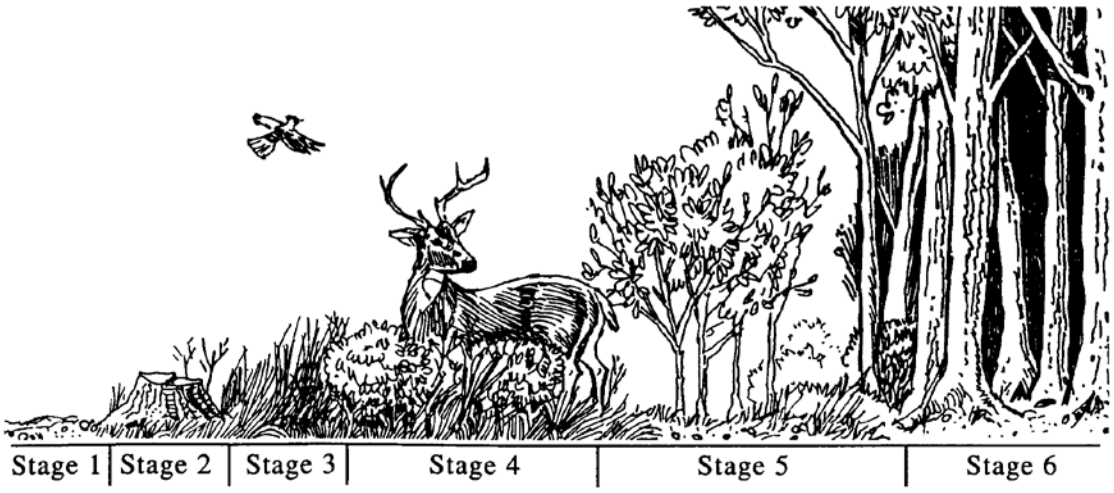
Concept 4

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. Note that 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 this handbook. A description of the typical successional stages occurring in relation to water can be found in the Wetland Region description. 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.

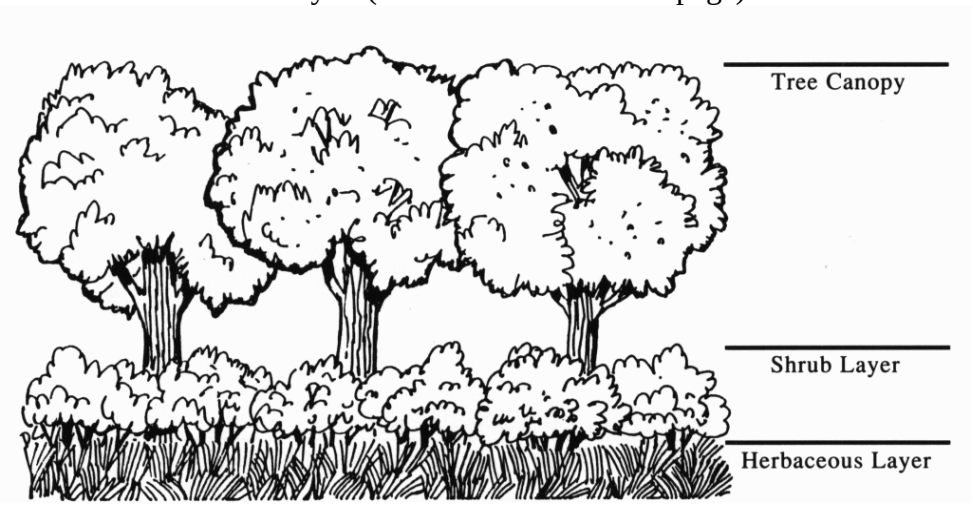
However, succession is more frequently altered by humans through a variety of habitat management practices: plowing (agriculture), prescribed burning, cutting of forests, grazing, and clearing shrubby areas, all of which may mimic natural disturbances in many cases. Nature never gives up. Even abandoned 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 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). 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. (see illustration on next page)



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 juxiposition. 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 a wildlife species, the required successional stages must be close to each other (within the species “home range”) or linked by corridors to 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. A way to measure interspersion is explained in the Activities section. The size and shape of different successional stages also influences the amount of edge habitat created and the stage’s usefulness for wildlife (see stage 7).

Concept 7

Edges and Contrast

The boundary where two or more types of vegetation or successional stages meet is called "edge." Sometimes there is an abrupt change where one type of vegetation stops and another begins (see Figure 1 below), or the change can be less distinct, with a gradual transition from one stage to another (see Figure 2 below). In places where a gradual change occurs, the edge is wide and has characteristics of multiple successional stages or vegetation types. Where abrupt changes occur, the edge is narrow. Edges attract many different wildlife species because the variety of food, cover, and other habitat requirements associated with each stage are arranged close together.

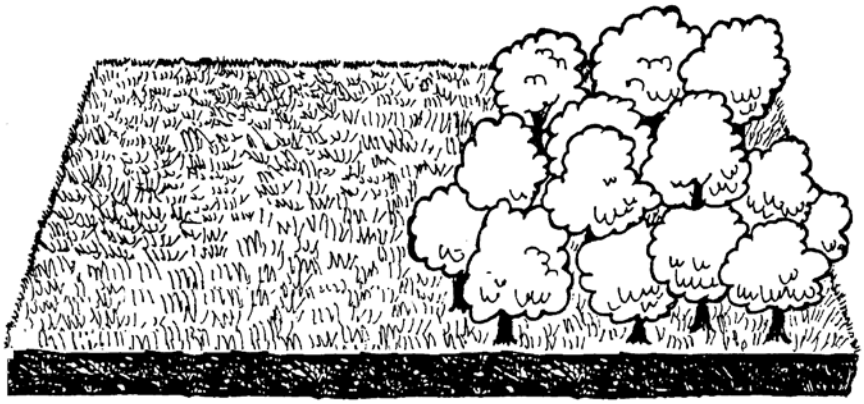


Figure 1. Abrupt edge with high contrast

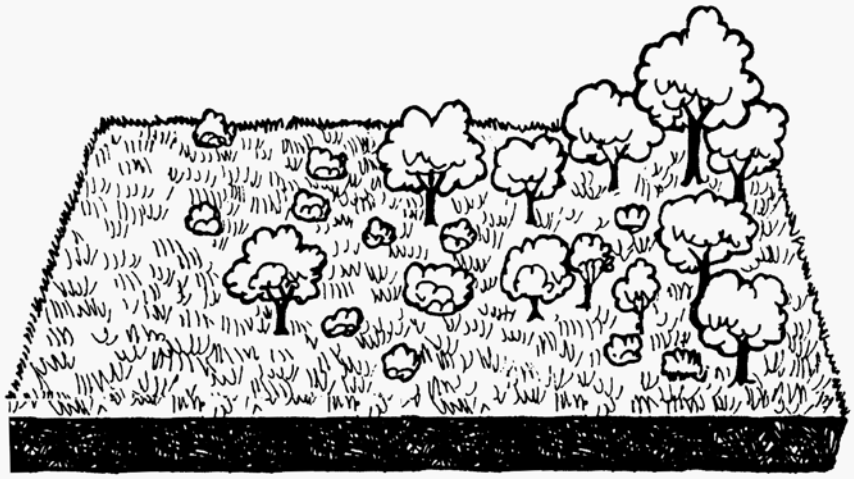


Figure 2. Gradual edge with low contrast

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. 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 interspersion 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

Edge is not beneficial for all wildlife. 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. 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.

Fragmentation is the disruption of areas of large, continuous habitat types either by man-made or natural processes.

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

Biological 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 biological 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.

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.

Stream Habitats
A stream can be defined as a body of water moving in a more or less definite pattern and following the course of least resistance to a lower elevation. Because water volume and rate of land erosion fluctuate along the course of the stream, the bottom and shoreline are relatively unstable. As the water moves, it carries materials such as gravel, sediment, or debris that have been picked up and redistributed them along the stream course. When water flow is restricted to a narrow area, the stream can create more erosion resulting in deeper areas or pools. As the stream passes through wider passages, the water flow slows and material is deposited to form areas known as riffles.

These pools and riffles are important habitat types for the various fish species that inhabit streams. Pools provide areas for fish to feed and find refuge from fast moving water that requires more energy for swimming. Riffles are usually preferred habitat for spawning.

It is important that fish have the ability to move freely between these various habitats in the stream. While some species of fish can complete their life cycle within a small portion of the stream, other species such a salmon must migrate to the ocean and return to the stream to spawn.

Concept 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 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 to deter damage-causing wildlife or to attract predators that prey on damage-causing wildlife, or changing human behaviors that attract damage-causing wildlife. Additional wildlife damage techniques that can be used fall into either the lethal or non-lethal category, depending on your point of view. These techniques are used to control reproduction in wildlife populations, and include sterilization, birth control, and abortion-causing agents. Some reproductive control methods can only be used for research purposes, and all are relatively expensive.

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.

Regardless of what management practice is used to reduce or eliminate wildlife damage or health hazards, there are some general guidelines that can increase the success of a wildlife damage management program. Be absolutely positive that you have correctly identified the type of wildlife causing the damage. An integrated wildlife damage management program is strongly recommended, meaning the combination of 2 or more wildlife damage management practices. Wildlife are very much creatures of habit, and will get used to a foreign object in their area the longer that object is left there (this is called habituation). The more diverse and varied the management techniques used, the less chance for habituation to occur and the more successful the wildlife damage management program. Another factor that will increase the success of a wildlife damage management program and combat habituation is randomness. The more random the application of the wildlife management techniques, the more the successful one will be in reducing or eliminating damage because the wildlife will never be sure when it is safe to be in the area. Not all wildlife damage management practices are equally effective or applicable in all areas; many times it is necessary to develop a wildlife damage management program specific to the area where the problem is occurring. And finally, make sure you know all of the local, state, and sometimes federal laws that regulate the wildlife you are trying to manage, especially when using lethal management techniques.

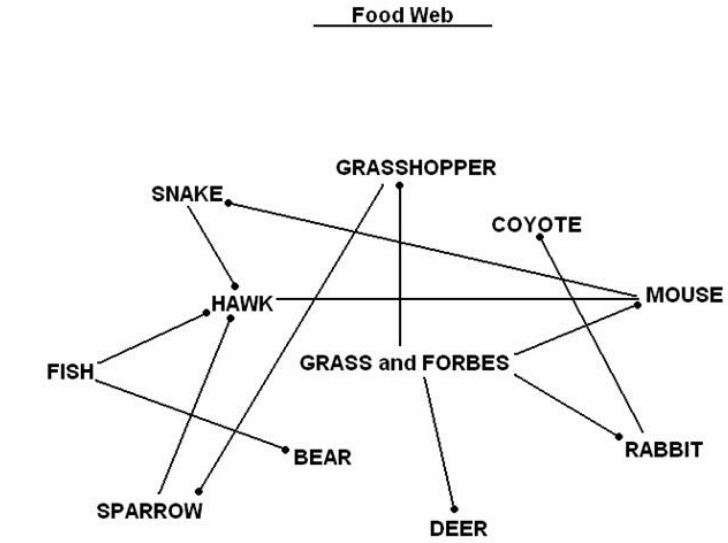
Wildlife damage management may be recommended in addition to the practice of increasing bag/creel limits if individual animals are causing damage or health hazards.

• 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.

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.

The Eastern Deciduous Forest Region

Physical Description:
Most of the terrain is rolling except for the Appalachian Mountains which are steep. The average annual precipitation ranges from 35 to 60 inches and is well distributed throughout the year. Summers are hot and dry. Winters are cold.

Dominant Vegetation:
The final stage of succession is dominated by tall broadleaf trees. Depending on the geographic location, trees such as oaks, beech, basswood, hickory, and maple, can be indicators of climax vegetation.

There are many lower canopy trees and deciduous shrubs that are important including American hornbeam, hop hornbeam, sassafras, eastern redbud, flowering dogwood, and striped maple.

Common shrubs are spicebush, arrow-wood, black huckleberry, blueberry, hawthorn, witch-hazel, and viburnums. A wide variety of forbs are also found on the forest floor. Grasses and annual forbs are mostly limited to areas recently disturbed.

Farming:
Large areas of this region have been cleared of the native vegetation for the production of crops and livestock forage. In some areas, only steep slopes, frequent floods, or water associated with rivers and swamps have prevented the total clearing of forests. Depending on how croplands are managed, some species of wildlife benefit from farming, especially if trees and shrubs are nearby.

Plant Succession Stages:
State 1 — bare ground; Stage 2 — annual forbs and grasses; Stage 3 — perennial forbs and grasses; Stage 4 — shrubs; State 5 — young woodland; Stage 6 — woodland.

Species Recommended for Study in The Pennsylvania Wildlife Habitat Evaluation Project:

Birds
American Kestrel
Eastern Bluebird
Eastern Towhee
Hairy Woodpecker
Mourning Dove
Ovenbird
Red-tailed Hawk
Ruffed Grouse
Turkey
Wood Duck

Mammals
Beaver
Bobcat
Eastern Cottontail
Eastern Gray Squirrel
Muskrat
White-tailed Deer

Others
Bluegill
Largemouth bass

PA & Eastern Deciduous Forest WMP Grid	American Kestrel	Eastern Bluebird	Eastern Towhee	Hairy Woodpecker	Mourning Dove	Ovenbird	Red tailed Hawk	Ruffed Grouse	Turkey (Wild)	Wood Duck	Beaver	Bobcat	Eastern Cottontail	Eastern Gray Squirrel	Muskrat	White-tailed Deer	Largemouth Bass/Bluegil
1. Brush chopping	X	X	X		X				X				X		X	X	
2. Brush piles												X	X				
3. Chaining, roller beating			X														
4. Controlled burning	X	X	X		X		X	X	X				X		X	X	
5. Corridors				X			X		X			X	X	X		X	
6. Disking					X				X								
7. Grain, leave unharvested					X				X	X				X		X	
8. Harvest less					X			X	X	X	X		X	X	X	X	X
9. Harvest more					X			X	X	X	X		X	X	X	X	X
10. Lime ponds and fields					X				X				X			X	X
11. Livestock grazing management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12. Nesting boxes, strucs., platforms	X	X			X		X			X				X			
13. Plant food plots					X				X				X			X	
14. Plant grasses and forbs	X								X				X			X	
15. Plant mast trees								X	X	X				X		X	
16. Plant trees or shrubs	X	X	X	X		X	X		X	X	X	X	X	X		X	
17. Ponds, lakes, artificial reefs																	X
18. Ponds, clear muddy water																	X
19. Pond construction					X					X					X		X
20. Small dikes for temp. flooding										X					X		
21. Ponds, deepen edges																	X
22. Ponds, determine balance																	X
23. Ponds, diversion ditches																	X
24. Ponds, fertilize																	X
25. Ponds, remove trees near dike					X					X					X		X
26. Ponds, repair spillway					X					X					X		X
27. Ponds, reseed watershed/filterstp.																	X
28. Ponds, restock																	X
29. Ponds, stop leaks					X					X					X		X
30. Ponds/wetlands, shallow water										X		X			X		
31. Snags, dead, down wood	X	X		X			X	X		X							
32. Tillage, eliminate in fall					X				X	X				X			
33. Timber harvest, clear-cut	X	X	X		X		X	X	X			X	X			X	
34. Timber harvest, selection cut						X		X	X	X				X		X	
35. Water control structures										X					X		X
36.Wildlife damage management									X			X				X	

Wildlife Species

Birds

American Kestrel

General Habitat Preference:
Stage 2 and 3 of plant succession for feeding, and stages 4, 5, and 6 for nesting. Large open areas where adequate nesting sites are available.

Habitat Requirements:
Food: Primarily insects and small mammals associated with open areas.

- Brush chop, chain, or roller beat small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 4 (shrub) vegetation.
- Control burn small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 4 (shrub) vegetation.
- Clear-cut small areas in large expanses of stage 5 and 6 woodlands.
- Livestock grazing management should leave enough herbaceous canopy to support insects and small rodents.
- Plant grasses and legumes in Stage 1-2

Cover: Kestrels nest in tree cavities and other sites including holes in cliffs, canyon walls, and artificial nesting boxes.

- Maintain areas of stage 5 and 6 vegetation interspersed with stage 2 and 3 vegetation.
- Plant trees in large open areas (irrigate if necessary) on idle lands.
- Provide kestrel nesting boxes in areas lacking adequate nesting cavities. Boxes can be placed on fence posts in open areas.
- Manage livestock grazing to maintain trees in riparian areas.

Water: Obtain necessary water from diet, do not need water for drinking.

Eastern Bluebird

General Habitat Preference:
Stage 2 and 3 of plant succession interspersed with stages 5 and 6 vegetation.

Habitat Requirements:
Food: Insects and spiders make up a large portion of the diet. A limited amount of fruit is also eaten. Bluebirds usually forage in open areas.

- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 woodland.
- Brush chop, chain, or roller beat, small areas (40 acres maximum, 10 top 20 acres preferred) in large expanses of stage 4 vegetation.
- Control burn small areas in large expanses of stage 4 and 5 vegetation.

Cover: Nesting sites are in natural cavities and old woodpecker holes.

- Leave 3 to 4 standing dead or nearly dead large trees per acre during timber harvest operations.
- Place nest boxes 4 to 5 feet high in or adjacent to open areas. Boxes should be spaced more than 200 feet apart.

Water: Obtain necessary water from diet, but will use other water sources when available.

Eastern Towhee

General Habitat Preference:
Stage 4 of plant succession. Associated with a wide variety of shrubs.

Habitat Requirements:
Food: Forage on the ground, eating invertebrates such as ants, beetles, caterpillars, and grasshoppers. About half of the diet is made up of seeds and green foliage of forbs, grasses, and shrubs.

- Livestock grazing management should leave adequate herbaceous vegetation needed for food.

Cover: Use shrubs for hiding and protective cover. Nest on ground, usually under shrubs.

- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 woodland.
- Controlled (prescribed) burning of small areas (40 acres maximum, 10 to 20 acres preferred) in old decadent stands of stage 4 vegetation will promote resprouting of shrubs.
- Chaining, roller beating or brush chopping small areas (40 acres maximum, 10 to 20 acres preferred) in old decadent stands of stage 4 vegetation will also promote resprouting of shrubs.
- Plant shrubs in large areas of stage 2 and 3 vegetation.

Water: Obtain necessary water from diet.

Hairy Woodpecker

General Habitat Preference:

Stage 4, 5, and 6 of plant succession are best habitat. Will use stage 3 of plant succession if areas with mature trees are nearby. Also use wooded urban and riparian areas.

Habitat Requirements:
Food: Majority of food is animal matter 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 limited.

Cover: Holes are excavated in mature and dying trees and snags for nesting.

- Maintain areas with large mature and dying trees, especially in open areas. Within wooded areas maintain at least 1 large snag per acre.
- Plant softwood trees.
- Manage livestock grazing in riparian areas to maintain trees. Grazing when woody vegetation is not growing fast (fall and winter) usually does less damage to woody vegetation than at other times of year.

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

Mourning Dove

General Habitat Preference:
Stages 2 and 3 of plant succession with some shrubs and trees nearby. Often use agriculture areas for feeding.

Habitat Requirements:
Food: Waste grain from cropland and variety of grass and forb seeds.

- Do not till in fall after harvest of small grain crops. Leave waste grain available.
- Leave some areas of small grains (wheat, barley, millet, milo, or oats) unharvested.
- Plant annual food plots in areas lacking grain.
- Brush chop, chain, or roller beat small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 4 vegetation.
- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large areas of stage 5 and 6 woodland.
- Control burn small areas (40 acres maximum, 10 to 20 acres preferred) in large areas of stage 4 and 5 of plant succession.
- Livestock grazing can be used to keep some areas in stage 2 and 3 vegetation.

Cover: Prefer tall shrubs and trees for nesting and loafing. Nest is made of twigs placed on branches of shrub or tree. Nests are also placed on ground.

- Plant shrubs and trees 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 any other idle land area.
- Mourning doves often construct loose, flimsy nests. High winds and rainstorms often destroy many of them. To provide secure nesting sites, wire cone nesting structures can be placed where tree limbs fork 6 to 15 feet above the ground. This practice is most useful in regions where high winds and large open areas are common.

Water: Require water daily. Prefer shorelines and banks without vegetation.

- Where water is limited or absent, development of water sources is desirable.

Developments such as catchment ponds, guzzlers, and spring developments

Ovenbird

General Habitat Preference:
Associated with stages 5 and 6 of plant succession. Lives on or very near the ground.

Habitat Requirements:

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

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

Cover: Nest on the ground. Construct a unique nest out of grasses and weed stems that is arched over in shape of a Dutch oven. Nest is usually well hidden in herbaceous vegetation on the forest floor. The herbaceous vegetation is also used for hiding cover.

- Livestock grazing should be managed so that adequate herbaceous vegetation is maintained on the forest floor.
- Selective-cut forest management in large expanses of stage 6 woodland could increase cover used by this species.
- Plant trees and shrubs in large areas of stages 3 and 4 of plant succession.

Water: Usually obtain necessary water from diet, but will use other water sources when available.

Red-tailed Hawk

General Habitat Preference:

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

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

- Manage livestock grazing to maintain some areas with an adequate herbaceous ground layer for small mammals to live in.
- Control (prescribe) burn chop, chain, or roller beat small areas (40 acres maximum) in large expanses of stage 4 vegetation. Burning and brush chopping can also be used to rejuvenate stage 3 vegetation and improve small mammal habitat.
- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 4, 5, and 6 woodlands.
- Provide perch poles or plant trees in areas where trees are absent.

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

- Plant trees where trees are not present (irrigate if necessary).
- Maintain large mature trees in areas where trees are not plentiful.
- Provide nesting platforms.

Water: Obtain necessary water from diet.

Ruffed Grouse

General Habitat Preference:
Stage 4, 5, and 6 of plant succession. Optimum habitat includes all three stages interspersed in close proximity to each other.

Habitat Requirements:
Food: Primarily twigs, buds, and flowers of shrubs and trees. Buds of aspen or other deciduous trees are needed for winter survival. Young grouse eat insects.

- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 6 woodland. The benefits of this management practice will not be seen until stage 4 and 5 vegetation becomes established on cut area.
- Controlled (prescribed) burns can be used to revert vegetative succession from stage 6 to stages 4 and 5.
- Selective-cut forest management in large expanses of stage 6 woodland.
- Livestock grazing should be managed so that young deciduous trees and shrubs are maintained in the area.

Cover: Winter cover is considered most critical. Grouse use shrubs, deciduous trees, and conifer trees for cover. In cold weather they use low branches of conifer trees. However, deciduous trees provide the best cover.

Cover can be improved with practices listed under Food.

Water: Obtain necessary water from diet.

Wild Turkey

General Habitat Preference:
One half to 3/4 of range in stages 5 and 6 of plant succession interspersed with areas in stages 3 and 4 of plant succession.

Habitat Requirements:
Food: Forage mostly on the ground for herbaceous plant seeds, nuts, acorns, and insects. Will use waste grain from croplands if adjacent to woodlands.

- Brush chop or disk small areas to maintain some stage 3 to 4 vegetation.
- Control (prescribed) burn every 3 to 5 years in stage 4 to 5 vegetation in eastern and southern United States.
- Clear-cut small areas (40 acres maximum, 10 to 20 acres preferred) in large expanses of stage 5 and 6 woodland.
- Selective-cut forests in large areas of stage 6 woodland.
- Plant several perennial food plots and small (1 to 10 acre) fields to grasses and legumes in large expanses of stages 4, 5, or 6 vegetation, and in any other areas where food is limited.
- Plant mast trees.
- Eliminate fall tillage of grain crops, especially adjacent to woodlands.
- Leave small areas of grain crops unharvested.
- Plant annual food plots near woodlands.
- Livestock grazing management should leave some forbs and grasses available for food. This is especially important in riparian areas and may include the development of livestock watering facilities on adjacent uplands to discourage congregation in and overuse of these areas.

Cover: Nest is shallow depression on ground lined with leaves and grass that is well concealed in thick shrubs or woodlands. Usually nest within 1/4 mile of available water. Roost in trees or tall shrubs at night.

- In some areas will use artificial roost structures.
- Maintain a significant component of vegetation in stages 5 and 6 of succession, especially near streams.
- Plant trees and shrubs where cover is sparse.

- Livestock grazing management should leave thick herbaceous cover for nesting. Spring grazing can be detrimental to nesting habitat, especially in riparian areas.

Water: Require water frequently. Usually will not travel over 1/4 to 1/2 mile for water.
- Where water is limited or absent, development of water sources is desirable.

Wood Duck

General Habitat Preference:
Stage 5 woodlands flooded with water, and open water adjacent to stage 5 and 6 woodlands. Or, stage 3 and 4 wetlands dominated by trees adjacent to stage 2 wetlands.

Habitat Requirements:
Food: Fruits and nuts of woody plants, some grain, seeds of water lily and other aquatic plants, and some insects. Insects are used by young wood ducks.

- During late fall and winter, temporarily flood stage 5 deciduous woodland with mast trees, such as oak, and grain crops. Natural flooding may occur, or small dikes and water control structures may be used.
- Leave small areas of cropland that are near wetlands and open water unharvested.
- Plant mast trees adjacent to wetlands or in areas that can be temporarily flooded.
- Selective cutting of woodlands that can be flooded is desirable to improve mast production.
- Construct ponds and/or wetlands and provide shallow water areas where aquatic emergent vegetation can grow.

Cover: Nest in cavities in trees of flooded woodlands or adjacent to water. Use stage 2 and 3 wetlands with an abundance of aquatic vegetation to raise young.

- Nest boxes can be provided if adequate nest sites are limited.
- Plant trees for future nesting sites.
- Construct ponds and wetlands. Provide shallow water areas where aquatic emergent vegetation can grow.
- Control water level to provide open shallow water areas (stage 2 wetlands) adjacent to areas dominated by emergent aquatic (stage 3 wetlands) vegetation.

Water: Require water as described above.

Mammals

Beaver

General Habitat Preference:
Riparian areas in stages 4 and 5 of plant succession, and wetlands that have permanent water with a variety of shrubs and trees adjacent to the water.

In some areas beaver are a nuisance. They can cut down trees that people want to save, and they can dam up ditches and streams in undesirable places.

Habitat Requirements:
Food: Primarily the bark and wood of shrubs and trees, also some forbs and grasses. Store shrub and tree cuttings in caches (piles of branches) for use during the winter.

- Plant willows, other shrubs and deciduous trees near water that can be used by beaver. If beaver are already in the area, new plantings will need protection or the beaver temporarily removed while plantings become established.
- Livestock grazing should be managed so that shrubs and trees are maintained adjacent to waters that may be used by beavers. This may include developing livestock watering facilities in upland areas to discourage congregation in and overuse of riparian areas.
- Control beaver populations. Harvest more or less. Beaver can become too numerous and eat all available shrubs and trees. To prevent this from happening it may be necessary to periodically remove some beaver.

Cover: Beaver construct lodges from sticks and mud or dig burrows in banks of streams and rivers. Beaver prefer slow-moving or still water with a constant water level. Will build dams from tree branches, shrubs, and mud to form ponds which stabilize water levels, slow water movement and provide shelter beneath the ice in winter.

Protect and maintain beaver dams. When beavers construct dams in places that cause problems for people, removal of the beaver is usually the best solution. If the dam is destroyed and the beaver remain they will usually build the dam again.

- Provide dam building material such as precut logs and branches in areas where such materials are scarce.

Water: Water requirements are discussed under cover requirements. Should be of sufficient depth (5 feet) to allow free movement under the ice in winter.

Bobcat/Lynx

General Habitat Preferences:

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 forests 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 farmlands (stage 2 and 3), brushy areas (stage 4), heavily wooded uplands and bottomland forests (stage 5 and 6). Both the bobcat and lynx are nocturnal and are seldom active in the daytime. The bobcat is classified as a furbearer game species in most states.

Habitat Requirements:

Food: Rodents (squirrels, chipmunks, voles, rats and mice), domestic poultry, rabbits, opossum, raccoons, skunks, birds, and snakes are prey of the bobcat. Lynx are dependent on the varying hare as a primary food source. Bobcats are capable of killing a deer, but the bobcat is not a significant cause of deer mortality. Deer, in the form of carrion, is eaten mainly during autumn and winter coinciding with deer hunting season. Bobcats have caused excessive mortality in pronghorn fawns in western states. The cottontail rabbit appears to be the principal prey of the bobcat throughout its range.

- Protect poultry from predation by bobcats by enclosing poultry in cages or predator-proof exclosures.
- Timber harvest using small clear-cuts can increase prey abundance.
- Control bobcat populations. Increase or decrease bag limits. Bobcat can become too numerous and attack livestock, pets, or game animals. To prevent this from happening, it may be necessary to periodically remove some bobcat. Bobcat pelts also have value as fur.

Cover: The importance to bobcats of rock piles or broken rocky ledges for dens is well known.

- The bobcat also uses brush piles and cavity trees and hollow logs as rest areas and birthing dens.
- Manage livestock grazing so that adequate cover for prey is retained.
- Plant shrubs where cover is sparse.

Water: Although water requirements are not well documented, they are known to use free standing water. Much of their water requirements may be met in their diet.

Eastern Cottontail

General Habitat Preference:
Stage 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. Also use parks, golf courses, and stream corridors in urban areas.

Habitat Requirements:
Food: A variety of forbs and grasses are eaten from spring through fall. In winter often eat bark of shrubs and trees.

- Plant 1/8 to 1/4 acre annual food crops (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 crops (grass and clover) in areas with too little grassland. Again, 1 plot per 15 acres maximum.
- Brush chopping, chaining, roller beating and controlled (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.
- Clear-cut small areas (10 acres maximum) in large expanses of stage 5 and 6 woodlands.
- Livestock grazing management should avoid use of food and cover plots, and leave ample amounts of herbaceous vegetation in other areas used by cottontails for food and cover.

Cover: Use thick shrub or herbaceous vegetation for hiding and resting cover.

- 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.
- Provide brush piles where additional cover is needed.

Water: Obtain necessary water from diet.

Eastern Gray Squirrel

General Habitat Preference:
Deciduous woodland in stages 5 and 6 of plant succession.

Habitat Requirements:
Food: Spend much time foraging on the ground. Feed on a variety of nuts, grains, acorns, seeds, mushrooms, and buds.

- Leave some grain unharvested (corn preferred) and/or eliminate fall tillage of croplands adjacent to stage 5 and 6 vegetation.
- Selective-cut timber management in large expanses of stage 5 and 6 woodlands. Leave 3 to 4 den trees and several other mature trees per acre.
- Plant mast-producing trees along fence rows, adjacent to streams, or in other idle land areas. When possible, locate plantings adjacent to existing croplands.
- Livestock grazing should be managed to maintain adequate forage on the forest floor. Maintain deciduous tree corridors along streams.

Cover: Nest in cavities in trees or build nests out of twigs and leaves. Nest is usually placed in the crotch of a tree over 30 feet above the ground. In areas where den sites are scarce, will use nest boxes.

- Need 3 to 4 den trees or suitable nest boxes per acre. Nest boxes are most beneficial in stage 5 woodlands.

Water: In warm seasons require water daily.

Muskrat

General Habitat Preference:
Stage 2 and 3 wetlands interspersed (mixed) together.

Habitat Requirements:
Food: Eat the roots, tubers, and green vegetation of emergent aquatic vegetation such as cattails and bulrushes.

- 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.
- Controlled (prescribed) burns and brush chopping can be used to rejuvenate old, decadent wetland vegetation.
- Control water levels with water control structures. Provide areas in wetland with water less than 2 feet deep where cattails and bulrushes can grow. Up to 80 percent of the wetland should be able to grow such vegetation.
- Ponds and wetlands can be constructed with shallow water areas where emergent aquatic vegetation can grow.
- Provide shallow water areas in existing ponds and wetlands where emergent vegetation can grow..
- Small dikes can be used to temporarily flood areas to promote the growth of cattails and bulrushes.

Cover: Build lodges out of bulrushes and cattails which are usually placed in dense growths of cattails and bulrushes. Rest on open shorelines, floating logs, or on tops of lodges. Also make dens in banks.

Practices under Food can provide areas for lodges.

Floating logs and rafts can be placed in open water areas. They should be anchored to the bottom.

Water: Need water of sufficient depth (4 feet) or flowing water that allows free movement under ice during the winter. During warm seasons, prefer water 1 to 2 feet deep, with around 20 percent of the wetland comprised of open water free of emergent aquatic vegetation. Again, controlling the water level when possible can be a beneficial management practice.

White-tailed Deer

General Habitat Preference:
Stage 3, 4, and 5 of plant succession all interspersed together.

Habitat Requirements:
Food: A variety of shrubs, forbs, grasses, and waste grain. Acorns and nuts are favorite foods. In the northern parts of its range, conifer trees are used in the winter.

- 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.
- Plant several 1 acre perennial food plots of grass and clover in large expanses of stage 5 and 6 woodland.
- Plant annual food plots to grain.
- Plant mast trees.
- Leave small areas of cropland adjacent to woodlands unharvested.
- Eliminate fall tillage of grain crop residue adjacent to woodlands.
- Plant fields to grasses and legumes in large expanses of stage 4, 5, and 6 vegetation.
- Controlled burning at three-year intervals in stage 5 pine woodlands or periodically in stage 3 and 4 vegetation.
- Brush chop 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.
- Manage livestock grazing 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. May include the development of livestock watering facilities in upland areas to discourage congregation of livestock and overuse in riparian areas.

Cover: Use woodlands and tall shrubs for hiding and travel cover. Also use tall emergent aquatic vegetation for cover in the Great Plains Grassland Region.

- Construct new wetlands and/or develop shallow water areas in existing ponds and wetlands where large areas of tall emergent aquatic vegetation can grow.
- Control water levels with water control structures, or use small dikes to temporarily flood areas to encourage the growth of tall emergent aquatic vegetation.
- Plant trees and shrubs in ravines, along field borders, and other idle land areas.

Water: Drink water when it is available, but can go for long periods without it.

Other Species

Largemouth Bass / Bluegill

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

Habitat Requirements:
Food: Young bass eat insects in their aquatic stages and other invertebrates that depend on phytoplankton for food. Adult bass eat other small fish such as bluegill and a variety of minnows, tadpoles, and crayfish. Bluegill eat a variety of insects, tadpoles, small minnows, and crayfish.

- Construct ponds.

Maintain a green color in pond water (green enough that a white disk cannot be seen 15 inches deep). The color is caused by phytoplankton (microscopic plant life).

- In clear water, fertilizer may be added to increase phytoplankton.
- Determine pond balance using a minnow seine.
- Harvest more or fewer bluegill depending on seine sample results.
- Harvest more or fewer bass.
- Remove existing fish and restock pond.

A bass to bluegill ratio of 3 to 6 pounds of bluegill to one pound of bass is considered a good fish population balance.

- Prevent or clear up muddy water (brown or gray color). Muddy water blocks sunlight needed in producing phytoplankton.
- Manage livestock grazing to maintain thick herbaceous vegetation surrounding pond and in watershed that drains into pond. Develop livestock watering facilities away from pond or allow access to only a small area of pond.
- Reseed watershed.

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

- 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 (sunk with weight) can be used for additional cover. These practices are recommended for ponds larger than 10 surface acres in size.

Aquatic vegetation can become too abundant (over 30 percent of water surface covered).

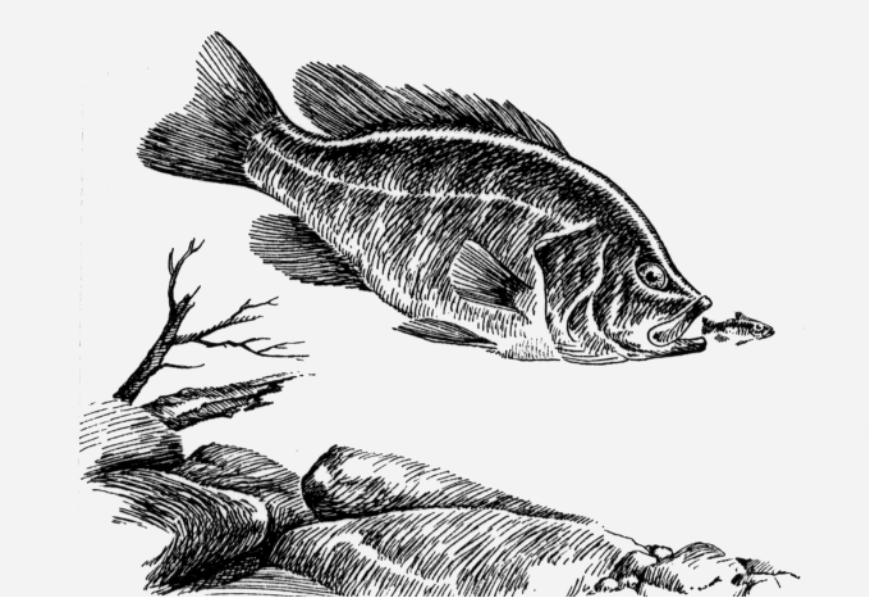
- Deepening the pond edges to 2 feet deep or more discourages aquatic vegetation growth.

Water: Require an adequate quantity and quality of water.

- Stop pond leaks if and when they occur.
- Repair spillway if needed.
- Diversion ditches can be used to ensure an adequate water supply.
- Remove trees from dike or dam portion of pond.

Fish need water of a certain quality. Some of the basic requirements are: dissolved oxygen - minimum of 5 parts per million (ppm); carbon dioxide - should not exceed 20 ppm; pH should range between 7.0 and 9.0; and water temperature should reach at least 70 degrees Fahrenheit sometime during the summer (1 foot below surface in shade).

- Test the water to see if it meets requirements.
- Aerate pond to increase oxygen and decrease carbon dioxide
- Lime ponds to increase pH if below 7.0.



Wildlife Management Practices (WMP)

In this section, various practices 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.

Identify and learn the practices that are recommended for the species listed in the Pennsylvania Habitat No. 1 & 2 sections. Many of these practices are commonly used in certain regions and not in others. Study only the appropriate practices that are listed on the chart found in the particular description of the habitat that you are using. It is always wise to learn as much as possible about any practice before implementing it. Additional reading, research, and guidance from wildlife management professionals is suggested.

Some of the practices may seem contradictory. For example, Practice 25 - Ponds, Deepen Edges discourages the growth of emergent aquatic vegetation, while Practices 34 - Ponds/Wetlands Provide Shallow Water encourages growth. Landowner objectives will determine which practices you recommend.

At times the best habitat management is maintaining an area in its current condition. This can include protecting the area from development and applying various management practices which 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.

1. Brush Chopping (Mowing)

General Description:
Involves mowing dense vegetation (including fairly large shrubs) with a large rotary mower mounted behind a tractor.

Effect on Habitat:

- Helps keep vegetative succession in stage 2.
- Helps keep vegetative succession in stage 3.
- Sometimes reverts succession from stage 4 to stage 3. Helps remove competition with 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 stages 2, 3, and 4, helps rejuvenate grasses, forbs, and shrubs which improves quality of future nesting sites.
- In stages 5 and 6, maintains dense low understory in properly thinned woodlands.
- In grass-clover plots, helps keep vegetation low enough for use by some wildlife species such as doves and turkeys
- In wetlands can be used to increase interspersion by reducing vegetative cover.

This practice is used in stage 5 and 6 vegetation in Eastern Deciduous Forests

2. Brush Piles

General Description
Brush piles can be made from saplings or tree branches available from land clearing, timber harvest operations, tree pruning, etc. For best results, piles should be 3 to 5 feet high, 15 feet in diameter and very loose. This will allow grass and forbs to grow in them, creating more food and cover for wildlife.

Effect on Habitat:
- Particularly useful for rabbits and quail in areas with little cover, especially in areas with plenty of food and little cover such as corn, soybean, grain sorghum, and small grain fields.
- Useful at the edge between fields and woodlands.

3. Chaining/Roller Beating

General Description:
Chaining: A large chain is strung between two bulldozers that run parallel to each other (50 to 100 feet apart depending on length of chain). The chain knocks down shrubs and small trees.

Roller Beating: Large, sharp metal blades are welded lengthwise on a roller similar to those seen on steam rollers used to pave roads. The roller is pulled behind bulldozers to knock down and chop up large shrubs and small trees. Roller beating is an alternative to chaining and has nearly the same effects on vegetation.

Both techniques are used where rugged terrain, rocks, or large shrubs prevent the use of a brush chopper. This practice is not used like brush chopping to manipulate understory vegetation in woodlands.

Effect on Habitat:
- Stage 4 sometimes reverts succession to stage 3. Helps remove competition of some kinds of shrubs allowing grasses and forbs to grow better.
- Stage 4 sometimes helps keep vegetative succession in stage 4.
- Maintains low shrub growth with some kinds of shrubs by encouraging resprouting.
- In stages 5 and 6, causes succession to revert back to stages 3 and 4.

Most often used in stages 4, 5, and 6 of plant succession in the following regions: Mediterranean, Intermountain Foothills, Intermountain Montane, Intermountain Sagebrush, and Woodland.

4. Controlled (Prescribed) Burning

General Description:
Burning should be done under cool, moist, low-wind conditions, when danger of wildfire is low. Burn as early in the spring (before April 1 if possible) as conditions permit, so ground nesting wildlife are not disturbed. Do only under close supervision of wildlife, forestry, and/or range professionals that have experience with controlled burns. Results vary with the type of vegetation being burned, burning conditions, and the frequency of burning.

Some General Effects of Fire Are:
- Some understory shrubs sprout.
- Some shrubs are reduced which improves the vigor and quality of forbs and grasses.
- Releases nutrients in soil.
- Reduces excessive dead vegetation (leaves, old grass, etc.) so seed can reach mineral soil.
- Scarifies (breaks down outside coating) some seeds so they can germinate.
- Rejuvenates grass and herbaceous vegetation making area more productive.

Effect on Habitat:

Annual Burning:
- Stage 2 helps keep vegetative succession in stage 2.
- Stage 3 helps keep vegetative succession in stage 3.
- Stage 4 causes succession to revert to stage 3.
- Stage 5, in pines, keeps understory shrubs thinned out and stimulates grassy-weedy undergrowth if stands are properly thinned.
- Stage 6 is the same as stage 5.

Annual burning in stage 5 and 6 vegetation is a practice used in the Eastern Deciduous Forest

3- to 5-Year Interval Burning:
- Stage 2 allows succession to progress, but more slowly than if left alone.
- Stage 3 usually keeps vegetative succession in stage 3.
- Rejuvenate grass and grass-like vegetation in stage 3 and 4 wetlands.
- Periodic burning of vegetation-choked wetlands can improve the water and cover interspersion.
- Stage 4 makes shrub growth more dense due to abundant sprouting of shrubs.
- Stage 5, in pines, stimulates thicker understory shrubs if stands are properly thinned
- Stage 6 is the same as stage 5.

Three to five-year interval burning in stage 5 and 6 vegetation is a practice used in the Eastern Deciduous Forest.

5. Corridors

General Description:

"Corridors" are areas of continuous habitat that permit animals to travel securely from one habitat to another. As the landscape becomes more broken up (fragmented) from construction of roads, parking lots, urban areas, certain methods of timber harvesting, clearing for agriculture, hurricanes, and/or wild fires, etc., only small islands of suitable vegetation might remain.

Effect on Habitat:

- Corridors allow animals to meet and mate with other animals of the same species but from different populations, thus maintaining genetic diversity.

- Corridors also allow animals to find and use islands of suitable habitat for feeding. In an urban area, relatively unbroken corridors found along streamside (riparian) areas and ravines allow wildlife to move into parks and other suitable habitats. Preservation, maintenance, and creation of uninterrupted corridors are very important in wildlife habitat management.

- Corridors can be harmful if they are too small, i.e., less than 100 meters wide. Predators may be attracted to edge, and corridors then become unknowing traps for some animals. For example, the probability of predation by raccoons, skunks, bobcats, coyotes, and nest parasitism (laying eggs in another bird's nest) by brown-headed cowbirds, increases in narrow corridors.

Note: Riparian buffers may act as corridors but are not recommended for the same reasons. Corridors often may be needed in upland areas.

6. Disking

General Description:
Areas in successional stages 2, 3, and 4 can be disked to promote the growth of annual and perennial forbs and grasses.

Effect on Habitat:
- Keeps vegetative succession in stage 2.
- Promotes the growth of annual forbs that some wildlife prefer for food and cover.
- In stage 3, causes succession to revert to stage 2.
- In stage 4, causes succession to revert to stages 2 or 3.
- Can be used to decrease vegetative cover and increase interspersion in wetlands (during dry periods).

7. Grain, Leave Unharvested

General Description:
Strips or blocks of grain crops (1/8 to 1/4 acre is usually sufficient) can be left unharvested. Especially valuable if left adjacent to herbaceous, shrub, or tree cover.

Effect on Habitat:
- Provides a food source for many species of wildlife.

8. Harvest Less

Bass:
Needed when seine sample of pond reveals these situation:
- No recent bluegill hatch.
- Many medium-sized bluegill in poor condition.
- Bass few, large, and in good condition.

Bluegill:
Needed when seine sample of pond reveals these situations:
- Many recently hatched bluegill.
- Very few medium-sized bluegill.
- Bass less than one pound in poor condition.
- No young bass.

Trout:
Needed when seine, fishing rod, or electroshocking samples reveal these situations.
- Fish in good condition. Few medium and large sized fish. Many small fish.

Game Birds and Mammals:
- Used when there is a high proportion of young animals in the bag and hunting success is low. May apply to local situations, but not needed for small animal management in general.

9. Harvest More

Bass:
Needed when seine sample of pond reveals these situations:
- Many recently hatched bluegill.
- Very few medium-sized bluegill.
- Bass less than one pound in poor condition.
- No young bass.

Increase bass harvest cautiously. Spread the harvest over the entire summer.

Bluegill:
Needed when seine sample of pond reveals these situations:
- No recent bluegill hatch.
- Many medium-sized bluegill in poor condition.
- Bass few, large, and in good condition.

Trout:
Needed when seine, fishing rod, or electroshocking samples reveal these situations:
- Many fish, small (even older ones) and in poor condition. In many areas extremely cold water reduces trout growth. In these situations harvesting more will not help much.

Game Birds and Mammals:
Needed when animals show signs of overpopulation such as:
- Disease.
- Destruction of habitat by crowded animals.
- Poor body condition.
- Excessive fighting.
- Few young animals in bag.
- Higher percentage of older animals than young in fall population (indicates poor reproduction due to inadequate nutrition; thinning population will leave more food to go around). May apply to local situations, but not needed for small animal management in general.

10. Lime Ponds and Fields

General Description:
When water quality tests show the pH is below 7.0 it should be adjusted to 7 to 8 by using agricultural lime. Lime can also be added to food plots when soil tests recommend.

11. Livestock Grazing Management

General Description:
A practice for managing the use of vegetation by livestock. Can be used to manipulate successional stages to benefit wildlife (i.e. maintain open areas in woodlands). This practice also includes livestock exclusion when necessary.

Some General Principles Are:

Proper Grazing Use: On native rangelands and riparian areas, do not graze more than 50 percent of the yearly growth of vegetation preferred by livestock.

Timing: Avoid grazing areas during periods when wildlife and/or vegetation is vulnerable to damage.

Examples — Grazing riparian areas in the summer can damage young shrubs and trees; grazing in spring can reduce cover needed by ground-nesting wildlife.

Intensity: Relates to how many livestock are on a given area at any one time. Many livestock on an area is high intensity, few livestock is low intensity.

High intensity grazing should be for shorter periods of time or all the vegetation will be used.

High intensity grazing increases the chance that ground nests will be trampled, and should not be used in important nesting areas during the nesting season.

Rotation: Livestock should be moved from an area before vegetation is over-used. The vegetation is allowed to recuperate (rest) before it is grazed again.

Tools:

Fencing, water developments, salting, and herding are the most common methods used to control livestock grazing. Whenever livestock grazing management is recommended, it is implied that the necessary tools will be available. Some information on these tools follows.

Fencing: Useful to protect food plots, woodlands, or other natural vegetation areas from livestock. Often necessary for managing livestock grazing (such as rotating areas being grazed, controlling access to water, etc.)

Fences interfere with movement of wildlife, especially large animals such as deer and elk. They should be recommended only when necessary and designed to allow movement of wildlife.

The top wire should be a maximum of 42 inches above the ground (allows some wildlife to jump over) and the bottom wire should be smooth and a minimum of 16 inches above the ground (allows some wildlife to go under).

Water Developments: The more watering places available, the less likely livestock will concentrate in one area, and the more flexibility one has in managing livestock. Alternative water sources are often essential when developing grazing systems that permit occasional rest of important areas (i.e. riparian areas) during critical growing seasons.

Catchment ponds, dugouts, windmills, and spring developments discussed under Practice 41-Water Developments for Wildlife are also used to develop water for livestock.

Salting: Locating salting areas away from watering places and occasionally moving locations can be used to encourage uniform distribution of livestock.

Herding: Using horseback or other means to move animals is useful for achieving proper distribution of grazing animals. Used to discourage congregation of animals in attractive areas for long periods of time.

Effect on Habitat:
- Used to insure livestock grazing does not over-utilize vegetation which is also used by wildlife.
- If properly managed, livestock grazing is usually not harmful to wildlife habitat and in some instances, is used to improve wildlife habitat.
- Changes in grazing management are recommended only when it is evident that livestock use is damaging wildlife habitat or is needed to improve the habitat for selected wildlife species.
- Periodic grazing of vegetation (cattail) choked wetlands can improve water and vegetation interspersion.

12. Nesting Boxes Structures/Platforms

General Description:
The particular design and placement of nesting structures and boxes often determines which wildlife species will use the structure. See Cooperative Extension agent or The Pa Game Commission for specific designs of nest boxes and other artificial nesting structures.

Boxes: Some species have to nest in cavities that they don't excavate themselves. If natural cavities are not available, artificial cavities (nest boxes) can be used.

Each Species needs a certain kind of cavity (diameter of hole, depth, area, etc.) in a certain location (field, woods, water, etc.) and at a certain height (4 feet to 20 feet high).

Platform: Species such as the red-tailed hawk build nests in large trees or other structures above the ground. If nesting sites are scarce, artificial platforms placed on poles above the ground may be used.

Structures: Canada geese and mallards will also use platforms if they are placed near water. In wetlands dominated by open water and lacking islands or peninsulas, floating nest structures are often used by Canada geese and mallards.

Effect on Habitat:
- In Wooded Areas: Boxes are especially useful in stage 5 succession, or where trees are not old enough to provide cavities.
- In Open Areas (Stages 2, 3, and 4): Always useful unless an abundance of nesting cavities or locations already exist, such as hollow fence posts, isolated den or nesting trees, etc.
- In Wetlands: Provides secure nesting sites in areas lacking islands, peninsulas, or tall, dense vegetation.

13. Plant Food Plots (1/8 to 2 Acres)

General Description:
Strips can be long and narrow (300 to 400 feet long and 15 to 20 feet wide) or square blocks and preferably located at the edge between two or more kinds of habitat (such as between woodland and hayfield). Best if located next to natural cover such as shrubs, etc. Should be planted prior to June 1 (except for grass-clover mixture) to ensure maturity.

Where possible and in regions with heavy and drifting snow, plots should be square (1 acre minimum) and located near cover on the downwind side. Plots should be located such that nearby shrub and tree cover does not encourage snow to drift into them. Must be protected from livestock.

Effect on Habitat:
- Annual Food Plots - Usually Grains: Useful in areas of natural plant succession where row-cropping (corn, soybeans, grain sorghum, small grains, etc.) is scarce. One small (1/8 to 1/4 acre plot per 15 acres or large (1 to 2 acres) plot per 60 acres.
- Provides food for many species of wildlife.
- Perennials - Usually Grasses and Clover or Other Forbs: Useful in areas of row-crop farming (corn, soybeans, grain sorghum, small grains, etc.) especially where shrub field borders are scarce. Useful in most areas with absence of stage 3 succession.
- Provides both food and cover for many species of wildlife.

14. Plant Grass and Forbs

General Description:
Plant large fields of grasses and legumes. Field size between 2 and 40 acres.

Effect on Habitat:
- Smaller fields are useful for wildlife in wooded areas with little acreage in stages 2 and 3.
- Larger fields are useful in areas with little acreage in hayfields, pastures, or small grains that are used by some wildlife species for winter survival, nesting, or roosting cover.
- These fields will be used for food as well as cover by many species.
- To increase the value for wildlife, these plantings should be grazed, burned, or mowed occasionally (once every 3 to 5 years) to prevent deterioration of the vegetation.

15. Plant Mast Trees

General Description:
Mast means seed or fruit which provides food for wildlife. For the purpose of this handbook, mast trees are defined as those trees which produce an annual crop of acorns or other nuts. Mast

trees such as sawtooth oak produce an abundance of mast and they may be a desirable supplement to plant for wildlife. Plant mast trees in early spring when they are still dormant.

For specifics about what, when, and how to plant, see your local Cooperative Extension agent or Soil Conservation Service office.

Effect on Habitat:
- Especially useful for deer, squirrels, turkeys, and wood ducks in areas with little available mast, such as large expanses of farmland, pine woodland, field borders, urban areas, etc.

16. Plant Trees or Shrubs

General Description:
When properly located, shrubs and trees can benefit many species of wildlife. Fruiting shrubs and small evergreen trees are especially good for urban areas, fencerows, hedgerows, odd-areas, property boundary markers, and other idle land plantings. It may also be desirable to plant large trees and willows in some areas.

In large open areas, multi-row plantings of at least 15 rows of trees and shrubs are beneficial, especially if planted adjacent to tall herbaceous cover or a good food source. It is best to plant shrubs and trees in the early spring when they are still dormant.

For specific information on when, how, and what to plant, see your local Cooperative Extension Agent .

Effect on Habitat:
- Useful along fences in areas where field borders (such as fencerows) are scarce.
- They are especially useful to make travel lanes for wildlife to move safely across open fields between two areas of cover.
- Also useful along the edges between fields and woodlands, around farm homesteads, and urban areas.
- Can be a valuable practice used to restore and improve riparian areas.

17. Ponds/Lakes Artificial Reefs

General Description:
Large rocks can be piled together, or brush (used Christmas trees are good) weighted down and submerged to provide cover for fish. This practice is recommended for ponds or lakes that are larger than 10 acres. In smaller bodies of water artificial reefs may allow prey fish (bluegill, etc.) to be overly successful at avoiding predators. This can lead to an overabundance of prey fish that are in poor condition. Structures are usually placed on the ice during winter and allowed to sink. Be cautious about thickness of the ice.

18. Ponds, Clear Muddy Water

General Description:
You can clear muddy water in any of these ways:

Broadcast agricultural gypsum on the pond surface at the rate of 12 to 25 pounds per 1000 cubic feet of water (500-1000 pounds per acre-foot of water).

Broadcast hydrated lime on the pond surface at 20 to 40 pounds per acre-foot of water.

Broadcast agricultural limestone on the pond surface at the rate of 500 to 1000 pounds per surface acre.

Dissolve aluminum potassium sulfate (commercial alum crystals) in water and spread on the entire surface at the rate of 5 to 15 pounds per acre-foot of water.

Broadcast cottonseed meal on the pond surface at the rate of 100 pounds per acre.

Effect on Habitat:
- Remove silt in the water, allowing sunlight to reach phytoplankton.
- This reactivates the first step in the pond food chain.
- At the same time, any erosion of the watershed (which may have caused the muddy water) must be stopped.

Carp may also be the cause of muddy water. Poisoning (see Practice 32) or drainage may be necessary for pond rehabilitation.

19. Pond Construction

General Description:
This practice should be recommended for creating new ponds and wetlands with permanent water.

Dams and dikes can be used in natural drainages to create ponds and wetlands with permanent water for use by fish and wildlife.

When this practice is recommended, it is implied that adequate water control structures will be included and should not be an additional recommendation.

The design varies, depending on the purpose for constructing the pond and the region it is constructed in. For example, steep sloping sides benefit fish and gentle sloping banks benefit waterfowl.

See the Cooperative Extension agent or local Soil Conservation Service office for design details.

20. Small Dikes, for Temporary Flooding

General Description:
Only recommend this practice in existing wetlands or potential waterfowl feeding and nesting areas when appropriate. Small dikes are used to temporarily flood (usually in the fall) feeding and nesting areas for waterfowl. Grain fields, Japanese millet plantings, and stage 5 and 6 hardwood woodlands are examples of feeding areas flooded to attract waterfowl. Temporary flooding is also used to improve existing wetlands as nesting habitat for some wildlife such as the redhead, and to control the growth of aquatic vegetation.

When this practice is recommended it is implied that adequate water control structures will be included and should not be an additional recommendation.

21. Ponds, Deepen Edges

General Description:
Usually used to improve ponds for fish. To deepen pond edges, draw the water down, let banks dry out, and use a tractor with blade. Edges should be deepened to a minimum of 2 to 3 feet with steep side slopes. Soil removed from the edge can be piled around the bank and then smoothed out and planted to grass and legumes.

Effect on Habitat:
- Needed to reduce rooted aquatic vegetation around the edge of a pond.

22. Ponds, Determine Balance

General Description:
Population balance is first established in a farm fish pond by stocking the correct numbers of fish. After the first year, check fish pond balance during the summer months by using a 1/8-inch mesh minnow seine 15 feet long and 3 feet deep. Seine at intervals around the pond by anchoring one end at the bank, pulling the seine straight from the bank to its full length, and then sweeping in an arc back to the bank. Four to five sweeps in an average pond is usually enough.

Balance is determined by comparing age groups, condition, and numbers of bass and bluegill and/or trout caught in the seine. Recent reproduction of both bass and bluegill in the seine indicate that the fish population is balanced.

Trout do not often reproduce in ponds, so overall health of the fish is used as an indicator of pond balance. Growth rate, body condition (fat, skinny, size of head in relation to body, etc.), and evidence of disease are good indicators of pond balance.

23. Ponds, Diversion Ditches

General Description:
Diversion ditches should be constructed so that a small amount of water enters the pond and exits the spillway. The bulk of water is diverted around the pond through the diversion ditch.

Effect on Habitat:
- Needed for ponds with too much water flowing through them. Too much water dilutes and wastes fertilizer, and requires expensive water control structures for managing the water flow.
- Used to protect ponds from flood waters.

24. Ponds, Fertilize

General Description:
Well-fertilized ponds can produce up to three times as many pounds of fish as unfertilized ponds.

Start fertilizing fish ponds in the spring when the water temperature is above 60 degrees Fahrenheit. Apply at the rate of 40 pounds of 20-20-5 (or its equivalent) per acre at two-week intervals, or until a good color develops in the pond. Place the fertilizer in water less than 6 feet deep. Make additional applications of 1 bag of fertilizer per surface acre every 3 to 4 weeks, or when the water clears (becomes less green) so that you can see deeper than 15 inches into the water. Continue this program until water temperatures drop below 60 degrees Fahrenheit in the fall.

If a pond has been properly fertilized for the past 5 years and if there is no concentration of weeds, fertilize in the future with phosphate only. The rate is 40 pounds of super-phosphate per acre per application. Make the first 3 applications 2 weeks apart, and at 3 to 4 week intervals thereafter. Fertilizer may be broadcast by boat or from the bank or distributed from a fertilizer platform.

Effect on Habitat:
- Needed in balanced fish ponds with water clear enough so that a white object can be seen at 15 inches deep.
- Fertilizer in ponds stimulates phytoplankton production, which is the first step in the food chain of a balanced fish pond.

25. Ponds, Remove Trees Near Dike

General Description:

Roots of trees growing on the dam will loosen the soil compaction and cause leaks. This practice is needed anytime trees occur on the dam or when trees occur around more than 1/3 of the remaining pond bank. Improves the pond's capability to hold water, and cleans pond banks for use by doves.

Effect on Habitat:
- Trees growing around the pond will reduce the water level.
- Some species (such as doves) prefer clean banks for watering.

Some nearby trees are desirable for many wildlife species, but need not occupy more than 1/3 of the pond bank.

26. Ponds, Repair Spillway

General Description:
Needed if spillway in existing dam or dike is eroding or otherwise damaged, keeping the pond water level too low.

27. Ponds, Reseed Watershed/Filter Strips

Effect on Habitat:
- One method of reducing erosion in the watershed.
- Reduces silt in pond water and allows sunlight to reach phytoplankton.
- Improves water quality and provides nesting, brooding and winter cover for some wildlife.

28. Ponds, Restock

General Description:
Restock only after all fish in pond are removed, either by draining pond or applying rotenone.

Rotenone kills fish by interfering with the gills' ability to use oxygen in the water. It is applied as a liquid or powder during early fall. Bluegill fingerlings are then stocked in the late fall, and bass fingerlings are stocked the following June. Trout fingerlings are usually stocked in the spring. Present stocking rates are 500 bluegill and 50 bass per surface acre, or 300 to 500, 2 to 4 inch fingerling trout per surface acre. Trout are not often stocked with bluegill and bass. As many as 50 channel catfish fingerlings per acre may also be stocked at the same time as the bluegill.

Effect on Habitat:

- The techniques of draining or rotenoning ponds allow unbalanced fish populations to be removed and new ones started with an exact ratio of bass to bluegill, or appropriate number of trout.
- Needed in ponds with extremely unbalanced fish populations:
  - Overabundance of small, stunted bluegill or trout.
  - Few hard-to-catch fish of usable size.
  - Presence of wild fish such as carp, shad, goldfish, suckers, crappie, green sunfish, or bullhead catfish.

29. Ponds, Stop Leaks

General Description:
Leaks in existing ponds may be stopped with:

Bentonite at 100 pounds per 100 square feet. OR

Salt at 16 to 20 pounds per 100 square feet. OR

Tetrasodium pyrophosphate at 2 tons per acre. OR

Soda ash at 5 tons per acre.

In severe cases, plastic sheeting may be used.

Effect on Habitat:
- Necessary in leaking ponds with limited water supply.

30. Ponds/Wetlands, Provide Shallow Water, Islands, Peninsulas

General Description:
To increase emergent aquatic vegetation and/or provide islands and peninsulas for wildlife. This practice can only be recommended for existing ponds and wetlands. Not recommended for areas with moving water such as rivers and streams.

Draw the water down, let the area dry out, and use a tractor with a blade and front end loader. Soil can be gathered from nearby sources or pond/wetland bottom and used to build islands, peninsulas, and shallow water areas (less than 2 feet deep). Areas above the water line that are disturbed by this activity should be smoothed and planted to grass and legumes.

Effect on Habitat:
- Needed to increase nesting areas and emergent aquatic vegetation.

31. Snags, Dead and Down Woody Material

General Description:

In forested habitat, leave or provide a minimum of seven snags, 10-20+ inches in diameter, and four down logs per acre. Large down logs 24 inches in diameter, 50 feet long are optimal. In intensively managed forests of smaller material, leave logs of 12+ inches in diameter and 20 feet long—minimum. Conifer logs usually decay slower and provide habitat over a longer period of time. Logs of different species with remaining limbs, bark, and stumps should be retained for habitat diversity.

Snags should be retained as an eventual source of dead and down woody material in forested habitats.

In streams, woody material creates stream diversity. It creates structure that may be used as cover.

Effect on Habitat:

- Dead and down wood is important to numerous species of terrestrial wildlife as sites for feeding, reproducing, hiding, and resting. The use of dead and down material varies as the log decomposes.
- Down logs in various stages of decay provide denning sites and a rich food source for insect- and fungi-eating animals.
- Down logs provide drumming sites that are important for mating rituals for ruffed grouse.
- As logs decompose, they can hold more moisture and provide an essential cool, moist microhabitat for many species of reptiles, amphibians, and small mammals.
- 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.
- Large logs create in-stream pools and riffles (see Rainbow Trout and Pacific Salmon).
- Logs, large limbs, and smaller branches provide shade, cover, and food for aquatic organisms, some of which are food for younger salmon or trout.
- Snags provide roosting and perching sites for many birds.
- Snags provide sites for cavity construction.
- Snags provide foraging sites for many species.

32. Tillage, Eliminate in Fall

General Description:

When tillage is necessary, inversion tillage (soil is turned over and covers up crop residue) such as mold board or disc plowing should be avoided. Tillage implements such as chisel plows and rod weeders can be used to do tillage operations without turning the soil over.

Effect on Habitat:
- Provides waste grain as a food source used by many species of wildlife.

33. Timber Harvest, Clear-cut

General Description:
A type of timber management where all trees are harvested at the same time on a tract of land. Different tracts are cut each year and rotated over an area like a checker-board.

In general, tracts should not be over 40 acres in size, and often tracts as small as 10 to 20 acres are preferred. They should be long and narrow with irregular shapes. The increased sprouting of shrubs, grasses, and forbs that result from sunlight reaching the forest floor is beneficial to several wildlife species. Many wildlife species also prefer the edge between forest and openings created by such cuts.

This practice can be harmful to wildlife species that need woodlands to supply all of their welfare requirements such as red squirrels, woodpeckers, etc. But again, if harvested tracts are not too large and there are sufficient amounts of surrounding forest, these species should remain.

Effect on Habitat:
- Useful in large forested areas with very little acreage in stages 2, 3, and 4, of succession. Reverts stages 5 and 6 to 2, 3, and 4, with more emphasis on stage 4.
- At least 3 to 4 den and/or large mature trees per acre should be left in areas protected from wind which could topple trees.

33. Timber Harvest, Selection Cut ("Selective Cut" in National Manual)

General Description:
Also called "all-aged management." Only selected trees are cut, a few at a time. Stands managed this way have trees of all ages.

This benefits many different species of wildlife. Animals preferring stages 2, 3, and 4 of succession benefit from the sprouting of shrubs, grasses, and forbs where individual trees were cut, yet mature trees are also present for species which prefer stages 5 and 6.

Effect on Habitat:
- Stimulates shrub, grass, and forb understory production in woodlands due to removal of large tree crowns which would otherwise cause shading.
- Also stimulates growth of mast-producing and other surrounding trees.

- At least 3 to 4 den, old mature, and large dead (snags) trees per acre should be maintained.

35. Water Control Structures

General Description:
Various structures made out of concrete, pipes, wood, etc., are useful to control the water level in wetlands and ponds. They usually are combined with dams and shallow dikes for water control. Recommend only when inadequate structures are present on an existing dam or dike.

For specific designs on such structures see the local Soil Conservation Service office.

Effect on Habitat:
- Allows management of water levels to increase or decrease the amount of aquatic vegetation. Useful for creating a desirable mix (interspersion) of open water and aquatic vegetation.
- Can be used to manage the quality of water in the pond or wetland and for control of unwanted fish.

36. Wildlife Damage Management

General Description:

Professional wildlife biologists often have to exclude, trap, relocate, euthanize (humanely put to death), repel, poison, shoot, or frighten individual animals in order to reduce or eliminate damaging behaviors or health hazards. Examples of wildlife damage are coyotes that prey on sheep or pets, raccoons or bats in the attic, deer eating ornamental plants in the yard, skunks under the house, snakes in the house, bird strikes at airports, cormorants eating catfish fingerlings at an aquaculture facility, or starlings roosting in urban trees and defecating on sidewalks, creating a health hazard.

Wildlife damage management may be recommended in addition to the practice of increasing bag/creel limits if individual animals are nuisances.

- Direct control techniques like relocation, trapping, toxicants on livestock collars, and selectively shooting only problem animals are commonly used and effective.

- Nonlethal methods of predator control include sheep confinement and herding, use of guard dogs, and the use of exclusion fences. Nonlethal control techniques like repellents (also used on collars mounted on livestock prey-at-risk) and chemical sterilization are currently extremely limited in their usefulness.

- Methods of controlling herbivores (deer, rabbits, etc.) include exclusion fences, taste and area repellants, scare tactics (such as propane cannons), decoys (of predators), and others. Trapping and relocating large animals like deer and elk is not cost effective.

- Methods of bird control include scary balloons, exclusion devices, live trap and relocation, and others.

The 2012 PA WHEP Contest Activities and Scoring

Activities I, II, and III will be scored on an individual basis and Activity IV will be done as a team. Awards will be presented to the top five individuals for Activities I, II, and III and the top team score. Individual scores will be determined by combining scores earned in Activities I - III with the team score from Activity IV. Teams may have three or four individuals. The overall team score will be the sum of the top three individual scores plus the score of the team activity.

Activity I: Identification and Knowledge of Selected Wildlife Species (50 Points)
Activity II: Understanding of Wildlife Habitat (50 Points)
Activity III: On-Site Recommendation of Wildlife Management Practices (50 points)
Activity IV: Written Wildlife Management Plan - Team Activity (50 points)

Activity I: Identification and Knowledge of Selected Wildlife Species (50 Points)
The objective of Activity I is to demonstrate knowledge of the specific wildlife species of the Eastern Deciduous Forest region(s) that are described in this project book (listed below). This activity will be conducted indoors. Participants should be prepared to visually identify any life stage of these species (by photo or specimen), indicate which foods they eat, know what habitat they prefer, describe the cover they use, and understand where they obtain their water. This is an individual activity and no talking to other participants is allowed. **Participants are strong encouraged to obtain and study wildlife field guides and other information concerning the selected wildlife species.**

Birds
American Kestrel
Eastern Bluebird
Eastern Towhee
Hairy Woodpecker
Mourning Dove
Ovenbird
Red-tailed Hawk
Ruffed Grouse
Turkey
Wood Duck

Mammals
Beaver
Bobcat
Eastern Cottontail
Eastern Gray Squirrel
Muskrat
White-tailed Deer

Others
Bluegill
Largemouth bass

Activity II: Understanding of Wildlife Habitat (50 Points)
The objective of Activity II is to demonstrate knowledge of wildlife habitat and the important concepts about habitat described in this project book. Participants should be prepared to recognize general habitat features and concepts in the field. This activity will be conducted outdoors, on site, and some of the questions may involve giving descriptive answers verbally. This is an individual activity, again no talking to other participants is allowed. **Participants are strongly encouraged to obtain and study wildlife field guides and other information concerning the selected wildlife species.**

Activity III: On-Site Recommendation of Wildlife Habitat Management Practices (WMPs) (50 points)
Activity III involves the recommendation of WMPs necessary to manage wildlife and habitat on a given site. Management recommendations in Activity III should consider each species listed separately and WMPs recommended as if each species was the only species considered on the site. Only those practices appropriate for Eastern Deciduous Forest region (listed in this project book) are to be used. Refer to the WMP chart on page 20 for an condensed list of these WMPs. Prior to starting Activity III, information will be given about the site (a scenario), either verbally or written (describing field conditions). Based on this information, an "X" should be marked in the box for each WMP recommended. This is an individual activity, and no talking to other participants is allowed.

Participants are given credit for putting an "X" in the correct boxes. Keep in mind that during a contest, all "X's" marked on the WMP chart may or may not be used, as the correct answers depend on the information given about the site and the conditions present on site at the time of the contest. Regardless of the scenario and field conditions, boxes that are not marked on the WMP chart should never be marked during a contest because these practices have been determined inappropriate for that species and region. Answers will be incorrect if boxes that should be marked are left blank; and boxes that should not be marked are marked. No negative scores will be assigned. The minimum individual score on Activity III is zero. A blank WMP worksheet for this activity is shown on the next page for practice use. In the actual contest, several of the selected wildlife species will be listed across the top of the worksheet and a variety of possible wildlife management practices will be listed down the left side of the worksheet.

Activity III Scorecard ***On-Site Habitat Recommendations (50 points)*** ***Wildlife Management Practices (WMP's)***	Wildlife Species							
	1	2	3	4	5	6	7	8
Number Answered								
Number Correct								

Score = [(total correct - total incorrect) / total possible correct] X 50

Score _____

Total Answered _____

Total Correct _____

Total Incorrect _____

ACTIVITY IV: Written Wildlife Management Plan - Team Activity (50 points)
Activity IV will be scored as a team effort. The written wildlife management plan is worth 50 points. Referring to an identified area, teams of 3-4 participants make written recommendations based on landowner objectives as stated on a written Field Condition Sheet, which is provided to each team prior to the activity. Each team interprets the objectives, identifies the focal species, recommends WMPs and their intended impact and states how the plan will be evaluated.

The "Judges' Scoring Sheet – Written Management Plan," shown below, details how plans are judged and scored. All plans must be written using paragraph format. A sample management plan worksheet is also included to help teams prepare for writing management plans. For the State WHEP Contest, teams may use one side of each of three pieces of paper provided. Two of these sheets are for writing a plan, and the third sheet is for making a sketch map illustrating where practices are implemented. The team number must be written on the blank back side of each sheet. Only write the plan (including the map) on the front of each sheet of paper. Plans not written in the proper format or correctly identified will not be judged and no points will be awarded.

Participants will be required to draw a sketch and locate where recommended practices will be implemented. An aerial photo of the area may be provided. Teams will have about 1 hour to complete this activity.

Sample Written Wildlife Management Plan

Field Condition Sheet (This is provided for the area used for the contest)

The Three Peaks area has long been favored by outdoor enthusiasts. The area is owned by the Bureau of Land Management (BLM). Managing the area for multiple user groups is often difficult. Users at Three Peaks include hunters, recreational shooters, hikers, bird watchers, ATV riders and remote control airplane hobbyists. BLM requests your assistance in developing a management plan for wildlife on the 4,000 acre tract.

The area marked by flags is a representative sample of the vegetation and topography on the 4,000-acre area. Sage grouse are not hunted on Three Peaks. University researchers have surveyed the area and determined sage grouse populations are very low. Early indicators suggest a lack of brood rearing cover and nest disturbance by recreational users may be to blame. Bird watchers and hikers on the area occasionally observe red-tailed hawks pursuing desert cottontails and kangaroo rats. BLM would like to see an increase in the red-tailed hawk population. Some bird watchers have also reported seeing sage thrashers. Constructing Interstate 15 directly through the mule deer winter migration corridor leading to Three Peaks has had a negative impact on the herd. Biologists have determined this hunted mule deer population is negatively impacted by deer/car collisions and have determined mule deer here have relatively low body weights.
The presence of cheat grass on Three Peaks is also a major concern because it is invasive and does not provide adequate cover or forage. Fire is not the preferred method of disturbance on this site because it allows cheat to dominate. If disturbance occurs naturally or by recommendation,

efforts should be made to establish native grasses and forbs to avoid this problem. Prepare a plan to meet BLM's objectives for mule deer, sage grouse, red-tailed hawk and sage thrasher. This is a team activity. Use only one side of each of two (2) pages to write your plan. You have 1 hour to complete this activity. Good Luck!

Sample Written Wildlife Management Plan Worksheet

The sample worksheet below is intended to help you learn the correct format for writing management plans. In a contest, you will be given three blank pieces of paper. You must know the format and what is to be included in each section. You can only use one side of each of three sheets of paper. Learn to write neatly, using small print and short concise sentences. For the total score, in addition to the points listed below, a maximum of 5 points will be given for use of the correct format and inclusion of an accurate sketch of the site.

Sample Worksheet

Part 1: Plan Background (5 Points)

What are the species to be managed? (5 points) For example: The species to be managed are Eastern bluebirds, coyote and American kestrel. State the management objectives (5 points). The management objectives are to increase numbers of Eastern bluebirds, decrease the coyote population, and maintain the number of American kestrels on the property.

Part 2: Plan Development (10 Points)

Species Habitat Requirements (5 Points)

State the basic habitat needs for each species. For example:Eastern bluebirds are found in early successional areas interspersed with trees and shrubs where they forage on insects. Water is obtained from their diet. Bluebirds nest in cavities when available, but will readily use nesting boxes.

Habitat Assessment (5 points)

Evaluate the area and state what is present and lacking with respect to the needs of each species. For example:The area is primarily Stages 5 and 6. Stages 2 and 3 is lacking for Eastern bluebird.

Part 3: Plan Implementation (25 Points)

This section should indicate the team has an understanding of the appropriate WMPs that should be implemented and the effects of those practices on the habitat and other species managed. For example:Forest regeneration and chainsawing will open the Stage 6 forest and provide more usable space for bluebirds. Native grasses and forbs should be established to provide suitable foraging areas. Although a few cavity trees are available and should be retained when implementing forest regeneration and chainsaw work, additional nesting cover is desirable and nest boxes should be put in place.

Part 4: Plan Evaluation (10 Points)

State what you will do to determine if your plan worked. For example: Spring counts and nest box checks will be conducted to determine presence of bluebirds. Vegetation surveys will evaluate if establishment techniques for native grasses and forbs were successful.

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

Scale for Scoring: 0 = not at all, 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent

Part 1: Plan Background (5 points maximum)						
The plan accurately identified the wildlife species and the management objectives to be managed	0	1	2	3	4	5
					Part 1: Plan Background Subtotal	_____
Part 2: Plan Development (10 points maximum)						
The team demonstrated understanding of the habitat needs of each species	0	1	2	3	4	5
The team accurately evaluated the existing habitat (what is present and what is lacking) based on management objectives and species to be managed	0	1	2	3	4	5
					Part 2: Plan Development Subtotal	_____
Part 3: Plan Implementation (25 points maximum)						
The team included the appropriate management Practices	0	1	2	3	4	5
The team fully explained when and where each practice should be implemented.	0	1	2	3	4	5
The team demonstrated knowledge of practices effects on existing habitat and benefits to each species	0	1	2	3	4	5
The team used the appropriate native plant species in their plan and/or recognized invasive species	0	1	2	3	4	5
The team recognized the management compromises Necessary to meet the needs of each species and showed understanding of the mutual benefits of implementing certain WMPs	0	1	2	3	4	5
					Part 3: Plan Implementation Subtotal	_____
Part 4: Plan Evaluation (5 points maximum)						
The team presented a realistic plan for monitoring the success of their plan	0	1	2	3	4	5
					Part 4: Plan Evaluation Subtotal	_____

Part 5: Content (5 points maximum)
The team presented the plan in the appropriate narrative and included a sketch of the area that accurately reflected the management practices to be implemented 0 1 2 3 4 5

Part 4: Plan Content Subtotal _____

Comments:

WRITTEN PLAN FINAL SCORES:
Total Points for Part 1 _____
Total Points for Part 2 _____
Total Points for Part 3 _____
Total Points for Part 4 _____
Total Points for Part 5 _____

Final Total Score (50 points max) _____
(Total points are awarded to each team member)