# Wildlife Habitat Education Program

18 USC 707

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# History of the National Wildlife Habitat Education Program

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

In 1990-91, the program was expanded nationally, and this manual was produced with sponsorship by Champion International Corporation and the U.S. Fish and Wildlife Service. The manual was revised in 1998-99 to reflect 4-H Leaders' suggestions over the years and to incorporate new information in wildlife science and management. The Ruffed Grouse Society, Rocky Mountain Elk Foundation, and the USDA Cooperative State Research, Education and Extension Service were added as sponsors of the manual revision. The manual incorporates the basic concepts originated by Byford and Hill with the addition of landscape regions across the U.S., urban activities, and a wider array of habitat wildlife management practices and wildlife species. Since 1991, the manual has undergone three major revisions (the latest in 2009), each incorporating new information as knowledge is added through wildlife research. This process is very important and highlights the need to always keep an open mind and strive to continue learning. Starting in 2010, FFA teams were invited to compete in WHEP. FFA teams and 4-H teams do not compete against each other, but rather against teams within each organization. Additionally, in 2010, the name Wildlife Habitat Evaluation Program was changed to Wildlife Habitat Education Program to reflect the intent of this program to provide curriculum on wildlife management in addition to the contest format.

This manual is intended for use in local programs and to prepare for the annual National Invitational Contest. It is the intent of the organizers to move the national contest to different locations each year. States without a wildlife habitat judging program are encouraged to prepare through local contests and to send a delegation to the national contest. This manual is designed to provide uniformity for the program and provide wildlife management information using representative species occupying major regions of the U.S.

**For information contact your State 4-H Office, County Extension Agent, or Wildlife Specialist.**

# Table of Contents

# Introduction

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

In this program, youth learn how management for wildlife includes management of habitat and populations. The information in this manual is provided to teach wildlife habitat management concepts and to prepare participants for 4-H natural resources competitive events. The manual and activities are focused not only on increasing knowledge in the wildlife management field, but also in developing skills to apply that knowledge. The invitational addresses these concepts with the following four activities:

1. on-site recommendation of wildlife management practices (individual activity);
2. written wildlife management plan (team activity) and an oral defense of the written plan (individual activity);
3. general wildlife knowledge (individual activity); and
4. wildlife identification test (individual activity).

Before making wildlife management recommendations, it is important to know all possible information about the life requirements of the species for which the area is being managed. The Concepts and Terms; Regions; Wildlife Species; Wildlife Management Practices; and Wildlife Management sections of this manual provide basic information related to wildlife ecology as well as the life requirements of various wildlife species.

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

# About the Manual

The manual is divided into the following major sections.

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

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

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

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

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

The **Activities** section refers to the competitive component of WHEP and provides resources to help contestants and coaches prepare for a WHEP contest. This section also contains information on how the national contest will be scored. All of the activities and scorecards that will be used for each region(s) are provided. A number of practice/study tools are also provided, such as blank score sheets for the WMP's portion of the contest and a written management plan worksheet.

**Scoring the Contest** explains the scoring procedure for the national contest.

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

# How to Use the Manual

Leaders and participants should first learn the concepts and terms. Then, locate and mark materials pertinent for a particular region. The basic steps are as follows:

**Determine which region to use.** This may be where a local, state or national contest is going to be held. Maps and region descriptions found in the Regions section should be used when making this decision. The wetlands and urban descriptions are applicable to all regions.

**Determine which wildlife species will be used.** A list of recommended species accompanies each region. There are many field guides and Web sites that provide photos of the applicable wildlife species.

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

**Locate and mark the appropriate Wildlife Management Practices in the wildlife management practices section.** Learning how various wildlife management practices affect wildlife species is critical. Not all wildlife management practices listed in the manual are used in every region.

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

# Preparing for Contests

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

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

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

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

Collecting pictures of the species from several different sources will help with the identification portion of the test.

Beginning and young 4-H'ers should not be expected to perform all the activities. Organizers of local and state events may limit activities for junior division participants. Written management plans and oral reasons may not be appropriate for this age group. Participants in the national event (ages 14 years to 19 years as of January 1 of the contest year) will be asked to perform all of the activities in this manual.

## General Rules and Guidelines

The national event will comply with all policies and guidelines for national 4-H competitive events.

### *I. Contestants and Eligibility:*

A. Each state is allowed to enter only one 4-H team and/or one FFA team or up to two 4-H individual contestants and/or two FFA individual contestants. A team will consist of no less than three and no more than four official entrants who are 4-H or FFA members in their state during the current year. If a state is unable to assemble a team, it may send up to two contestants to the individual events only.
B. All contestants must be at least 14 years old as of January 1 of the year of the contest and cannot be older than 19 years as of December 31 of the contest year.
C. An individual or team may enter the National 4-H Wildlife Invitational event only once during his/her 4-H and FFA career. For example, a team (or individual) may not compete as a 4-H team one year, then come back another year as an FFA team or individual.
D. The team of contestants must be certified as the official state entry by the state Extension or FFA director, or by a person designated by the director. The individuals or team may be selected by any procedures a state considers appropriate. It is required that each state obtain medical authorizations for participants and accompanying adults.

E. If a participant has an Individual Education Plan, a copy of the IEP and any special accommodations must accompany the official entry for the team. Once the IEP and accommodations are received, they will be reviewed. The WHEP National Committee will make all reasonable efforts to accommodate participants with IEPs.

Contestants in the National 4-H Wildlife Invitational must **not** have participated in official post-secondary (university, college, junior college or technical school) competitive events of a similar nature in the same subject matter area. Neither can participants be a member of a post-secondary team undergoing training in preparation for an event. For example, a contestant who has competed in an official collegiate wildlife contest, on or off campus, is ineligible to compete in the national contest. The state 4-H program leaders are responsible for determining the eligibility for participants in national 4-H competitive events from their respective states.

### *II. General Contest Rules and Information:*

The date, location and region for the National 4-H Wildlife Invitational will be announced no later than May 1 after the 4-H WHEP National Committee's spring meeting. When wetlands or urban areas are used, species from the region where the contest is held may also be used in the contest.

A. State team entries must be submitted through the official entry process.
B. Each team shall have no more than two adults at least 21 years of age accompanying the team to the invitational.
C. Although there will be educational opportunities before the contest begins, all contestants should study this manual and be prepared before coming to the national event. Questions will not be allowed during the contest except for those related to contest procedure.
D. A materials packet to supplement this manual may be available for leaders and participants in advance of the national event. The packet may contain information on region and wildlife species used in the upcoming event. The materials packet will be supplied by the Extension wildlife specialist, 4-H office or other qualified personnel from the state hosting the national event.
E. Contestants will be required to adhere to the host state's Code of Conduct. No alcohol, tobacco or drug use will be allowed during the event.
F. Contestants and coaches/chaperones are required to take part in all phases of the National 4-H Wildlife Invitational, including the opening ceremony, educational program, contest, fun activities, coaches tour, and awards banquet.

### *On Contest Day:*

A. All contestants must provide their own pen or pencil and clipboard.
B. No electronic devices of any kind are allowed at the contest site. This includes, but is not limited to, cell phones and ipods/mp3 players.
C. Absolutely no talking by contestants will be allowed during the contest, except when working on the designated team activity.
D. Anyone caught cheating may be disqualified at the discretion of the National WHEP Committee.
E. All adults, except contest officials, will be separated from contestants at all times while the contest is in progress. All adults must participate in the designated coaches' activity during contest day.
F. Contestants will work independently on Activity I, III, and IV. Activity II-A is a team event. Preparation for Activity II-B may also be completed as a team. Scorecards will be submitted to an official committee member immediately after each event.
G. An official committee will score the contest and analyze results. Their decision is final.
H. The team score will be the sum of the three highest scores in each of Activities I, III and IV, plus the team score for Activity II, which will include the top three scores for Activity II-B.
I. After the event, individual and team scores and justifications will be made available to the teams. Contest score sheets will not be distributed.
J. Distribution of awards is determined by the state host. However, every National 4-H Wildlife Invitational will recognize for both FFA and 4-H:
   First Place Team
   Second Place Team
   Third Place Team
   First Place High Individual (determined by activities I, III, and IV)
   Second Place High Individual (determined by activities I, III, and IV)
   Third Place High Individual (determined by activities I, III, and IV)

# Wildlife Management Concepts and Terms

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

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

Look up the definitions of words or terms you do not understand in a dictionary, wildlife management or ecology textbook, field guide or in the glossary found at the back of this manual.

## Concepts and Terms

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

## Communities and Ecosystems

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

## Habitat Requirements

"Habitat" represents the physical and biological resources (food, cover, water, space) required by wildlife for survival and reproduction. Habitat requirements are species specific. That is, not all species require the same resources in the same amount. Differences in habitat requirements among some species are subtle, while differences in habitat requirements among other species are dramatic. For example, habitat requirements for Northern bobwhite and Eastern cottontail are somewhat similar. They both require early successional cover, share some food resources, obtain water from plants and require relatively little area when food and cover resources are abundant. However, habitat requirements for Eastern gray squirrel and mourning dove are dramatically different, as they use different vegetation types and foods and have different space requirements.

It is important not to confuse "habitat" with habitat components. Some of the habitat components among wildlife species may be similar, while other components are not. For example, both Northern bobwhite and American kestrel require early successional cover, but while bobwhites primarily eat various plants, seed, mast and insects, kestrels prey on other animals and insects. Thus, even though they may use the same type of cover, their habitat requirements are different. Another example is from whitetailed deer. Whitetails thrive in areas with considerable interspersion. Thus, habitat for whitetailed deer usually includes several vegetation (or cover) types. These vegetation types might include mature oak-hickory forest, old fields undergoing succession, regenerating pine forest, brushy thickets and agricultural fields. Although some people may use the term "habitat type" interchangeably with "vegetation type," this is confusing and should be avoided.

Habitat requirements for wildlife often change through the year. Food and cover resources needed during one season may be much different than what is required or available during another. For example, wild turkey hens and their broods spend the night on the ground where there is adequate groundcover until the poults are able to fly. During summer, wild turkey broods use early successional areas with abundant forbs where they feed upon insects and are hidden from overhead predators. As young wild turkeys reach 2 to 3 weeks of age, they roost in trees and shrubs, and—as mast becomes available in the fall—wild turkeys are frequently found in mature hardwood forests when available.

## Focal Species

There are two basic goals in wildlife habitat management. One is to provide the habitat requirements for a particular, or focal, wildlife species. The other, which is explained later in this

Craig Harper

**A well-developed forest understory provides both cover and food resources for many species of wildlife.**

manual under Species Richness and Diversity, is to provide habitat requirements for multiple wildlife species in the same area.

When evaluating habitat, you must first determine the focal species. Landowners or the general public may have specific objectives or concerns about a particular species. Once the species is decided, determine the habitat requirements for the focal species and evaluate the capability of the area to provide those requirements. If one or more habitat requirements is in short supply or lacking, then various habitat wildlife management practices may be used to improve the area's ability to supply the needed requirements. Occasionally, the focal species may be totally incompatible with the available habitat and management goals must be changed.

It is usually best to select wildlife management practices that provide the habitat requirements most lacking and, thus, are limiting the population (limiting factors). For instance, if a species requires trees for cover with water nearby, and the area you are evaluating has plenty of trees but no water, a management practice that will supply water will improve the area more effectively than planting trees. When determining which wildlife management practices to apply, remember that wildlife management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage an area for any one species or group of species that require similar habitat without influencing other species in some manner. For example, if you plan a clearcut in a deciduous forest to benefit ruffed grouse, you may also benefit wild turkey, white-tailed deer and Eastern cottontail, while species such as ovenbird, wood thrush and Eastern gray squirrel, which prefer unbroken mature deciduous forest, will be forced to use another area.

Craig Harper

**When managing property for wildlife, it is important to identify the focal species for management. Not all species benefit from the same habitat and wildlife management practices.**

## Species Richness and Diversity

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

## Plant Succession and Its Effect on Wildlife

Plant succession involves an orderly change in the species of plants occurring in a particular area over time. In climates with sufficient rainfall, plant communities dominated with herbaceous species (nonwoody plants such as grasses, forbs and legumes) succeed to woody species. In drier climates, perennial (plants that live more than two growing seasons) grasses and forbs or shrubs may represent the ultimate, or climax, successional stage. In other words, the climax stage is the final stage of a site if no disturbance takes place. Disturbance events, such as fire, grazing, ice and wind storms, lightning and flooding—continually set back succession and the process starts over.

Succession occurs rapidly in areas with warm temperatures and abundant rainfall. For example, in the Eastern Deciduous Forest, grasses and forbs germinate from the seedbank

Craig Harper

**Plant succession involves a change in plant species composition over time. This field represents a relatively early successional stage with blackberry, persimmon, and scattered oak trees pioneering into perennial grasses (switchgrass and broomsedge)**

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

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

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

The compositional and structural changes of plants following disturbance events are fairly predictable within a given region. Thus, wildlife managers intentionally manage disturbance to provide the appropriate successional stage(s) for various wildlife species or groups of species. Wildlife management practices, such as prescribed burning, timber harvest, selective herbicide applications, grazing and disking—can be used in the absence or interruption of natural disturbance events. Alternatively, planting select plants and the lack of disturbance can be used to allow succession to advance.

Descriptions of a typical successional stage found in different regions of the U.S. can be found in the regions section of this manual. A description of the typical successional stage occurring in relation to water can be found in the wetland region description. Throughout this manual, successional stages have been numbered to help define plant communities and the structure they represent. In general, stages of plant succession that occur on land can be defined as:

Craig Harper

**Stage 1 – Bare ground.**

Craig Harper

**Stage 2 – Annual grasses and forbs.**

Chris Wolkonowski

**Stage 3 – Perennial grasses and forbs.**

Craig Harper

**Stage 4 – Brushy cover, composed primarily of shrubs.**

Craig Harper

**Stage 5 – Young forest.**

Craig Harper

**Stage 6 – Mature forest.**

Although successional stages have been defined and numbered here for simplicity, successional stage sometimes can be difficult to distinguish. That's because succession is continual, and one successional stage gradually develops into the next. When using the designations above, consider the dominant plants in the area you are considering. For example, both annual and perennial grasses and forbs are often present in early successional areas. Brushy areas often slowly develop into young forest, depending on the species present. If tree species dominate, the canopy is beginning to close, and the understory is beginning to open, it is a young forest. The structure is no longer representative of brushy cover. Is it a forest or a woodland? A savanna or grassland? These can be differentiated by tree density. In general, a forest is defined as an area with more than 60 square feet of basal area (a relatively dense stand of trees). A woodland contains 20 square feet to 60 square feet of basal area (a lot of trees, but widely spaced apart), a savanna contains

Craig Harper

**Oak savannas and woodlands represent early successional vegetation with scattered trees. Without continued fire, oak savannas and woodlands would succeed into forests.**

Craig Harper

**The vertical structure in this mature oak/hickory forest provides cover and food resources for a suite of forest songbird species that otherwise would not be found here.**

5 square feet to 20 square feet of basal area (only a few trees, very widely spaced apart) and a grassland has less than 5 square feet of basal area (very few, if any, trees).

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

## Vertical Structure

In a forest or woodland, there may be three distinct layers of vegetation. The understory is composed of those plants growing near the ground, up to 4.5 feet tall. The understory may be very diverse and include grasses, forbs, ferns, sedges, shrubs and young trees. The midstory is represented primarily by shrubs and trees more than 4.5 feet tall yet below the overhead canopy. The overstory is made up of those trees in the canopy. How the different layers of vegetation are arranged in relation to each other is important to many wildlife species. For example, some birds may require a herbaceous understory for feeding but nest in the overstory. The forest structure may vary dramatically from site to site, even within a given forest type. For example, one mature oak-hickory forest might have a well-developed understory and midstory with visibility of no more than 20 feet, while another has very little understory vegetation and no midstory at all. Although they are the same forest type, these two forests would not necessarily provide suitable habitat for the same wildlife species. The structure could be manipulated on these sites depending on the objectives.

## Arrangement and Interspersion

How different successional stages or vegetation types are situated in relation to each other is often referred to as horizontal arrangement or juxtaposition. While some wildlife species obtain all their habitat requirements from only one successional stage, many wildlife species need more than one successional stage to provide all their habitat requirements (see the Habitat Requirements). For example, ruffed grouse may forage on acorns in mature mixed-hardwood stands during fall and winter but use young forest stands with high tree stem densities during this time for escape cover. Likewise, when a field with abundant forb cover is located near a field containing native warm-season grasses, distance from nest sites to brooding areas are reduced for Northern bobwhite. Required successional stages must be close to each other to allow for safe travel to and from those areas. This is especially true for species with relatively small home ranges. Managing areas of different successional stages within a landscape is called interspersion. Usually, more interspersion supports a greater diversity of wildlife. A way to es-

Craig Harper

**The arrangement of vegetation types and successional stages directly influences animal movements and home range size. Here, nesting cover, brooding cover, and escape are all arranged in close proximity (juxtaposed) to favor habitat requirements for Northern bobwhite.**

timate the amount of interspersion is explained in the activities section. However, as discussed in Edge, increased interspersion is not necessarily beneficial to all species. As interspersion increases, so does the amount of edge.

## Edge

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

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

The concept of edge is important in wildlife management. If there is increased edge, then there is increased interspersion of vegetation types or successional stages. This may be beneficial for a particular wildlife species if:

John Weir

**The abrupt change in species composition and structure shown here is typical of a hard edge.**

Craig Harper

**Allowing native grasses, forbs, and brambles to grow into the field from a woods edge increases the amount of "usable space" for many wildlife species by providing suitable cover and food resources.**

- the types or stages present provide some habitat requirement;
- the arrangement of the types or stages is suitable and within the home range (see home range) of the focal species (see arrangement and interspersion); or
- the specific vegetation types and successional stages for the focal species are in proximity.

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

It is important to realize the presence of edge is not always beneficial for any wildlife species.

If the vegetation types or successional stages present do not provide any habitat requirement for the species in question, the interspersion and resulting edge is meaningless. Thus, looking at an aerial photo and counting the number of times two vegetation types or successional stages meet is not necessarily a good measure of habitat quality for any particular species. Also, some species may actually avoid edges and seek areas that are uniform.

Further, some species often found along an edge have been relegated to use the edge because the interior of the adjacent vegetation type is unattractive or does not provide any habitat requirement. For example, wild turkey and Northern bobwhite broods might be found along the edge of a field dominated by tall fescue or bermudagrass. The reason the birds are not in the field is not because they necessarily like the edge, but because there is not suitable cover or food resources in the field, or the structure of the vegetation in the field is so thick at ground level the birds cannot walk through it. Thus, if the composition and structure of the field was improved to provide high-quality, early succcessional cover for quail and turkeys, there would be as many birds in the middle of the opening as along the edge. As a result, there would be more usable space for the birds and the carrying capacity of the property would be increased (see biological carrying capacity). The edge is not what is necessarily important, but rather the composition and structure of the vegetation.

John Gruchy

**For those wildlife species considered "edge" species, the physical edge presented where 2 vegetation types or successional stages meet is not as important as the actual structure presented within a vegetation type or successional stage.**

Craig Harper

**Some species do not require much space to live. An Eastern gray squirrel or Eastern box turtle might spend their entire lives on only a few acres. Other species, however, require considerable area. Grasshopper sparrows, for example, are rarely found in grasslands smaller than 100 acres.**

## Area Sensitive Species

Fragmentation is the disruption of vegetation types either man-made or by natural processes. All wildlife species do not respond to fragmentation the same way. For some, the edge between a young forest and an older forest may fragment their habitat, while others may not respond to fragmentation except under extreme circumstances such as an interstate highway bisecting a forest or prairie. Some species need large, unfragmented areas in a certain successional stage to provide some or all of their habitat requirements. Such species are referred to as area sensitive. For these species, large areas in one successional stage are desirable. Unfragmented habitat of at least 100 acres is considered the minimum requirement for many area sensitive species. Some species, such as the grasshopper sparrow, may require a minimum of 1,000 acres of relatively unfragmented habitat to sustain a viable population. Others, such as the prairie chicken, may require 30,000 acres of relatively unfragmented habitat.

## Home Range, Corridor, Movements and Migration

A home range is the area in which an animal lives. For every species, home range size is re-

lated to habitat quality. Daily movements include those for normal day-to-day activities. In higher-quality habitat, home ranges tend to be smaller than in poor habitat because movements necessary to obtain habitat requirements are reduced. A seasonal home range can be defined if an animal uses a different area during different seasons. A seasonal movement, or migration, is made when an animal moves from one seasonal home range to another. Migration for many species, such as waterfowl and songbirds, involves movements to and from wintering and nesting areas, but this is not true for all species. For example, elk and some species of grouse migrate from high elevations to lower elevations each spring and fall, as food availability varies with the seasons.

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

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

## Carrying Capacity

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

Biological carrying capacity varies from season to season and often from year to year. For most species, it is usually greatest from late spring through fall when food and cover are most abundant. This is when most young are born, which helps ensure adequate nutrition and cover are available for growth and survival. With the coming of winter or summer drought, food and cover gradually diminish.

More animals are produced each year than will survive. Surplus animals are lost to predation, starvation, competition or disease. Young wildlife and animals in poor health experience the highest mortality rates. Hunting and fishing remove some animals and help prevent overpopulation for some species.

In suburban areas, the biological carrying capacity may be able to support a given number of animals. However, humans may demand the density of certain wildlife be lower because of wildlife damage issues. For example, white-tailed deer populations can thrive in suburban areas where the biological carrying capacity is relatively high because deer have adapted to feed successfully on ornamental plants. However,

Craig Harper

**Any area is only able to support a certain number of animals before available food and cover resources are depleted. Here, overabundant white-tailed deer have exceeded the carrying capacity of the area. Chronic overbrowsing has eliminated the forest understory and thus negatively affected many other wildlife species that require understory vegetation for nesting, feeding, roosting, or escape cover.**

homeowners have low tolerance for deer feeding on expensive landscape plants. Thus, the deer population must be reduced to limit damage. In this case, the cultural carrying capacity is lower than the biological carrying capacity.

## Pond Dynamics, Pond Balance and Stream Habitat

A properly managed pond can provide excellent fishing and can benefit many species of wildlife. The basics of a well-managed pond are properly stocking the right species, a balanced harvest, proper fertilization, a stable water level and aquatic weed control. Pond balance occurs when a balance between prey and predator fish is established and maintained. In most warm-water ponds, bluegill is the prey species and largemouth bass is the predator species. In cold-water ponds, a trout species is usually the predator, and insects and small fish are prey. Balance between predator and prey is achieved by establishing an adequate food chain for the prey species and controlling the prey and predator species numbers through fishing.

Phytoplankton (microscopic algae) are the base of the pond food chain. Zooplankton and aquatic insects feed on phytoplankton, which are eaten by small fish. Small fish are eaten by larger fish. Managing phytoplankton through fertilizing and liming (if necessary) is the key to producing abundant and healthy fish populations. Suspended mud in ponds blocks sunlight, and algae cannot bloom. Excessive water exchange through the pond prevents adequate phytoplankton blooms because fertilization is diluted.

Low water levels can cause significant problems also. Improperly constructed or damaged spillways can lead to excessive dam erosion. Low water levels, resulting from damaged spillways or improperly sloped banks, can lead to excessive aquatic vegetation along pond margins.

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

Dwayne Elmore

**Clean water is essential for healthy aquatic life. Water quality is improved and fish populations benefit when sufficient vegetation is present along riparian areas to buffer sedimentation and nutrient run-off.**

Riparian buffers are vegetated areas along streams and ponds. They may be forested or grassy depending on the water body. Vegetated buffers are important to maintain streambank stability as the roots of the vegetation along the stream help to hold the soil in place along the stream. Additionally, the above ground vegetation in buffers filters sediment from water moving into the stream or pond after rainfall events. Thus, water quality is impacted by the amount of buffer along these wetlands. Finally, buffers of vegetation provide shade to keep the water temperatures during summer lower, which may allow for cold-water fish species to survive.

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

spawn. Riparian buffers (such as grass or forest plant communities) are important to filter sediment entering aquatic systems. They can also regulate water areas and provide wildlife habitat.

## Food Webs

A food web is a network of interconnected food chains, which are the step-by-step passage of material 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, 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 these categories are very broad and general. Many animals fit into more than one group, and there are more complex levels of the web. An example of this is an omnivore, which is an animal that eats both plant and animal matter.

Any of the food web components mentioned above can be broken down by decomposers—organisms such as bacteria and fungi that reduce dead plant or animal matter into smaller particles. A decaying plant, for example, will be broken down into nutrients that enrich the soil. This process supports the growth of more plants.

## Invasive Species

Many plants and animals have been introduced, either accidentally or intentionally, into the United State from around the world. Some of these species became established and have proven to be persistent and competitive with native plants and animals. Often these species are successful because the climate is similar to that from which they originated and when introduced into a new area they no longer have natural pests and competitors that may have limited them in their original location. These plants are known as invasive species.

Alan Windham

**Predators, such as this red-tailed hawk, are necessary to buffer populations of various prey species. For most predators, when one prey species begins to decline, other prey species become more prevalent in the diet.**

Invasive species can contribute to loss of habitat for native species and cause these native species to decline. This poses a considerable challenge for natural resource managers. Often these invasive species are difficult to control or eradicate. Prescribed fire, herbicide, mechanical removal, and other methods are commonly used to limit their impact on native species. In some instances biological control, such as an insect pest, may be used. Not only do invasive species impact native wildlife and plants, they also impact agriculture production, water resources, municipal capacity, and even human health and safety. Every effort should be made to prevent the introduction of exotic species that are likely to become invasive.

# Regions

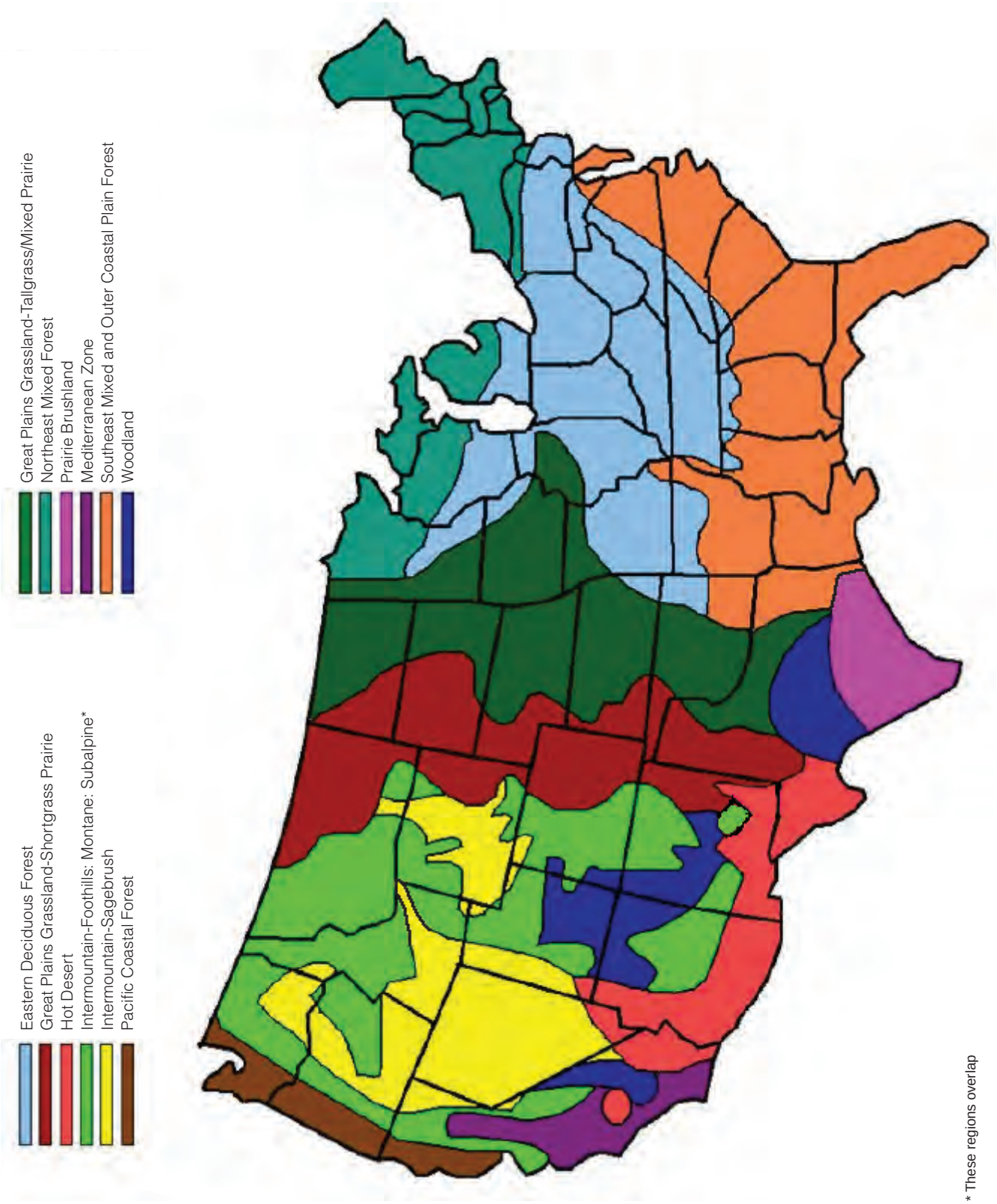
Areas of the country can be separated into regions having similar climate, vegetation and wildlife. They are described in very general terms. The wetland and urban regions may be used in any of the regions where they occur.

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

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

## Index to Regions

# Map of Regions




* These regions overlap

# Eastern Deciduous Forest

## Physical Description

Most of the terrain is rolling except for the Appalachian Mountains and Ozark Mountains, which can be steep. The average annual precipitation ranges from approximately 35 inches to 90 inches and is usually well-distributed throughout the year. Summers are hot; winters are cold.

Craig Harper

**Many species of trees and shrubs are present in this mature Eastern Deciduous Forest and provide well-developed vertical structure.**

Craig Harper

**Not all wildlife species use mature forest. This young Eastern Deciduous Forest provides necessary habitat components for species such as brown thrasher and ruffed grouse.**

## Dominant Vegetation

Depending upon site, the final stage of succession is dominated by a variety of deciduous trees. Depending on geographic location, trees such as oaks, hickories, maples, American beech, basswood, buckeye, yellow poplar, walnut and birches can be indicators of climax vegetation. Common evergreen trees on many sites undergoing succession include Virginia pine shortleaf pine, and eastern redcedar.

In the Appalachians, Eastern hemlock has been an important component in the Eastern Deciduous Forest. However, its decline following invasion of the Asian hemlock adelgid will surely lead to functional changes within this region. Changes in the composition, structure and function of the Eastern Deciduous Forest have already occurred during the past 100 years with the loss of American chestnut and the near total exclusion of fire. Prior to fire suppression, oak savannas and woodlands were prevalent over much of this region. Prevalent midstory trees include flowering dogwood, sassafras, sourwood, Eastern redbud, hophornbeam, American hornbeam and striped maple. Common shrubs include arrowwood, black huckleberry, blueberries, hawthorn, pawpaw, spicebush, viburnums and witchhazel. A wide variety of forbs and ferns may be found in the understory. Well-interspersed with forested areas are fields undergoing succession containing a wide variety of grasses and forbs. Virtually all of these “old fields” have been cropped in the past, and the vast majority has since been planted to non-native grasses. Restoring early successional areas with native grasses and forbs is a major objective concerning wildlife conservation in this region. Native grasses, forbs, shrubs and brambles occurring naturally in openings and savannas include bluestems, panicgrasses, indiangrass, switchgrass, asters, lespedezas, tick trefoils, partridge pea, pokeweed, wild plum, sumacs and blackberry.

Typical invasive plants in the Eastern deciduous forest include tall fescue, orchard grass, timothy, sericea lespedeza, Bradford pear, Russian olive, and bicolor lespedeza.

## Farming and Ranching

Large areas of Eastern Deciduous Forest have been cleared of native vegetation for crop production and livestock forage. Depending on how croplands and pastures are managed, some wildlife species benefit from farming. Unfortunately, the vast majority

of pasture and hayland are composed of non-native grasses that are not beneficial for wildlife.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial forbs and grasses, Stage 4 — brushy cover, Stage 5 — young forest, Stage 6 — mature forest.

## Species Recommended for Judging

black bear
bluegill
bobcat
box turtle
brown thrasher
Eastern bluebird
Eastern cottontail
Eastern gray squirrel
great horned owl
largemouth bass
mourning dove
Northern bobwhite
ovenbird
ruffed grouse
white-tailed deer
wild turkey
wood duck

# Eastern Deciduous Forest

| Food Groups | black bear | bluegill | bobcat | box turtle | brown thrasher | Eastern bluebird | Eastern cottontail | Eastern gray squirrel | great horned owl | largemouth bass | mourning dove | Northern bobwhite | ovenbird | ruffed grouse | white-tailed deer | wild turkey | wood duck |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | | | | | | | | | | | | x |
| Bark | | | | | | | x | x | | | | | | | | | |
| Birds | | | x | | | | | | x | x | | | | | | | |
| Buds | x | | | | | | x | x | | | | x | | x | x | x | |
| Carrion | x | | x | x | | | | | | | | | | | | | |
| Crayfish | x | x | | | x | | | | | x | | | | | | | |
| Earthworms | | x | | x | | | | | | x | | | | | | | |
| Eggs | | x | | x | | | | x | | | | | | | | | |
| Fish | x | x | | | | | | | | x | | | | | | | |
| Forbs | x | | | x | | | x | | | | | x | | x | x | x | |
| Frogs & Salamanders | | x | | | x | | | | x | x | | | | | | | |
| Fungi | x | | | x | | | | x | | | | | | | x | | |
| Grain | x | | | | x | | x | x | | | x | x | | | x | x | x |
| Grass | x | | | x | | | x | | | | | | | | x | x | |
| Hard Mast | x | | | | x | | | x | | | | x | | x | x | x | x |
| Insects and Spiders | x | x | | x | x | x | | x | x | x | | x | x | x | | x | x |
| Leaves & Twigs | x | | | | | | x | x | | | | | | x | x | x | |
| Lizards | | | | | x | | | | x | | | | | | | | |
| Mammals | x | | x | | | | | | x | | | | | | | | |
| Seeds | x | | | | x | | | x | | | x | x | | x | | x | x |
| Snails | | | | x | x | | | | | | x | x | | x | | x | x |
| Snakes | | | x | | x | | | | x | x | | | | | | | |
| Soft Mast | x | | | x | x | x | x | x | | | | x | | x | x | x | x |
| Tubers | x | | | | | | | | | | | | | | | x | |

# Eastern Deciduous Forest

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

# Great Plains Grasslands – Shortgrass Prairie

## Physical Description

The terrain is flat to rolling with occasional valleys, canyons, mesas and buttes. Average annual precipitation ranges from 10 inches to 25 inches. Precipitation increases from north to south and is received primarily as summer rain and winter snow. Evaporation usually exceeds precipitation.

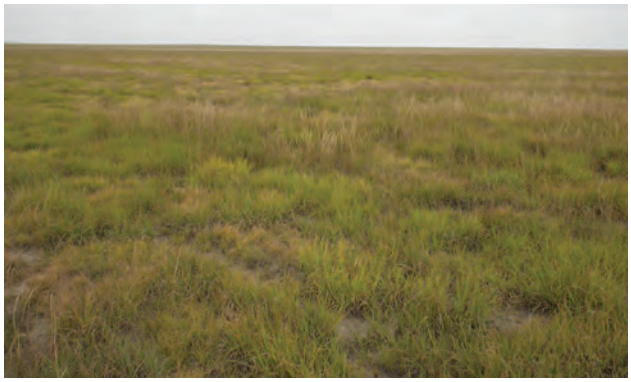
## Dominant Vegetation

In the western Great Plains (or shortgrass prairie), climax vegetation typically consists of short grasses such as the gramas, buffalo grass, needle grasses and wheatgrasses. In many areas, various species of shrubs—such as sagebrush, sumacs, salt bush and winterfat—are found mixed with the grasses. Locoweed, sunflowers, ragweed, lupine and herbaceous sage are common forbs present in this area.

Within this region, there are large areas along major rivers and drainages dominated by trees and shrubs such as cottonwood, red maple, bur oak, American elm, box elder and various willows. These sites are very attractive to species of wildlife that require late stage of plant succession.

Depressions (potholes) caused by glaciation in the north and closed drainages (playas) in the south fill with water, creating numerous wetlands that are extremely valuable to wildlife. These wetlands, especially the smaller ones, are susceptible to periodic droughts.

Typical invasive plants in the Shortgrass include cheatgrass, old world bluestem, saltcedar, yellow sweet clover, knapweed, and leafy spurge.



Dwayne Elmore

**Shortgrass prairie is dominated by low growing grasses such as this.**

Dwayne Elmore

**In some areas of prairie, shrubs such as yucca provide important diversity that several wildlife species require.**

## Farming and Ranching

Cultivated cropland is found in portions of this region. Where precipitation is adequate or where irrigation is possible, large areas are planted into agricultural crops such as cereal grains, grain sorghum, flax, sunflowers and alfalfa.

Changes in farm machinery and management have produced large areas of cropland with little or no native vegetation available for use by wildlife. Recent irrigation water management techniques have reduced the amount of wetlands and riparian vegetation associated with irrigated crops. In the past, large areas of wetlands were drained or altered in some manner so crops could be grown and this practice continues. Much of this area is native rangelands, most of which is grazed by livestock, except for a few locations where terrain is too rugged or water is unavailable. Many acres of rangeland and former cropland have been converted to introduced grasses such as Old World bluestem and smooth brome, which have limited wildlife value.

***Special***: Planting trees for wildlife in this region is only recommended in areas where trees would have occurred historically such as in riparian areas or major drainages. The historic occurrence of these trees was influenced by soils, moisture and fire.

## Plant Succession Stage

Stage 1 – bareground, Stage 2 – annual forbs and grasses, Stage 3 – perennial grasses and forbs, Stage 4 – shrubs/brush are also found mixed with Stage 3, Stage 5 – young woodland, Stage 6 – mature woodland. Stages 5 and 6 are found along stream and river courses, Stages 3 and/or 4 are usually the final stage of succession in this region.

## Species Recommended For Judging

American kestrel
black-tailed prairie dog
bluegill
blue-winged teal
coyote
largemouth bass
lark bunting
mallard
mourning dove
mule deer
Northern harrier
pronghorn
scaled quail
sharp-tailed grouse
Western hognose snake

# Great Plains Grassland: Shortgrass Prairie

| Food Groups | American kestrel | black-tailed prairie dog | bluegill | blue-winged teal | coyote | largemouth bass | lark bunting | mallard | mourning dove | mule deer | Northern harrier | pronghorn | scaled quail | sharp-tailed grouse | Western hognose snake |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | x | | | | x | | | | | | | |
| Bark | | | | | | | | | | x | | | | | |
| Birds | x | | | | x | x | | | | | x | | | | x |
| Buds | | | | | | | | | | x | | x | | x | |
| Carrion | | | | | x | | | | | | | | | | |
| Crayfish | | | x | | | x | | | | | | | | | |
| Earthworms | | | x | | | x | | | | | | | | | |
| Eggs | | | x | | x | | | | | | | | | | x |
| Fish | | | x | | | x | | | | | | | | | |
| Forbs | | x | | x | | | | | | x | | x | x | x | |
| Frogs & Salamanders | | | x | | x | x | | | | | x | | | | x |
| Fungi | | | | | | | | | | x | | | | | |
| Grain | | | | x | | | x | x | x | x | | | x | x | |
| Grass | | x | | | | | | | | x | | x | x | x | |
| Hard Mast | | | | | | | | x | | x | | | | | |
| Insects & Spiders | x | | x | x | x | x | x | x | x | | | | x | x | x |
| Leaves & Twigs | | | | | | | | | | x | | x | | x | |
| Lizards | | | | | x | | | | | | x | | | | x |
| Mammals | x | | | | x | x | | | | | x | | | | x |
| Seeds | | x | | x | | | x | x | x | | | | x | x | |
| Snails | | | | x | | | | x | | | | | | | |
| Snakes | | | | | x | x | | | | | x | | | | x |
| Soft Mast | | | | | x | | | | | x | | | x | x | |

## Great Plains Grassland: Shortgrass Prairie

| | American kestrel | black-tailed prairie dog | bluegill | coyote | largemouth bass | lark bunting | mallard | mourning dove | mule deer | Northern harrier | pronghorn | scaled quail | sharp-tailed grouse | western hognosed snake |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | X | X | X | X | | | | X | | X | X | X | |
| Delay Crop Harvest | | | | | | X | X | | | X | | | X | |
| Establish Field Buffers | X | | | X | | | | | X | | | X | X | |
| Establish Native Grasses and Forbs | X | X | | X | | X | X | X | X | X | X | X | X | X |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | | | | X | | | | | X | | | | | |
| Increase Harvest | | X | X | X | X | | | | X | | X | | | |
| Leave Grain Unharvested | | | | | | | X | X | X | | | X | X | |
| Manage disturbance | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Nesting Structures | X | | | | | | X | | | | | | | |
| Plant / Manage Food Plots | | | | | | | X | X | X | | X | | X | |
| Plant Shrubs | X | | | X | | | | X | X | | | X | X | |
| Plant Trees | X | | | | | | | | X | | | | | |
| Ponds: Construction | | | X | | X | | | | | | | | | |
| Ponds: Deepen Edges | | | X | | X | | | | | | | | | |
| Ponds: Fertilize / Lime | | | X | | X | | | | | | | | | |
| Ponds: Reduce Turbidity | | | X | | X | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | X | | X | | | | | | | | | |
| Ponds: Restock | | | X | | X | | | | | | | | | |
| Create Snags | X | | | | | | | X | | | | | | |
| Tillage Management | X | | | | | | X | X | X | X | | X | X | |
| Water Control Structures | | | X | | X | | X | | | | | | X | |
| Water Developments for Wildlife | | | | | | | | X | X | | X | X | | |
| Wildlife Damage Management | | X | | X | | | | | X | | X | | | |

# Great Plains Grasslands – Tallgrass/Mixed Prairie

## Physical Description

The terrain is characterized by flat to rolling plains. Average annual precipitation ranges from 20 inches to 40 inches. Precipitation increases from west to east and is received primarily as summer rain and winter snow. Winters are cold; summers are hot.

## Dominant Vegetation

In undisturbed areas, climax vegetation in the eastern Great Plains (or tallgrass prairie) is typically tall grasses such as various bluestems, indiangrass and switchgrass. A variety of forbs are also found such as sunflowers, broomweed, ragweed and lespedezas. Sedges, buttonbush, cottonwood, willow, and other shrubs and trees are often present in drainages, stream courses and other moist areas.

Within the entire Great Plains grasslands region, there are large areas along major rivers and drainages dominated by trees and shrubs such as cottonwood, green ash, red maple, bur oak, American elm, box elder, eastern red cedar and various willows. Because of the abundant vegetation and readily available water, these sites are very attractive to various wildlife species that are adapted to woody vegetation.

In the southeast part of the tallgrass prairie, a mixture of woodland dominated by post oak and blackjack oak exists on upland sites. This area is known as the Cross Timbers. It extends from northern Texas through central Oklahoma into Kansas. All of these vegetation types were historically maintained by a combination of grazing and fire. The lack of fire is a major cause of rangeland deterioration throughout this region.

Depressions (potholes) caused by glaciation in the north and closed drainages (playas) in the south fill with water, creating numerous lakes, ponds and other wetlands that are extremely valuable to wildlife. These wetlands, especially the smaller ones, are susceptible to periodic droughts.

***Special***: Planting trees for wildlife in this region is only recommended in areas where trees would have occurred historically such as in riparian areas or major drainages. The historic occurrence of these trees was influenced by soils, moisture and fire.

Typical invasive plants in the Tallgrass include serecia lespedeza, Bermudagrass, Canada thistle, smooth brome, musk thistle, and tall fescue.

Dwayne Elmore

**Large expanses of prairie are critical to many grassland species such as the greater prairie-chicken.**

Dwayne Elmore

**Prairie is not only composed of grasses, but forbs are equally important. This recently burned prairie has abundant forbs and bare ground.**

## Farming and Ranching

The central Great Plains (or mixed-prairie area) consists of a mix of short, intermediate and tall grasses depending on the site. Tall grasses dominate moist sites with soil depth greater than 20 inches such as flood plains and valleys. Dry sites such as hill tops and south facing slopes are dominated by shortgrass species. Transition sites (between areas) consist of a mixture of tall, mixed and short grasses. In addition to the grass species mentioned previously, bluegrasses, prairie sandreed, grama grasses and various dropseeds are found in this area. Drainages and other moist areas may have shrubs and trees such as native plum, buttonbush and cottonwood.

Cultivated cropland is found in portions of this region. Where precipitation is adequate or irrigation is possible, large areas are planted into agricultural crops such as barley, wheat, millet, flax, oats, mustard, corn, sunflowers and alfalfa. In the eastern part of the Great Plains and other areas where soil is fertile, the main crops are wheat, sugar

beets, corn, soybeans, grain sorghum, edible beans and alfalfa.

Changes in farm machinery and management have produced large areas of cropland with little or no other types of vegetation available for use by wildlife. Recent irrigation water management techniques have reduced the amount of wetlands and riparian vegetation associated with irrigated crops.

Most of the native range is grazed by livestock except for a few locations where terrain is too rugged or water is unavailable. Many acres of native rangelands in this region are being invaded by eastern redcedar because of fire suppression. Fire is a critical component to rangeland and forest health. The current lack of fire is the greatest threat to wildlife in this region.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial grasses and forbs, Stage 4 — shrubs occur most frequently on moist sites in mid and eastern areas, also found mixed with Stage 3 in western areas, Stage 5 — young woodland and Stage 6 — mature woodland. Stages 5 and 6 are found along stream and river courses and are more common in the eastern parts of the Great Plains. Stages 3 and/or 4 are commonly the final stage of succession in this region.

## Species Recommended For Judging

bluegill
blue-winged teal
coyote
dickcissel
Eastern cottontail
grasshopper sparrow
greater prairie-chicken
largemouth bass
mourning dove
Northern bobwhite
Northern harrier
ring-necked pheasant
Western hognose snake
white-tailed deer
wild turkey

## Great Plains Grassland: Tallgrass-Mixed Prairie

| | bluegill | blue-winged teal | coyote | dickcissel | Eastern cottontail | grasshopper sparrow | greater prairie-chicken | largemouth bass | mourning dove | Northern bobwhite | Northern harrier | ring-necked pheasant | Western hognose snake | white-tailed deer | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aquatic Plant** | | x | | | | | | | | | | | | | |
| **Bark** | | | | | x | | | | | | | | | x | |
| **Birds** | | | x | | | | | | | | | | | | |
| **Buds** | | | | | x | | | | | x | | x | | x | x |
| **Carrion** | | | x | | | | | | | | | | | | |
| **Crayfish** | x | | x | | | | | x | | | | | | | |
| **Earthworms** | x | | | | | | | x | | | | | | | |
| **Eggs** | x | | x | | | | | x | | | | | x | | |
| **Fish** | x | | | | | | | x | | | | | | | |
| **Forbs** | | | | | x | | x | | | x | | x | | x | |
| **Frogs & Salamanders** | x | | x | | | | | x | | | | | x | | |
| **Fungi** | | | | | | | | | | | | | | x | |
| **Grain** | | x | | x | x | | x | | x | x | | x | | x | x |
| **Grass** | | | | | x | | x | | | | | x | | x | x |
| **Hard Mast** | | | | | | | | | | x | | x | | x | x |
| **Insects and Spiders** | x | x | x | x | | x | x | x | x | x | | x | x | | x |
| **Leaves & Twigs** | | | | | x | | x | | | | | x | | x | x |
| **Lizards** | | | x | | | | | | | | x | | x | | |
| **Mammals** | | | x | | | | | | | | x | | x | | x |
| **Seeds** | | x | | x | x | x | x | | x | x | | x | | | x |
| **Snails** | | x | | | | | | x | | | | | | | x |
| **Snakes** | | | x | | | | | x | | | x | | x | | x |
| **Soft Mast** | | | x | | x | x | x | | | x | | x | | x | x |

## Great Plains Grassland: Tallgrass/Mixed Prairie

| | bluegill | blue-winged teal | coyote | dickcissel | Eastern cottontail | grasshopper sparrow | greater prairie-chicken | largemouth bass | mourning dove | Northern bobwhite | Northern harrier | ring-necked pheasant | Western hognose snake | white-tailed deer | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | X | | X | | X | | X | X | | X | | X | | X | X |
| Delay Crop Harvest | | | | X | | X | X | | X | | X | X | | X | X |
| Establish Field Buffers | | | X | X | X | | X | | | X | | X | | X | X |
| Establish Native Grasses and Forbs | | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | | | X | | X | | | | | X | | | | X | X |
| Increase Harvest | X | | X | | X | | | X | | | | X | | X | X |
| Leave Grain Unharvested | | X | | X | X | | X | | X | X | | X | | X | X |
| Manage disturbance | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Plant / Manage Food Plots | | X | | | X | | X | | X | X | | X | | X | X |
| Plant Shrubs | | | X | | X | | | | X | X | | X | | X | X |
| Plant Trees | | | | | | | | | | | | X | | X | X |
| Ponds: Construction | X | | | | | | | X | | | | | | | |
| Ponds: Deepen Edges | X | | | | | | | X | | | | | | | |
| Pond: Fertilize / Lime | X | | | | | | | X | | | | | | | |
| Ponds: Reduce Turbidity | X | | | | | | | X | | | | | | | |
| Ponds: Repair Spillway/ Levee | X | | | | | | | X | | | | | | | |
| Ponds: Restock | X | | | | | | | X | | | | | | | |
| Create Snags | | | | | | | | | X | | | | | | |
| Tillage Management | | X | | X | X | | X | | X | X | X | X | | X | X |
| Water Control Structures | X | X | | | | | | X | | | | | | | |
| Water Developments for Wildlife | | X | | | | | | | X | | | | | X | X |
| Wildlife Damage Management | | | X | | X | | | | | | | X | | X | X |

# Hot Desert

## Physical Description

The terrain is relatively flat to rolling with isolated buttes and mountains. Annual precipitation varies from 2 inches to 25 inches depending on elevation, but seldom exceeds 7 inches over most of the region. Moisture is usually received in the form of short, violent storms or cloudbursts in the summer and fall.

Summers are hot; winters are cool. There are extreme differences in the daily high and low temperatures, which encourage nightly dew formation. Where precipitation is low, dew formation is important as a water source for wildlife.

## Dominant Vegetation

Vegetation is sparse and dominated by cacti and thorny shrubs over most of the region. Depending on the location within the region, the most common plants are creosote bush, bur sage, chamise, paloverde, ocotillo, saguaro, and cholla. Shrubs are often widely spaced with a few short annual grasses growing among them. After rains, many flowers and grasses appear—quickly go to seed—and disappear until the next rain.

Dwayne Elmore

**Plants in the hot desert are adapted for high temperatures and low rainfall. Many species of cacti, grasses, and shrubs dominate.**

Dwayne Elmore

**While deserts may appear barren, there are many species that occur here.**

Vegetation associated with river and stream courses is often composed of different species and is more abundant than in the surrounding areas. These riparian areas are dominated by cottonwoods, willows, tamarisk, mesquite, and a variety of grasses and forbs. The abundance and variety of vegetation and presence of water compared to the surrounding desert makes riparian areas very attractive to wildlife.

Typical invasive plants in the hot desert region include African rue, Malta starthistle, Russian knapweed, medusahead, bufflegrass, and Saltcedar.

## Farming and Ranching

Water is diverted from large rivers such as the Colorado to irrigate orchards, grain, hay and vegetable crops. Irrigation water is expensive, which encourages the use of modern irrigation systems that do not waste much water. When waste water is present, it supports a wide variety of vegetation and wetlands not common to this region. Wildlife species not normally associated with the desert are found in these areas.

Livestock grazing is an important use of this region where water is available or can be developed. Riparian and wetland areas are attractive for livestock grazing, which must be managed to avoid damage to wildlife habitat.

## Plant Succession Stage

Plant succession is not conspicuous in the desert. When vegetation is disturbed, it is often replaced by the same type without intervening stages. Replacement of disturbed vegetation can take a long time because of the harsh environment. Stages 1, 2, 3 and 4 are present, with 4 being the final stage in most areas. Stages 5 and 6 are present in limited amounts only along rivers and streams.

## Species Recommended for Judging

American kestrel
black-tailed prairie dog
black-throated sparrow
bluegill
bobcat
coyote
crissal thrasher
desert cottontail
Gambel's quail
ladder-backed woodpecker
largemouth bass
mallard
mule deer
pronghorn
Northern raccoon
red-tailed hawk
white-winged dove

## Hot Desert

| Food Groups | American kestrel | black-tailed prairie dog | black-throated sparrow | bluegill | bobcat | coyote | crissal thrasher | desert cottontail | Gambel's quail | ladder-backed woodpecker | largemouth bass | mallard | mule deer | Northern raccoon | pronghorn | red-tailed hawk | white-winged dove |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | | | | | | | x | | | | | |
| Bark | | | | | | | | x | | | | | x | | | | |
| Birds | x | | | | x | x | | | | | x | | | x | | x | |
| Buds | | | | | | | | x | x | | | | x | | x | | |
| Carrion | | | | | x | x | | | | | | | | x | | | |
| Crayfish | | | | x | | | | | | | x | x | | x | | | |
| Earthworms | | | x | x | | | x | | | | x | x | | x | | | |
| Eggs | | | | x | | x | | | | | | | | x | | | |
| Fish | | | | x | | x | | | | | | | | x | | | |
| Forbs | | x | | | | | | x | x | | | | x | | x | | |
| Frogs & Salamanders | | | | x | | | | | | | x | | | | | | |
| Grain | | | | | | | | x | x | | | x | x | | | | x |
| Grass | | x | | | | | | x | x | | | | x | | x | | |
| Hard Mast | | | | | | | | | | x | | x | x | x | | | x |
| Insects and Spiders | x | x | x | x | | x | x | | x | x | x | x | | x | | | |
| Leaves & Twigs | | | | | | | | x | x | | | | x | | x | | |
| Lizards | | | | | x | x | x | | | | | | | x | | x | |
| Mammals | x | | | | x | x | | | | | x | | | x | | x | |
| Scorpions | | | | | | | | | | x | | | | | | | |
| Seeds | | x | x | | | | x | | x | x | | x | | x | | | x |
| Snails | | | | | | | | | | | | | | x | | | |
| Snakes | | | | | x | x | | | | | x | | | x | | x | |
| Soft Mast | | | x | | | x | x | x | x | x | | x | x | | | | x |

## Hot Desert

| | American kestrel | black-tailed prairie dog | black-throated sparrow | bluegill | bobcat | coyote | crissal thrasher | desert cottontail | Gambel's quail | ladder-backed woodpecker | largemouth bass | mallard | mule deer | Northern raccoon | pronghorn | red-tailed hawk | white-winged dove |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | X | | X | X | X | | X | X | | X | | X | X | X | | |
| Establish Field Buffers | X | | | | | X | | X | X | | | | X | X | X | X | |
| Establish Native Grasses and Forbs | X | X | | | | X | | X | | | | | X | | X | X | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Increase Harvest | | X | | X | X | X | | X | | | X | | X | X | X | | |
| Leave Grain Unharvested | | | | | | | | X | X | | | X | | X | | | X |
| Manage disturbance | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Nesting Structures | X | | | | | | | | | | | | | | | | |
| Plant Shrubs | X | | | | X | X | X | X | X | X | | | X | X | | X | X |
| Plant Trees | | | | | | | | | | | | | X | X | | X | |
| Ponds: Construction | | | | X | | | | | | | X | | | | | | |
| Ponds: Deepen Edges | | | | X | | | | | | | X | | | | | | |
| Ponds: Fertilize / Lime | | | | X | | | | | | | X | | | | | | |
| Ponds: Reduce Turbidity | | | | X | | | | | | | X | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | X | | | | | | | X | | | | | | |
| Ponds: Restock | | | | X | | | | | | | X | | | | | | |
| Create Snags | X | | | | | | | | | X | | | | | | X | |
| Tillage Management | X | | | | | | | X | X | | | X | X | X | | X | X |
| Water Control Structures | | | | X | | | | | | | X | X | | X | | | |
| Water Developments for Wildlife | | | X | | | | X | | X | | | X | X | X | X | | X |
| Wildlife Damage Management | | X | | | X | X | | X | | X | | | X | X | | | |

# Intermountain – Foothills Zone

## Physical Description

The terrain varies from steep hills at the base of large mountains, to dissected plateaus and flat valleys. Average annual precipitation is between 10 inches and 25 inches. Most of the moisture is received in the winter at higher elevations and in the late summer at lower elevations. The summers are warm, and the winters are moderately cold.

## Dominant Vegetation

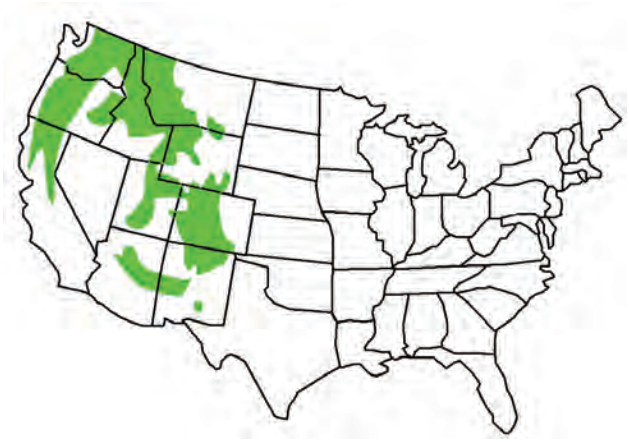
The foothills zone is found directly below the montane zone (in elevation) and is associated with most major mountain ranges in the western U.S.

Dwayne Elmore

**Foothills are typically composed of mixed grass, shrub, and trees. This variety of habitat provides for a diversity of wildlife species.**

Dwayne Elmore

**Fire suppression in the foothills has allowed fire intolerant species such as juniper to expand into the valley floors. This has negatively impacted some species while favoring others.**



The upper reaches of this region have many of the characteristics of the montane zone, while the lower reaches have similarities with the sagebrush zone. Typically the region is dominated by shrubs such as scrub oaks, mountain mahogany, serviceberry, bitterbrush, manzanita, buckbrush and sagebrush. Perennial grasses and many different forbs are also common. Occasionally, aspen and ponderosa pine may be found on moist sites. In the southern areas of this region, pinyon and juniper trees are found on drier sites.

As with most of the regions in the arid West, the vegetation associated with rivers and streams is often composed of different species and is more abundant than the surrounding areas. These riparian areas are dominated by cottonwood, willow, tamarisk, Russian olive, sumac, silver buffaloberry and a variety of grasses and forbs. The abundance and variety of vegetation and the availability of water make these areas very attractive to wildlife.

Typical invasive plants in the Intermountain include cheatgrass, saltcedar, yellow star thistle, knapweed, halogeten, Dyer's woad, and Canada thistle.

## Farming and Ranching

In the valleys and other areas where slopes are gentle, water, when available, is diverted to irrigate crops. Hay, alfalfa and oats are the most common crops. The terrain often makes management of irrigation water difficult. Water that runs off irrigated fields and leaks out of earthen delivery ditches often creates wetlands and/or supports vegetation similar to that found in riparian areas. In some areas, nonirrigated crops such as wheat and barley are grown. Unless the slopes are extremely steep, most of this region is used for livestock grazing. Cattle and sheep are the most common grazers.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial grasses and forbs, Stage 4 — shrubs. Succession does not always revert to earlier stage from disturbance by fire, as many of these shrubs resprout after fire. Stages 5 and 6 occur on moist (usually streamside) areas (mainly aspen or ponderosa pine) or on drier sites (pinyon or juniper trees).

## Species Recommended for Judging

American kestrel
blue grouse
coyote
elk
mallard
mountain cottontail
mourning dove
mule deer
Northern flicker
rainbow trout
red-tailed hawk
spotted towhee
wild turkey

## Intermountain Foothills

| Food Groups | American kestrel | coyote | dusky grouse | elk | mallard | mountain cottontail | mourning dove | mule deer | Northern flicker | rainbow trout | red-tailed hawk | spotted towhee | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | x | | | | | | | | |
| Bark | | | | x | | x | | x | | | | | |
| Birds | x | x | | | | | | | | | x | | |
| Buds | | | | x | | x | | x | | | | | |
| Carrion | | x | | | | | | | | | | | |
| Crayfish | | | | | | | | | | x | | | |
| Eggs | | x | | | | | | | | x | | | |
| Fish | | | | | | | | | | x | | | |
| Forbs | | | x | x | | x | | x | | | | | x |
| Frogs & Salamanders | | x | | | | | | | | x | | | |
| Grain | | | | | x | x | x | | | | | | x |
| Grass | | | | x | | x | | x | | | | | |
| Hard Mast | | | | x | | | | x | x | | | x | x |
| Insects and Spiders | x | x | x | | x | | x | | x | x | | x | x |
| Leaves & Twigs | | | x | x | | x | | x | | | | | x |
| Lizards | | x | | | | | | | | | x | | |
| Mammals | x | x | | | | | | | | | x | | |
| Seeds | | | x | | | | x | | x | | | x | x |
| Snails | | | | | | | | | | x | | | |
| Snakes | | x | | | | | | | | | x | | |
| Soft Mast | | x | x | x | | x | | x | x | | | x | x |

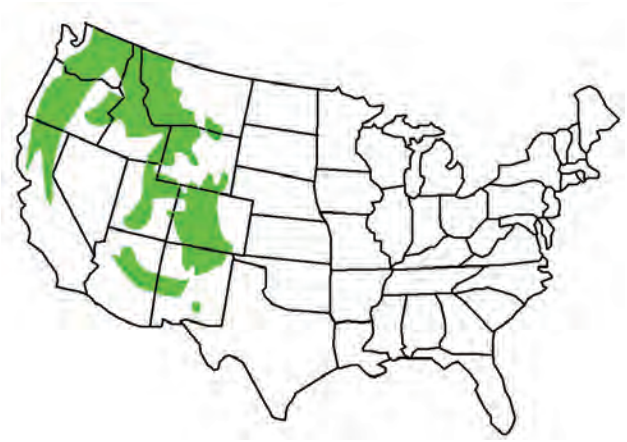
## Intermountain Foothills

| | American kestrel | coyote | dusky grouse | elk | mallard | mountain cottontail | mourning dove | mule deer | Northern flicker | rainbow trout | red-tailed hawk | spotted towhee | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | X | X | X | | X | | X | | X | | | X |
| Delay Crop Harvest | | | | | X | | | | | | | | |
| Establish Field Buffers | X | X | | X | | | | X | | | X | | X |
| Establish Native Grasses and Forbs | X | X | X | X | X | X | X | X | | | X | | X |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | X | X | X | X | | X | | X | X | | X | X | X |
| Increase Harvest | | X | | X | | X | | X | | X | | | X |
| Leave Grain Unharvested | | | | | X | | X | X | | | | | |
| Manage disturbance | X | X | X | X | X | X | X | X | X | | X | X | |
| Nesting Structures | X | | | | X | | | | | | | | |
| Plant / Manage Food Plots | | | | X | X | X | X | X | | | | | X |
| Plant Trees | X | | X | X | | | | X | X | | X | | X |
| Plant Shrubs | X | X | X | X | | X | X | X | X | | X | X | X |
| Ponds: Construction / | | | | | | | | | | X | | | |
| Ponds: Deepen Edges | | | | | | | | | | X | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | X | | | |
| Ponds: Reduce Turbidity | | | | | X | | | | | X | | | |
| Ponds: Repair Spillway/Levee | | | | | X | | | | | X | | | |
| Ponds: Restock | | | | | | | | | | X | | | |
| Create Snags | X | | | | | | | | X | | X | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | X | | | |
| Streams: Remove Fish Barriers | | | | | | | | | | X | | | |
| Tillage Management | X | | | | X | | X | X | | | X | | X |
| Water Control Structures | | | | | X | | | | | X | | | |
| Water Developments for Wildlife | | | | X | X | | X | X | | | | | X |
| Wildlife Damage Management | | X | | X | | X | | X | X | | | | X |

# Intermountain – Montane Zone

## Physical Description

The terrain includes high rugged mountains of volcanic origin. Average annual precipitation is highly variable, ranging from 10 inches to 100 inches depending on the site. The majority of the moisture comes in the winter and early spring except for areas in the southwestern U.S. which also see late summer monsoon rains.



## Dominant Vegetation

Final stage of plant succession is typically dense coniferous forests. Depending on the location, western hemlock, sitka spruce, redwood, Douglas fir, incense cedar and ponderosa pine are species associated with climax or final successional stage. Aspen and lodgepole pine are not considered climax species, but they dominate large areas for long periods of time in the Rocky Mountains at the higher elevations of this region. In the northern reaches of this region, silver fir, Sitka spruce and Alaskan cedar are common.

In mature forests, shrub and herbaceous layers are poorly developed. In openings, dense growths of shrubs may be found such as salal, vine maple, salmon berry and devil's club in the Northwest and northern Rocky Mountains. Serviceberry, chokecherry, scrub oak, mountain mahogany, ceanothus and snowberry are found in the central and southern Rocky Mountains. Manzanita, sticky laurel, currant, waxberry and buckthorn commonly grow in the Sierra Nevada Mountains. Perennial grasses and a variety of forbs are also common in open areas.

Typical invasive plants in the Intermountain include cheatgrass, saltcedar, yellow star thistle, knapweed, halogeten, Dyer's woad, and Canada thistle.

Dwayne Elmore

**Aspen is an important plant in the montane zone. There are many bird species such as dusky grouse and ruffed grouse that depend on it for habitat.**

Dwayne Elmore

**Open stands of ponderosa pine are maintained by frequent fire in the montane zone.**

## Farming and Ranching

In the larger valleys, water is diverted from nearby streams and rivers to irrigate crops. Where the slopes are not too steep, livestock grazing is a very important use of this region. Open areas dominated by shrubs and grasses, as well as areas adjacent to rivers and streams, are used most often for grazing. In some areas, crops such as small grains and alfalfa are grown in the valleys and other areas cleared of native vegetation. Steep slopes often prevent the annual cultivation of many deforested areas.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial grasses and forbs, Stage 4 —shrubs, aspen in some areas; Stage 5 — young coniferous forest and Stage 6 — mature coniferous forest.

## Species Recommended for Judging

American beaver
dusky grouse
bobcat
cutthroat trout
elk
hairy woodpecker
mallard
mule deer
Northern goshawk
rainbow trout
red-tailed hawk
ruffed grouse
spotted towhee
yellow-rumped warbler

## Intermountain Montane

| Food Groups | American beaver | bobcat | cutthroat trout | dusky grouse | elk | hairy woodpecker | mallard | mule deer | Northern goshawk | rainbow trout | red-tailed hawk | ruffed grouse | spotted towhee | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | x | | | | | | x | | | | | | | |
| Bark | x | | | | x | | | x | | | | | | |
| Birds | | x | | | | | | | x | | | | | |
| Buds | x | | | | x | | | x | | | | x | | |
| Carrion | | x | | | | | | | | | x | | | |
| Crayfish | | | x | | | | | | | x | | | | |
| Eggs | | | x | | | | | | | x | | | | |
| Fish | | | x | | | | | | | x | | | | |
| Forbs | x | | | x | x | | | x | | | | x | | |
| Frogs & Salamanders | | | | | | | | | | x | | | | |
| Fungi | | | | | | | | x | | | | | | |
| Grain | | | | | | | x | | | | | | | |
| Grass | | | | | x | | | x | | | | | | |
| Hard Mast | | | | | x | | | x | | | | x | x | |
| Insects and Spiders | | | x | x | | x | x | | | x | | x | x | x |
| Leaves & Twigs | x | | | x | x | | | x | | | | x | | |
| Lizards | | | | | | | | | x | | x | | | |
| Mammals | | x | | | | | | | x | | x | | | |
| Seeds | | | | x | | x | x | | | | | x | x | |
| Snails | | | x | | | | x | | | x | | | | |
| Snakes | | x | | | | | | | | | | | | |
| Soft Mast | | | | x | x | x | x | x | | | | x | x | x |

## Intermountain Montane

| | American beaver | bobcat | cutthroat trout | dusky grouse | elk | hairy woodpecker | mallard | mule deer | Northern goshawk | rainbow trout | red-tailed hawk | ruffed grouse | spotted towhee | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | X | X | X | X | X | | | X | | X | | X | | |
| Delay Crop Harvest | | | | | | | X | | | | | | | |
| Establish Field Buffers | | | | | X | | | X | | | X | | | |
| Establish Native Grasses and Forbs | | | | X | X | | X | X | | | X | | | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | | X | | X | X | | | X | X | | X | X | X | X |
| Increase Harvest | X | X | X | | X | | | X | | X | | | | |
| Leave Grain Unharvested | | | | | | | X | X | | | | | | |
| Manage disturbance | X | X | | X | X | X | X | X | | X | X | X | X | X |
| Nesting Structures | | | | | | | X | | | | | | | |
| Plant / Manage Food Plots | | | | | | | X | X | | | | | | |
| Plant Shrubs | X | X | | X | | | | X | | | X | X | X | X |
| Plant Trees | X | | | X | X | X | | X | X | | X | X | | X |
| Ponds: Construction | | | | | | | | | | X | | | | |
| Ponds: Deepen Edges | | | | | | | | | | X | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | X | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | X | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | | | X | | | | |
| Ponds: Restock | | | | | | | | | | X | | | | |
| Create Snags | | | | | | X | | | | | X | | | |
| Streams: Dams, Boulders, or Logs | | | X | | | | | | | X | | | | |
| Streams: Remove Fish Barriers | | | X | | | | | | | X | | | | |
| Tillage Management | | | | | | | X | X | | | X | | | |
| Water Control Structures | X | | | | | | X | | | X | | | | |
| Water Developments for Wildlife | | | | | X | | X | X | | | | | | |
| Wildlife Damage Management | X | X | | | X | X | | X | | | | | | |

# Intermountain – Sagebrush Zone

## Physical Description

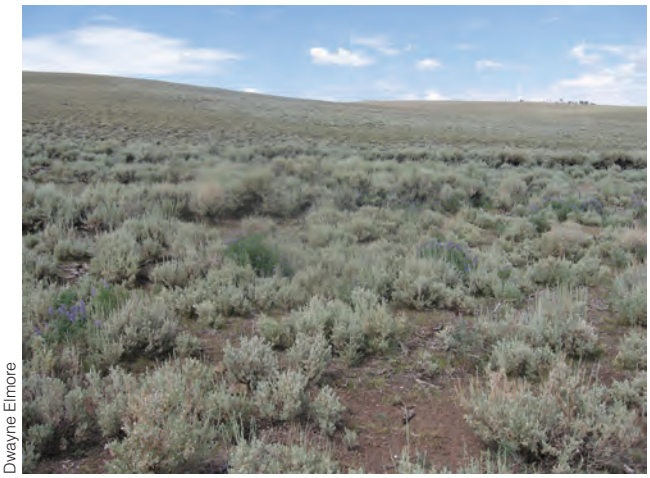
The terrain includes large, undulating hills within small interior basins that are often surrounded by mountains. Annual precipitation averages from 5 inches to 20 inches and occurs most often in the winter and spring. The summers are hot and the winters are moderately cold.

## Dominant Vegetation

In the final stage of plant succession, sagebrush dominates the lower elevations of the native rangeland along with other shrubs such as shadscale, bitterbrush, fourwing saltbush, rabbitbrush and horsebrush. Perennial grasses such as various wheatgrasses, needlegrasses, and bluegrasses are common and intermixed with the shrubs to varying degrees. Many forbs such as lupines, buckwheats and mallows are also present.

Riparian vegetation is often much different than the surrounding vegetation and is dominated by cottonwoods, willows, tamarisk, Russian olive, silver buffaloberry and a variety of grasses and forbs. The abundance of vegetation, availability of water and variety of vegetation makes riparian zones very attractive to wildlife.

Typical invasive plants in the Intermountain include cheatgrass, saltcedar, yellow star thistle, knapweed, halogeten, Dyer's woad, and Canada thistle.



Dwayne Elmore

**Sagebrush is the dominant plant in the sagebrush zone. Some species such as sage-grouse are evolved to depend on this plant species to survive.**

Dwayne Elmore

**Disturbances such as fire remove sagebrush. This can both negatively and positively benefit various species. It is important to manage disturbance such that all native species can persist in the sagebrush zone.**

## Farming and Ranching

Water is diverted from nearby streams and rivers to irrigate crops such as corn, barley, wheat, and alfalfa in the lower elevations and grass hayland at higher elevations. The terrain often makes management of irrigation water difficult. Water that runs off irrigated fields and leaks out of earthen delivery ditches often creates wetlands and/or supports vegetation similar to that found in riparian areas, which is attractive to a variety of wildlife species.

In areas where irrigation water is not available and terrain and climate permit, the native rangeland has been converted to nonirrigated cropland. Small grains such as barley and wheat are the most common crops. Near croplands are areas not cultivated and remain in native vegetation. This mix of dry cropland and rangeland is important to many species of wildlife.

There are large areas of shrubs and grasslands in this region that are primarily used for livestock grazing. In the winter, large herds of domestic sheep often use rangelands within this region.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial grasses and forbs and Stage 4 — shrubs, and perennial grass and forb mix. In Stage 4, brush seems to dominate on the drier sites, while grasses are more common on the moister sites. Continual overgrazing of perennial grasses can produce a Stage 4 dominated almost entirely by shrubs.

## Species Recommended for Judging

American kestrel
Brewer's sparrow
coyote
desert cottontail
mallard
mourning dove
mule deer
Northern flicker
pronghorn
rainbow trout
red-tailed hawk
greater sage-grouse
sage thrasher

## Intermountain Sagebrush

| Food Groups | American kestrel | Brewer's sparrow | coyote | desert cottontail | greater sage-grouse | mallard | mourning dove | mule deer | Northern flicker | pronghorn | rainbow trout | red-tailed hawk | ring-necked pheasant | sage thrasher |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | x | | | | | | | | |
| Bark | | | | x | | | | x | | | | | | |
| Birds | x | | x | | | | | | | | | x | | |
| Buds | | | | x | | | | x | | x | | | x | |
| Carrion | | | x | | | | | | | | | | | |
| Crayfish | | | | | | x | | | | | x | | | |
| Eggs | | | x | | | | | | | | x | | | |
| Fish | | | | | | | | | | | x | | | |
| Forbs | | | | x | x | | | x | | x | | | x | |
| Frogs & Salamanders | | | | | | | | | | | x | | | |
| Grain | | | | x | | x | x | x | | | | | x | |
| Grass | | | | x | | | | x | | x | | | x | |
| Hard Mast | | | | | | | | x | x | | | | x | |
| Insects and Spiders | x | x | x | | x | x | x | | x | | x | | x | x |
| Leaves & Twigs | | | | x | x | | | x | | x | | | x | |
| Lizards | | | x | | | | | | | | | x | | |
| Mammals | x | | x | | | | | | | | | x | | |
| Scorpions | | x | | | | | | | | | | | | x |
| Seeds | | x | | x | | | x | | x | | | | x | |
| Snails | | | | | | x | | | | | x | | | |
| Snakes | | | x | | | | | | | | | x | | |
| Soft Mast | | | x | x | | x | | x | x | | | | x | x |

## Intermountain Sagebrush

| | American kestrel | Brewer's sparrow | coyote | desert cottontail | greater sage-grouse | mallard | mourning dove | mule deer | Northern flicker | pronghorn | rainbow trout | red-tailed hawk | sage thrasher |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | | X | X | X | | | X | | X | X | | |
| Delay Crop Harvest | | | | | X | X | | | | | | | |
| Establish Field Buffers | X | | X | X | | | | X | | | | | |
| Establish Native Grasses and Forbs | X | | X | X | X | X | X | X | | X | | X | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Increase Harvest | | | X | X | | | | X | | X | X | | |
| Leave Grain Unharvested | | | | | | X | X | X | | | | | |
| Manage disturbance | X | X | X | X | X | X | X | X | | X | X | X | X |
| Nesting Structures | X | | | | | X | | | | | | | |
| Plant Shrubs | | X | X | X | X | | X | X | X | | | X | X |
| Plant Trees | | | | | | | | | X | | | X | |
| Pond Construction | | | | | | | | | | | X | | |
| Ponds: Deepen Edges | | | | | | | | | | | X | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | X | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | X | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | X | | |
| Ponds: Restock | | | | | | | | | | | X | | |
| Create Snags | X | | | | | | X | | X | | | X | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | X | | |
| Streams: Remove Fish Barriers | | | | | | | | | | | X | | |
| Tillage Management | X | | | X | | X | X | X | | | | X | |
| Water Control Structures | | | | | | X | | | | | X | | |
| Water Developments for Wildlife | | | | | X | X | X | X | | X | | | |
| Wildlife Damage Management | | | X | X | | | | | X | | | | |

# Mediterranean

## Physical Description

Mediterranean climates are found in only five places on Earth: California, northern Baja California, the basin of the Mediterranean Sea, southwestern Australia, the western cape of South Africa and the central coast of Chile. Mediterranean vegetation is dominated by evergreen trees and trees with short, hard, dense leaves (schlerophyllous). These plants have adapted to fire, summer drought and cool, moist winters.

The geologic history of California has produced a complex landscape with variations in topography and climate. The Mediterranean climate region lies west of the Sierra Nevada and includes a portion of coastal Baja California. The terrain includes gently to steeply sloping mountains, coastal plains and interior valleys. Average annual precipitation ranges from 12 inches to 40 inches with most of it occurring in winter as rain. Summers are hot and dry, while winters are mild and rainy. Rocky or shallow soils have evergreen shrublands called chaparral. Oak woodlands occur where soils are deeper or moisture is more available. Drier areas along the coast and inland at the transition to deserts support coastal sage scrub. Chaparral is the most abundant vegetation type.

Dwayne Elmore

**The Mediterranean-like climate found in California creates a grassland that is maintained by fire.**

Dwayne Elmore

**Many species of shrubs and small trees exist within the grasslands of central California. Periodic fire reduces their structure, but they quickly return after fire.**

## Dominant Vegetation

There are three common but different vegetation types found in this region: chaparral, oak woodlands, and coastal sage scrub. The chaparral is dominated by chamise, caenothus, mountain mahogany and manzanita. The southern oak woodlands are dominated by Engelmann oak, coast live oak, interior live oak and California walnut. The coastal sage scrub, also called soft chaparral, is dominated by California sagebrush and black sage, as well as California buckwheat. Each vegetation type is summarized below.

*Chaparral or Hard Chaparral*: Found from 1,000 feet to 5,000 feet in elevation. At its lower limits, annual grasslands and coastal sage scrub blend in. Most shrubs are 3 feet to 10 feet tall, with small, leathery leaves adapted to hot dry summers. This vegetation type is adapted to a 20-year fire return interval. Many plants such as Creosote contain flammable oils.

*Southern Oak Woodlands*: Found throughout the Sierra Nevada and Coast Range foothills and lower montane elevations from 1,800 feet to 4,850 feet, often on steep, rocky slopes where snow and cold temperatures occur. Trees are highly variable, growing from 15 feet to 70 feet tall, depending on the oak species, elevation and soil type. With frequent annual burning (at lower elevations and on warmer sites), this system is an open to dense woodland of

large oaks with well-developed grassy understories of native perennial bunchgrasses.

*Coastal Sage Scrub or Soft Chaparral*: The coastal sage scrub plant community of California exists along the coast from about San Francisco and Lafayette down through about San Diego and inland as far as Riverside in southern California. These shrubs are generally less than 6 feet tall with multiple woody stems. Leaves are often aromatic, gray, woolly or sticky. Leaves are pliable and thin (malacophyllous), which is why is it also called the soft chaparral.

Typical invasive plants in the Mediterrean region include red brome, yellow starthistle, leafy spurge, scotch thistle, and medusahead.

## Farming and Ranching

Agriculture is widespread and very diverse within this region. Stream valleys, coastal plains, and interior valleys are planted in a wide variety of truck crops, grain crops, orchards, vineyards, cotton and hay.

In the drier areas of the region, water must be diverted from rivers and streams to irrigate orchards, vineyards, citrus, hay and grain crops. Irrigation water is expensive, which encourages the use of modern irrigation systems that do not waste much water. Waste water, when present, often supports a wide variety of riparian vegetation and wetlands. In the moister areas, crops such as lemons, avocados, vegetables and flowers are grown.

Ranching operations are present in areas where the slopes are not too steep or rocky. Also, when the oak woodlands burn, grasses are available for grazing for a few years. Caution must be taken when ranching. Overgrazing in these sensitive habitats can create long-term damage to the vegetation. Overgrazing weakens the native vegetation, allowing non-native, aggressive species to establish.

## Plant Succession Stage

*Oak Woodland*: Succesion takes a long time for this vegetation type. Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — competition from introduced annual grasses often prevents this successional stage from occurring, Stage 4 — young oaks and open grassland or shrubby understory and Stage 5 — mature oaks and open grassland or shrubby understory.

*Coastal Sage Scrub*: Stage 1 — bare ground, Stage 2 — mustard, filaree, soft chess, and other annual forbs and grasses, Stage 3 — perennial grasses and forbs (often skipped in this community) and Stage 4 — shrubs such as chamise, manzanita, etc. These shrubs often resprout after fires, so succession does not always revert to an earlier stage after fires.

*Chaparral*: Stage 1 — bare ground, Stage 2 — herbs and forbs are present immediately after a fire, Stage 3 — perennial grasses and forbs (often skipped in this community), and Stage 4 — shrubs such as scrub oak take over herbs and forbs within 2 years to 5 years.

## Species Recommended for Judging

The species listed are not found in all of the vegetation types described.

American kestrel
bluegill
California quail
California thrasher
desert cottontail
largemouth bass
mallard
mourning dove
mule deer
Northern raccoon
Nuttall's woodpecker
spotted towhee
Western kingbird

## Mediterranean

| Food Groups | American kestrel | bluegill | California quail | California thrasher | desert cottontail | largemouth bass | mallard | mourning dove | mule deer | Northern raccoon | Nuttall's woodpecker | spotted towhee | Western kingbird |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | | x | | | | | | |
| Bark | | | | | x | | | | x | | | | |
| Birds | x | | | | | | | | | x | | | |
| Buds | | | | | x | | | | x | | | | |
| Carrion | | | | | | | | | | x | | | |
| Crayfish | | x | | | | x | | | | x | | | |
| Earthworms | | x | | x | | x | | | | | | | |
| Eggs | | x | | | | | | | | x | | | |
| Fish | | x | | | | x | | | | x | | | |
| Forbs | | | x | | x | | | | x | | | | |
| Frogs & Salamanders | | x | | | | x | | | | x | | | |
| Grain | | | x | | x | | x | x | x | | | | |
| Grass | | | x | | x | | | | x | | | | |
| Hard Mast | | | x | x | | | x | | x | x | | x | |
| Insects and Spiders | x | x | x | x | | x | x | x | | x | x | x | x |
| Leaves & Twigs | | | | | x | | | | x | | | | |
| Lizards | | | | | | | | | | x | | | x |
| Mammals | x | | | | | | | | | x | | | |
| Mussels | | | | | | | | | | x | | | |
| Scorpions | | | | | | | | | | | | | x |
| Seeds | | | x | | | | x | x | | x | x | x | |
| Snails | | | | | | | x | | | x | | | |
| Soft Mast | | | x | x | x | | x | | x | x | x | x | x |

## Mediterranean

| | American kestrel | bluegill | California quail | California thrasher | desert cottontail | largemouth bass | mallard | mourning dove | mule deer | Nuttall's woodpecker | Northern raccoon | spotted towhee | Western kingbird |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | X | X | | X | X | | | X | | X | | |
| Delay Crop Harvest | | | | | | | X | | X | | | | |
| Establish Field Buffers | X | | X | | X | | | | X | | X | | X |
| Establish Native Grasses and Forbs | X | | X | | X | | X | X | | | | | X |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | X | | | X | X | | | | X | X | | X | |
| Increase Harvest | | X | | | X | X | | | X | | X | | |
| Leave Grain Unharvested | | | X | | X | | X | X | X | | | | |
| Manage disturbance | X | | X | X | X | | X | | X | | | X | X |
| Nesting Structures | X | | | | | | | | | X | | | |
| Plant / Manage Food Plots | | | X | | X | | X | X | X | | | | |
| Plant Shrubs | X | | X | X | X | | | X | X | | X | X | X |
| Plant Trees | | | X | | | | | | X | X | X | | |
| Ponds: Construction | | X | | | | X | | | | | | | |
| Ponds: Deepen Edges | | X | | | | X | | | | | | | |
| Ponds: Fertilize / Lime | | X | | | | X | | | | | | | |
| Ponds: Reduce Turbidity | | X | | | | X | | | | | | | |
| Ponds: Repair Spillway/ Levee | | X | | | | X | | | | | | | |
| Ponds: Restock | | X | | | | X | | | | | | | |
| Create Snags | X | | | | | | | X | | | X | | X |
| Tillage Management | X | | X | | X | | X | X | X | | X | | |
| Water Control Structures | | X | | | | X | X | | | | X | | |
| Water Developments for Wildlife | | X | X | | | X | X | X | X | | X | | |
| Wildlife Damage Management | | | | | X | | | | X | X | | | |

# Northeast Mixed Forest

## Physical Description

The terrain is flat with some rolling hills and low mountains. The average annual precipitation ranges from 24 inches to 45 inches. Most of the precipitation is received in the summer, but snow is usually on the ground all winter. Summers are warm and winters are very cold.

## Dominant Vegetation

This region is transitional between the evergreen-dominated forests to the north and the broadleaf-dominated forests to the south. The final stage of succession can be dominated by both tall broadleaf (deciduous) and evergreen (coniferous) trees. They can be mixed together or in separate stands adjacent to each other. The dominant conifers are white pine, red spruce, subalpine fir, eastern hemlock and eastern redcedar. Beech, sugar maple and basswood are the most common deciduous trees. Common shrubs are rhododendron, dogwood, cranberry and hobblebush. A wide variety of forbs and grasses are found on the forest floor.

Typical invasive plants in the Northeast mixed forest include Japanese stilt grass, Canada thistle, garlic mustard, Russian olive, and tree-of-Heaven

Craig Harper

**The lush herbaceous understory of this 22-year-old northern hardwood forest provides optimum brooding cover for ruffed grouse.**

Craig Harper

**This mature stand of aspen, Eastern hemlock, and sugar maple is displaying peak autumn coloration.**

## Farming and Ranching

Very large areas of this region have been cleared of the native vegetation for industrial use, urban sprawl, and production of crops and livestock forage. In some areas, extremely poor soils and short growing seasons put limitations on agriculture. Depending on how the pastures and croplands are managed, some species of wildlife may benefit from farming, especially if trees and shrubs are nearby.

## Plant Succession Stage

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

## Species Recommended for Judging

American kestrel
bluegill
bobcat
brown thrasher
Eastern bluebird
Eastern cottontail
Eastern fox squirrel
hairy woodpecker
largemouth bass
mourning dove
ovenbird
Northern raccoon
ruffed grouse
snowshoe hare
white-tailed deer
wild turkey
wood duck

## Northeast Mixed Forest

| Food Groups | American kestrel | bluegill | bobcat | brown thrasher | Eastern bluebird | Eastern cottontail | Eastern fox squirrel | hairy woodpecker | largemouth bass | mourning dove | Northern raccoon | ovenbird | ruffed grouse | snowshoe hare | white-tailed deer | wild turkey | wood duck |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | | | | | | | | | | | | x |
| Bark | | | | | | x | x | | | | | | | x | x | | |
| Birds | x | | x | | | | | | x | | x | | | | | | |
| Buds | | | | | | | x | | | | | | x | x | x | x | |
| Carrion | | | x | | | | | | | | x | | | | | | |
| Crayfish | | x | | | | | | | x | | x | | | | | | x |
| Earthworms | | x | | x | x | | | | x | | x | x | | | | | x |
| Eggs | | x | | | | | x | | | | x | | | | | | |
| Fish | | x | | | | | | | x | | x | | | | | | |
| Forbs | | | | | | x | | | | | | | x | x | x | x | x |
| Frogs & Salamanders | | x | | x | | | | | x | | x | | | | | | |
| Fungi | | | | | | | x | | | | | | | | x | x | |
| Grain | | | | x | | x | x | | | x | x | | | | x | x | x |
| Grass | | | | | | x | | | | | | | | x | x | x | |
| Hard Mast | | | | x | | | x | | | | x | | x | | x | x | x |
| Insects and Spiders | x | x | | x | x | | x | x | x | x | x | x | x | | | x | x |
| Leaves & Twigs | | | | | | x | | | | | | | x | x | x | x | |
| Lizards | | | | x | | | | | | | x | | | | | | |
| Mammals | x | | x | | | | | | x | | x | | | | | | |
| Mussels | | | | | | | | | | | x | | | | | | |
| Seeds | | | | x | | | x | x | | x | x | | x | | | x | x |
| Snails | | | | x | | | | | | | x | x | x | | | x | x |
| Snakes | | | x | x | | | | | x | | x | | | | | x | |
| Soft Mast | | | | x | x | x | x | x | | | x | | x | | x | x | x |
| Tubers | | | | | | | | | | | x | | | | | | |

## Northeast Mixed Forest

| | American kestrel | bluegill | bobcat | brown thrasher | Eastern bluebird | Eastern cottontail | Eastern fox squirrel | hairy woodpecker | largemouth bass | mourning dove | Northern raccoon | ovenbird | ruffed grouse | snowshoe hare | white-tailed deer | wild turkey | wood duck |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | X | X | | | X | X | | X | | X | | X | X | X | X | |
| Delay Crop Harvest | | | | | | | | | | | | | | | X | | |
| Establish Field Buffers | X | | | | X | X | | | | | X | | | | X | X | |
| Establish Native Grasses and Forbs | X | | | | X | X | | | | X | | | | X | X | X | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | X | | X | X | X | X | X | | | | X | X | X | X | X | X | X |
| Increase Harvest | | X | X | | | X | X | | X | | X | | | X | X | X | |
| Leave Grain Unharvested | | | | | | X | X | | | X | X | | | | X | X | X |
| Manage disturbance | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Nesting Structures | X | | | | X | | | | | | | | | | | | X |
| Plant / Manage Food Plots | | | | | | X | | | | X | X | | | | X | X | X |
| Plant Shrubs | X | | X | X | X | X | | X | | X | X | | X | X | X | X | X |
| Plant Trees | X | | | | X | | X | X | | X | X | X | X | X | X | X | X |
| Ponds: Construction | | X | | | | | | | X | | | | | | | | |
| Ponds: Deepen Edges | | X | | | | | | | X | | | | | | | | |
| Ponds: Fertilize / Lime | | X | | | | | | | X | | | | | | | | |
| Ponds: Reduce Turbidity | | X | | | | | | | X | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | X | | | | | | | X | | | | | | | | |
| Ponds: Restock | | X | | | | | | | X | | | | | | | | |
| Create Snags | X | | | | X | | | X | | X | X | | | | | | X |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | | | | | | | |
| Tillage Management | X | | | | | X | X | | | X | X | | | | X | X | X |
| Water Control Structures | | X | | | | | | | X | | X | | | | | | X |
| Water Developments for Wildlife | | | | | | | X | | | X | X | | | | X | X | X |
| Wildlife Damage Management | | | X | | | X | X | X | | | X | | | X | X | X | |

# Pacific Coastal Forest

## Physical Description

The terrain includes coastal plains and broad interior lowland plains and valleys associated with the Puget Sound and Willamette Valley. It also includes ridge and valley zones associated with Coast Ranges and temperate forest zones extending up the western slopes of the Cascade Mountains, as well as those on all sides of the Olympic Mountains. Many narrow river valleys and adjacent steep slopes are associated with these forests. Average annual precipitation ranges from under 30 inches to 180 inches, most in the form of winter rainfall.

Dwayne Elmore

**Coastal redwoods are large trees and are one of the dominant plants in the Pacific coastal forest.**

Dwayne Elmore

**This well developed overstory prevents sunlight from reaching the forest floor and thus there is little understory vegetation for browsing or grazing wildlife species.**

## Dominant Vegetation

Final stage of plant succession are typically dense coniferous forests. Depending on the location and elevation, western hemlock, Sitka spruce, Douglas fir and western redcedar are species associated with the climax stage. Grand fir may also be found in the climax stage, and Pacific silver fir and noble fir are often found dominating in the higher mountain zones within the Pacific Coastal Forest. Red alder, either in pure stands or intermixed with earlier stages of plant succession, are found throughout the Pacific Coastal Forest. Big-leaf maple can be found through all stages of plant succession, but seldom in pure stands. In older, managed, even-aged forests, shrub and herbaceous layers are poorly developed. Dense and diverse shrub layers may be found in forest openings, early successional areas and in mature forests. Some dominant shrub species include salal, vine maple, salmonberry, devil's club, vaccinium, elderberries and swordfern, depending on site conditions. Serviceberry, chokecherry, Oregon white oak, snowberry, Oregon grape, oceanspray, hazel, scrub oaks and ceanothus may dominate on some of the drier sites within this region. Perennial grasses and a variety of forbs are also common in open areas.

Typical invasive plants in the Pacific Coastal Forest include tree of heaven, English ivy, Russian knapweed, skeleton weed, houndstongue, and Dyer's woad,

## Forest Management

A major portion of the area is within managed tree farms owned or operated by state agencies, industrial landowners and nonindustrial private landowners. Intensively managed forests are characterized by even-aged stands of few species, usually Douglas fir or western hemlock. These forests are often intensively managed for wood-fiber production

by occasional thinning and clearcut harvest, usually by 70 years of age. These forests are more closely associated with Stage 5 of plant succession.

## Farming and Ranching

In larger valleys, some water is diverted from nearby streams and rivers to irrigate grass hay. Crops such as corn, small grains, fruits and alfalfa are grown in the lower valley flood plains. Livestock grazing is common and widespread on both the original prairies and pastures converted from forests and wetlands. Dairy farming is common throughout the region, especially along the coastal corridor.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial grasses and forbs, Stage 4 — shrubs, alder and vine maple in some areas, Stage 5 — young coniferous forests, including managed industrial forests and Stage 6 — mature coniferous forests.

## Species Recommended for Judging

American beaver
bobcat
box turtle
coyote
great horned owl
hairy woodpecker
mallard
Pacific salmon
red squirrel
red-tailed hawk
rough-skinned newt
ruffed grouse
spotted towhee
wood duck
yellow-rumped warbler

## Pacific Coastal Forest

| Food Groups | American beaver | bobcat | box turtle | coyote | great horned owl | hairy woodpecker | mallard | Pacific salmon | red squirrel | red-tailed hawk | rough-skinned newt | ruffed grouse | spotted towhee | wood duck | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | x | | x | | | | x | | | | | | | x | |
| Bark | x | | | | | | | | x | | | | | | |
| Birds | | x | | x | x | | | | | x | | | | | |
| Buds | x | | | | | | | | | | | x | | | |
| Carrion | | x | x | x | | | | | | | | | | | |
| Crayfish | | | | | | | x | | | | x | | | x | |
| Earthworms | | | x | | | | | | | | | | | x | |
| Eggs | | | x | x | | | | x | x | | x | | | | |
| Fish | | | x | | | | | x | | | | | | | |
| Forbs | x | | | | | | | | | | | x | | x | |
| Frogs & Salamanders | | | x | x | x | | | | | | x | | | | |
| Fungi | | | x | | | | | | x | | | | | | |
| Grain | | | | | | | x | | | | | | | x | |
| Grass | | | | | | | | | | | | | | | |
| Hard Mast | | | | | | | x | | x | | | x | x | x | |
| Insects and Spiders | | | x | x | x | x | x | x | | | x | x | x | x | x |
| Leaves & Twigs | x | | | | | | | | x | | | x | | | |
| Lizards | | | | x | x | | | | | x | | | | | |
| Mammals | | x | | x | x | | | | | x | | | | | |
| Mussels | | | | | | | | | | | x | | | | |
| Seeds | | | | | | x | x | | x | | | x | x | x | |
| Snails | | | x | | | | x | | | | x | x | | x | |
| Snakes | | x | | x | x | | | | | x | | | | | |
| Soft Mast | | | x | x | | x | x | | x | | | x | x | x | x |

## Pacific Coastal Forest

| | American beaver | bobcat | box turtle | coyote | great horned owl | hairy woodpecker | mallard | Pacific salmon | red squirrel | red-tailed hawk | rough-skinned newt | ruffed grouse | spotted towhee | wood duck | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | X | X | | X | | | | | X | | | X | | | |
| Delay Crop Harvest | | | | | | | X | | | | | | | | |
| Establish Field Buffers | | | | X | X | | | | | X | | | | | |
| Establish Native Grasses and Forbs | | | X | X | X | | X | | | X | | | | | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | | X | X | X | X | | | | | X | | X | X | X | X |
| Increase Harvest | X | X | | X | | | | | X | | | | | | |
| Leave Grain Unharvested | | | | | | | X | | | | | | | X | |
| Manage disturbance | X | X | X | X | X | X | X | | X | X | | X | X | X | X |
| Nesting Structures | | | | | | | X | | | | | | | X | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | | |
| Plant Shrubs | X | X | | X | X | X | | | | X | | X | X | X | X |
| Plant Trees | X | | | | X | X | | | X | X | | X | | X | X |
| Ponds: Construction | | | | | | | | | | | X | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | X | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | X | | | | |
| Create Snags | | | | | X | X | | | | X | | | | X | |
| Streams: Dams, Boulders, or Logs | | | | | | | | X | | | X | | | | |
| Streams: Remove Fish Barriers | | | | | | | | X | | | | | | | |
| Tillage Management | | | | | X | | X | | | X | | | | X | |
| Water Control Structures | X | | | | | | X | | | | X | | | X | |
| Water Developments for Wildlife | | | | | | | | | | | | | | X | |
| Wildlife Damage Management | X | X | | X | X | X | | | | | | | | | |

# Prairie Brushland

## Physical Description

The terrain is level to rolling hills. Average annual precipitation is between 17 inches and 32 inches, increasing from northwest to northeast. Most of the moisture is received in the fall and spring. The summers are hot and winters are warm.

## Dominant Vegetation

Climax vegetation is characterized by grassland mixed with dense to open stands of shrubs forming a shrub savanna. Depending on the area, shrubs such as mesquite, black brush, catclaw, huisache and guajillo are common in the final successional stage. Other species that contribute to the shrub layer include white brush, bluewood, lotebush, coyotillo, live oak, cenizo, prickly pear and chollas. Some of the more common grasses associated with climax vegetation include various species of bluestem and paspalum, Arizona cottontop, buffalograss, burgrass, dropseed, pink pampasgrass, windmillgrass, slender grama, hairy grama, common sandbur and various species of bristlegrass.

Vegetation associated with river and stream courses is different than the surrounding vegetation. Trees such as live oak and hackberry are common along water courses. Mesquite grows much larger, looking more like a tree than a shrub, and the vegetation is generally more robust. The abundance and variety of vegetation combined with the availability of water make these areas attractive for wildlife.

Typical invasive plants in the Prairie Brushland include old world bluestem, buffelgrass, tanglehead, Lehmann lovegrass, and Chinese tallow tree.

Craig Harper

**Brush country in south Texas. Mesquite and prickly pear are prevalent with cottonwood in the drainages. This provides attractive habitat for wild turkey, Northern bobwhite, American kestrel, coyote, white-tailed deer, and others.**

Selma Glasscock

**Openings within brush country add considerable diversity to the landscape matrix and provide food and cover resources for several wildlife species.**

## Farming and Ranching

There is very little farming in this region. The large areas of shrubs and grasslands are used primarily for livestock grazing.

## Plant Successional Stage

Stage 1 — bare ground, Stage 2 — annual forbs and grasses, Stage 3 — perennial forbs and grasses, Stage 4 — shrubs and perennial grass forb mix. Continual heavy grazing of perennial grasses can encourage a Stage 4 dominated almost entirely by shrubs.

## Species Recommended for Judging

American kestrel
bluegill
brown thrasher
coyote
Eastern bluebird
Eastern cottontail
ladder-backed woodpecker
largemouth bass
mallard
Northern bobwhite
Northern raccoon
spotted towhee
Western kingbird
white-tailed deer
white-winged dove
wild turkey

## Prairie Brushland

| Food Groups | American kestrel | bluegill | brown thrasher | coyote | Eastern bluebird | Eastern cottontail | ladder-backed woodpecker | largemouth bass | mallard | Northern bobwhite | Northern raccoon | spotted towhee | Western kingbird | white-tailed deer | white-winged dove | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | | | | x | | | | | | | |
| Bark | | | | | | x | | | | | | | | x | | |
| Birds | x | | | x | | | | x | | | x | | | | | |
| Buds | | | | | | x | | | | x | | | | x | | x |
| Carrion | | | | x | | | | | | | x | | | | | |
| Crayfish | | x | | | | | | x | x | | x | | | | | |
| Earthworms | | x | x | | | | | x | | | x | | | | | |
| Eggs | | x | | x | | | | | | | x | | | | | |
| Fish | | x | | | | | | x | | | x | | | | | |
| Forbs | | | | | | x | | | | x | | | | x | | x |
| Frogs & Salamanders | | x | x | x | | | | x | | | x | | | | | |
| Fungi | | | | | | | | | | | | | | x | | x |
| Grain | | | x | | | x | | | x | x | x | | | x | x | x |
| Grass | | | | | | x | | | | | | | | x | | x |
| Hard Mast | | | | | | | x | | x | x | x | x | | x | x | x |
| Insects and Spiders | x | x | x | x | x | | x | x | x | x | x | x | x | | | x |
| Leaves & Twigs | | | | | | x | | | | x | | | | x | | x |
| Lizards | | | x | x | | | | | | | x | | | | | x |
| Mammals | x | | | x | | | | x | | | x | | | | | |
| Mussels | | | | | | | | | | | x | | | | | |
| Scorpions | | | | x | | | x | | | | | | x | | | |
| Seeds | | | x | | | | x | | x | x | x | x | | | x | x |
| Snails | | | x | | | | | | x | | x | | | | | |
| Snakes | | | x | x | | | | x | | | x | | | | | x |
| Soft Mast | | | x | x | x | x | x | | x | x | x | x | x | x | x | x |
| Tubers | | | | | | | | | | | x | | | | | x |

## Prairie Brushland

| | American kestrel | bluegill | brown thrasher | coyote | Eastern bluebird | Eastern cottontail | ladder-backed woodpecker | largemouth bass | mallard | Northern bobwhite | Northern raccoon | spotted towhee | Western kingbird | white-tailed deer | white-winged dove | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **Decrease Harvest** | | X | | X | | X | | X | | X | X | | | X | | X |
| **Delay Crop Harvest** | | | | | | | | | | | | | | X | X | |
| **Establish Field Buffers** | | | | X | X | X | | | | X | X | | X | X | | X |
| **Establish Native Grasses and Forbs** | X | | | X | X | X | | | X | X | | | X | X | X | X |
| **Fish or Wildlife Survey** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **Forest Management Techniques** | | | X | X | X | X | X | | | X | X | X | | X | | X |
| **Increase Harvest** | | X | | X | | X | | X | | | X | | | X | | X |
| **Leave Grain Unharvested** | | | | | | X | | | X | X | X | | | X | X | X |
| **Manage disturbance** | X | | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| **Nesting Structures** | X | | | | X | | | | | | | | | | | |
| **Plant / Manage Food Plots** | | | | | | X | | | X | X | | | | X | X | X |
| **Plant Shrubs** | X | | X | X | X | X | X | | | X | X | X | X | X | X | X |
| **Plant Trees** | X | | | | X | | X | | | | X | | | X | | X |
| **Ponds: Construction** | | X | | | | | | X | | | | | | | | |
| **Ponds: Deepen Edges** | | X | | | | | | X | | | | | | | | |
| **Ponds: Fertilize / Lime** | | X | | | | | | X | | | | | | | | |
| **Ponds: Reduce Turbidity** | | X | | | | | | X | | | | | | | | |
| **Ponds: Repair Spillway/ Levee** | | X | | | | | | X | | | | | | | | |
| **Ponds: Restock** | | X | | | | | | X | | | | | | | | |
| **Create Snags** | X | | | | X | | | | | | X | | X | | X | |
| **Tillage Management** | X | | | | | X | | | X | X | X | | | X | X | X |
| **Water Control Structures** | | X | | | | | | X | X | | X | | | | | |
| **Water Developments for Wildlife** | | | | | | | | | | | X | | | X | X | X |
| **Wildlife Damage Management** | | | | X | | X | X | | | | X | | | X | | X |

# Southeast Mixed and Outer Coastal Plain Forest

## Physical Description

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

## Dominant Vegetation

The final stage of succession usually consists of deciduous trees such as oaks, hickories, American beech, blackgum, red maple, redbay, Southern magnolia, laurel oak, American holly and winged elm. However, on upland sites where prescribed fire is still used, longleaf and/or shortleaf pine may be the principal overstory species. Fire suppression has decimated the longleaf pine community to a fraction of its former range throughout the region. Planted loblolly pine is widespread over much of the region, but without fire and judicious thinning, the value of loblolly plantings for wildlife is decreased. Gum and cypress are dominant on moist areas along the Atlantic and Gulf coasts and along major river drainages. Midstory trees throughout much of the region include dogwoods, American hornbeam, redbud, sweetbay, titi and shadbush. Native forbs and grasses commonly found in Stage 2 and Stage 3 include lespedezas, partridge pea, ragweed, pokeweed, bluestems, paspalums, wiregrass, povertygrass, and many others. Vines such as Virginia creeper, trumpet creeper, grapes, yellow jessamine, and greenbriar are common. Shrubs include sumacs, viburnums, elderberry, wild plum, blueberry, blackberry, hawthorns and wax myrtle.

Typical invasive plants in the Southeast Mixed Forest include Japanese climbing fern, privet, cogongrass, bahaigrass, Japanese honeysuckle, kudzu, and Chinaberry.

Dwayne Elmore

**Many species of pine are common across the Southeast. Early successional habitat is provided for a few years until the canopy of the pines closes.**

Dwayne Elmore

**Mature pine stands, especially longleaf, are best managed by thinning to a predetermined basal area, which allows better tree growth and a diverse understory. Prescribed fire is used to manage the composition and structure of the understory.**

## Farming and Ranching

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

## Plant Succession Stage

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

## Species Recommended for Judging

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

## Southeast Mixed and Outer Coastal Plain Forest

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

## Southeast Mixed and Outer Coastal Plain Forest

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

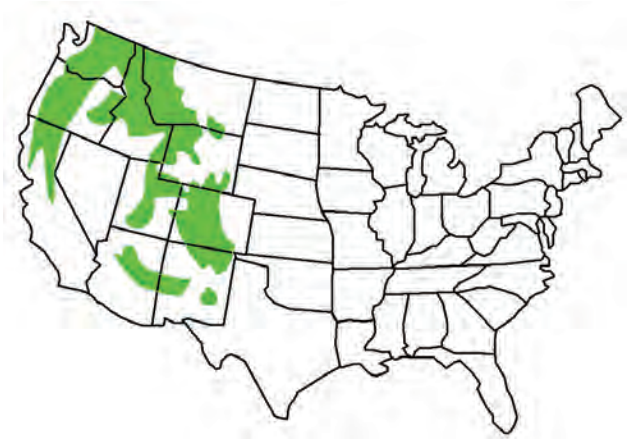
# Subalpine

## Physical Description

The terrain is steeply sloping mountains crossed by many valleys. Average annual precipitation is highly variable, typically ranging from 30 inches to 60 inches with some areas receiving more than 100 inches. The majority of the moisture comes in the winter and early spring as snow.

## Dominant Vegetation

This zone is found directly above the montane zone in elevation and is associated with most major mountain ranges in the western U.S. The lower reaches have many of the characteristics of the montane zone. The climax vegetation is typically dense coniferous forest. In the Sierra Nevada Mountains, mountain hemlock, California red fir, western white pine and whitebark pine dominate. In the Rocky Mountains, subalpine fir and Engelmann spruce dominate. In the Gila Mountains, Engelmann spruce and corkbark fir dominate.



The understory vegetation usually consists of sedges, a variety of forbs and low growing shrubs, such as vaccinium, elderberry, bearberry, currant and willow. Where the forest canopy is dense, understory plants are sparse. Aspen are found in early stages of plant succession.

Moist subalpine meadows dominated by grasses, sedges and forbs such as purple reedgrass, alpine fescue, slender wheatgrass, falsebulrush sedge, whiproot clover and bistort are scattered throughout this region. In high mountain valleys, streams and bogs are surrounded by thick stands of willow and subalpine meadow vegetation.

Dwayne Elmore

**Trees in the subalpine (such as this subalpine fire) grow slowly and rarely attain a tall structure as the growing conditions are harsh.**

Dwayne Elmore

**The growing season is short in the subalpine with most plants going dormant by October.**

## Farming and Ranching

An extremely short growing season, rocky soils and steep slopes prohibit the cultivation of crops. In some areas, water is diverted from streams to irrigate high mountain meadows for grass and sedge-hay production. Livestock grazing is important in localized areas and is usually restricted to the mountain meadows and aspen stands where slopes are less steep.

## Plant Succession Stage

Stage 1 — bare ground, Stage 2 — annual forbs, Stage 3 — perennial grasses and sedges, Stage 4 — aspen and shrubs, Stage 5 — young coniferous forest and Stage 6 — mature coniferous forest. On extremely moist sites, succession does not usually develop past Stage 4. On dry sites, such as steep

slopes with southern exposure succession does not usually develop past Stage 3 or Stage 4.

## Species Recommended for Judging

black-capped chickadee
blue grouse
cutthroat trout
elk
hairy woodpecker
marten
mule deer
Northern goshawk
rainbow trout
red squirrel
snowshoe hare
yellow-rumped warbler

## Subalpine

| Food Groups | American marten | black-capped chickadee | cutthroat trout | elk | hairy woodpecker | mule deer | Northern goshawk | rainbow trout | red squirrel | snowshoe hare | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | x | | | | | | | | |
| Bark | | | | x | | x | | | | x | |
| Birds | x | | | | | | x | | | | |
| Buds | | | | x | | x | | | | x | |
| Crayfish | | | x | | | | | x | | | |
| Eggs | x | | x | | | | | x | x | | |
| Fish | | | x | | | | | x | | | |
| Forbs | | | | x | | x | | | | x | |
| Frogs & Salamanders | x | | x | | | | | x | | | |
| Fungi | | | | | | x | | | | | |
| Grain | | | | | | | | | | | |
| Grass | | | | x | | x | | | | x | |
| Hard Mast | | | | x | | x | | | x | | |
| Insects and Spiders | x | x | x | | x | | | x | | | x |
| Leaves & Twigs | | | | x | | x | | | | x | |
| Lizards | x | | | | | | x | | | | |
| Mammals | x | | | | | | x | | | | |
| Seeds | | x | | | x | | | | x | | |
| Snails | | | | | | | | x | | | |
| Soft Mast | x | x | | x | x | x | | | x | | |

## Subalpine

| | American marten | black-capped chickadee | cutthroat trout | elk | hairy woodpecker | mule deer | Northern goshawk | rainbow trout | red squirrel | snowshoe hare | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | X | | X | X | | X | | X | X | X | |
| Establish Native Grasses and Forbs | | | | X | | X | | | | X | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | X | X | | X | | X | | | X | X | X |
| Increase Harvest | X | | X | X | | X | | X | X | X | |
| Manage disturbance | | X | X | X | X | X | | X | X | X | X |
| Nesting Structures | | X | | | | | | | | | |
| Plant Shrubs | X | X | | | X | X | | | | X | X |
| Plant Trees | | X | | | X | | X | | X | X | X |
| Ponds: Construction | | | | | | | | X | | | |
| Ponds: Deepen Edges | | | | | | | | X | | | |
| Ponds: Fertilize / Lime | | | | | | | | X | | | |
| Ponds: Reduce Turbidity | | | | | | | | X | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | X | | | |
| Ponds: Restock | | | | | | | | X | | | |
| Create Snags | | X | | | X | | | | | | |
| Streams: Dams, Boulders, or Logs | | | X | | | | | X | | | |
| Streams: Remove Fish Barriers | | | X | | | | | X | | | |
| Water Control Structures | | | | | | | | X | | | |
| Water Developments for Wildlife | | | | X | | X | | | | | |
| Wildlife Damage Management | | | | X | X | | | | | X | |

# Urban

## Physical Description

According to the U.S. Census Bureau in 2005, 80 percent of the American population lived in or near an urban area. The Census Bureau defines an urban area as a large central place with a total population of at least 50,000. In addition to a sizeable human population, urban areas are characterized by residential and commercial development connected and criss-crossed by infrastructure such as roads, train tracks, and utilities. Areas such as neighborhood parks offer the best example of contiguous wildlife habitat within an urban environment.

Dwayne Elmore

**Wildlife damage management is an important consideration in urban areas as wildlife frequently conflict with people. Here, netting is preventing gulls from roosting on houses.**

Dwayne Elmore

**While urban areas provide limited wildlife habitat, open areas with vegetation can allow some wildlife species to survive. This provides a higher quality of life for urban residents.**

## Dominant Vegetation

Because urban areas are found in all regions of the U.S., it is difficult to identify dominant vegetation common across all regions. However, urban regions typically contain Stage 1 in the form of bare ground and paved areas, annual plantings, perennial grasses and forbs, shrubs and young and mature trees. The vegetation is as likely to be an introduced species as it is a native species. Additionally, vegetated areas are typically manipulated in a landscaped manner versus "letting nature take over" as in rural areas. Interspersion is an important concept to understand in urban areas because of the fragmented landscape from residential and commercial development.

As a result of a disturbed and fragmented landscape, combined with the fact that many varieties of non-native ornamentals are planted for aesthetic purposes, urban areas are often dominated by non-native, invasive vegetation. Educating the public about native versus non-native cultivars and monitoring can also be very effective and should be implemented in all urban areas.

## Species Recommended for Judging

American robin
big brown bat
common nighthawk
desert cottontail
Eastern bluebird
Eastern cottontail
European starling
Eastern gray squirrel
house finch
house sparrow
house wren
mountain cottontail
Northern flicker
Northern raccoon
rock pigeon
ruby-throated hummingbird
song sparrow
Western bluebird

## Considerations for Urban Wildlife Management Practices

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

While there are several active management practices that can be implemented such as artificial feeders, mowing, planting flowers and rooftop/balcony gardens there are also some common-sense considerations that should always be given. For example, when nests of desirable species are found, care should be taken not to disturb them. Otherwise, the nest/nestlings may be abandoned. Another consideration is the use of pesticides. Insects are a great source of protein, calcium, and various vitamins and minerals and are the primary diet item for many birds seen in urban and suburban areas. Thus, it should be obvious that pesticides should be used sparingly and carefully. When using pesticides, follow all directions on the manufacturer's label and wear protective clothing.

## Urban

| Food Group | American robin | big brown bat | common nighthawk | desert cottontail | Eastern bluebird | Eastern cottontail | Eastern gray squirrel | European starling | house finch | house sparrow | house wren | ruby-throated hummingbird | mountain cottontail | Northern flicker | Northern raccoon | rock pigeon | song sparrow | Western bluebird |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bark | | | | x | | x | x | | | | | | x | | | | | |
| Birds | | | | | | | | | | | | | | | x | | | |
| Buds | | | | x | | x | x | | x | x | | | x | | | | | |
| Carrion | | | | | | | | | | | | | | | x | | | |
| Crayfish | | | | | | | | | | | | | | | x | | | |
| Earthworms | x | | | | | | | x | | x | x | | | | x | | | |
| Eggs | | | | | | | | | | | | | | | x | | | |
| Fish | | | | | | | | | | | | | | | x | | | |
| Forbs | | | | x | | x | | | | | | | x | | | | | |
| Frogs & Salamanders | | | | | | | | | | | | | | | x | | | |
| Fungi | | | | | | | x | | | | | | | | | | | |
| Grain | | | | x | | x | x | x | | x | | | x | | x | x | | |
| Grass | | | | x | | x | | | | | | | x | | | | | |
| Hard Mast | | | | | | | x | | | | | | | x | x | | | |
| Insects and Spiders | x | x | x | | x | | x | x | x | x | x | x | | x | x | | x | x |
| Leaves & Twigs | | | | x | | x | | | | | | | x | | | | | |
| Lizards | | | | | | | | | | | | | | | x | | | |
| Mammals | | | | | | | | | | | | | | | x | | | |
| Mussels | | | | | | | | | | | | | | | x | | | |
| Nectar | | | | | | | | | | | | x | | | | | | |
| Seeds | | | | | | | x | x | x | x | | | | x | x | x | x | |
| Snails | | | | | | | | | | | | | | | x | | | |
| Snakes | | | | | | | | | | | | | | | x | | | |
| Soft Mast | x | | | x | x | x | x | x | x | x | | | x | x | x | | x | x |
| Tubers | | | | | | | | | | | | | | | x | | | |

## Urban

| | American robin | big brown bat | common nighthawk | desert cottontail | Eastern bluebird | Eastern cottontail | Eastern gray squirrel | European starling | house finch | house sparrow | house wren | ruby-throated hummingbird | mountain cottontail | Northern flicker | Northern raccoon | rock pigeon | song sparrow | Western bluebird |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | X | X | X | X | X | X | X | | X | | X | X | X | X | X | | X | X |
| **Establish Native Grasses and Forbs** | | | | X | X | X | | | X | | | | X | | | | X | X |
| **Fish or Wildlife Survey** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **Nesting Structures** | X | X | | | X | | X | | | | X | | | | | | | X |
| **Plant Shrubs** | X | | | X | X | X | X | | X | | X | X | X | X | X | | X | X |
| **Plant Trees** | X | X | | | X | | X | | X | | X | X | | X | X | | | X |
| **Streams: Dams, Boulders, or Logs** | | | | | | | | | | | | | | | | | | |
| **Water Control Structures** | | | | | | | | | | | | | | | X | | | |
| **Water Developments for Wildlife** | | X | | | | | | | | | | | | | X | | X | |
| **Wildlife Damage Management** | | X | | X | | X | X | X | | X | | | X | X | X | X | | |
| **Artificial Feeders** | | | | | | | X | | X | | | X | | X | | | X | X |
| **Mowing** | X | | X | X | X | X | | | X | | | | X | X | | | | X |
| **Plant Flowers** | | | | | | | | | | | | X | | | | | | X |
| **Rooftop / Balcony Gardens** | | | | | | | | | | | | X | | | | | | |

# Wetlands

## Physical Description

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

## Dominant Vegetation

To describe wetland vegetation, aquatic vegetation must be distinguished from upland vegetation. Aquatic vegetation can survive in the water or on lands flooded or saturated with water for extended lengths of time. Upland vegetation cannot tolerate areas saturated or flooded with water for long periods. The vegetation found in association with wetlands varies with permanence of the water, depth of water, salinity and substrate (bottom). Wetlands with deep, permanent water typically have less emergent (above the water surface) aquatic vegetation and more floating or submerged (below the water surface) aquatic vegetation. As the water depth decreases, emergent

Dwayne Elmore

**Stage 1 wetland— Stage 1 wetland, such as visible here in the foreground, is characterized by open water and limited vegetation.**

Craig Harper

**Stage 2 wetland—This beaver-influenced wetland provides a mosaic of open water with submerged vegetation as well as floating islands of debris and emergent vegetation.**

**Stage 3 wetland—This natural freshwater marsh is covered with several species of native grasses and sedges. Over time, these freshwater wetlands become more similar to the adjacent uplands as they slowly fill-in.**

**Stage 4 wetland— Stage 4 wetlands are rarely flooded. Here, a riparian area along the Missouri River has recently flooded and sediment is deposited along the river. However, most of the time, this area is relatively dry.**

aquatic vegetation becomes more dominant. Less vegetation is found on rock and gravel bottoms than on bottoms that are more characteristic of soil such as the presence of silt, clay and organic (dead plants and animals that are decomposed) matter. Emergent aquatic vegetation includes trees, shrubs, grasses and grasslike plants.

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

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

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

Typical invasive plants found in wetlands include purple loosestrife, hydrilla, Eurasian watermilfoil, reed canarygrass, water hyacinth, alligator weed, and phragmites.

## Plant Succession Stage

Typically succession proceeds in the following order: Stage 1 — deep water with little vegetation, Stage 2 — shallow water dominated by submerged and floating aquatic vegetation, Stage 3 — very shallow water or wet ground dominated by any variety of emergent aquatic vegetation and Stage 4 — ground becomes drier and upland vegetation similar to the surrounding area becomes dominant.

Succession proceeds slowly in wetlands with large amounts of deep water or a rocky bottom. Fluctuations in water levels can cause the final stage of succession to regress to an earlier stage. For example, if a wetland in Stage 3 succession is flooded with deep water for a period of time, the aquatic emergent vegetation may die, leaving a wetland in Stage 1 or Stage 2 succession. The extent of this regression depends on the length of time the wetland is flooded with deep water, how much the water level changes, and the extent (length of time) the present vegetation can survive in the changed water level.

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

## Species Recommended for Judging

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

## Wetlands

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

## Wetlands

| | American beaver | bluegill | bullfrog | Canada goose | common muskrat | largemouth bass | mallard | mink | Northern raccoon | redhead | wood duck |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | X | X | X | | X | X | | X | X | | |
| Delay Crop Harvest | | | | | | | X | | | | |
| Establish Native Grasses and Forbs | | | | X | | | X | | | | |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | | | | | | | X | | X | | X |
| Increase Harvest | X | X | X | | X | X | | X | X | | |
| Leave Grain Unharvested | | | | X | | | X | | X | | X |
| Manage disturbance | X | X | X | X | X | X | X | X | X | X | X |
| Nesting Structures | | | | X | | | X | | | | X |
| Plant Shrubs | X | | | | | | | | X | | X |
| Plant Trees | X | | | | | | | | X | | X |
| Ponds: Construction | | X | | | | X | | | | | |
| Ponds: Deepen Edges | | X | | | | X | | | | | |
| Ponds: Fertilize / Lime | | X | | | | X | | | | | |
| Ponds: Reduce Turbidity | | X | | | | X | | | | | |
| Ponds: Repair Spillway/ Levee | | X | | | | X | | | | | |
| Ponds: Restock | | X | | | | X | | | | | |
| Create Snags | | | | | | | | | X | | X |
| Water Control Structures | X | X | X | X | X | X | X | X | X | X | X |
| Water Developments for Wildlife | | | X | X | X | | X | X | X | X | X |
| Wildlife Damage Management | X | | | X | X | | | | X | | |

# Woodland

## Physical Description

The woodland region is dominated by various types of woodlands. There are woodlands in other regions, but the woodland region is distinguished by species composition and structure of the vegetation community. Terrain in the woodland region is irregular with large hills and mesas that are often dissected by narrow drainages. The average annual precipitation ranges from 10 to 25 inches. Most of the precipitation is received in winter and late summer. Summers have hot days and cool nights. Winters are cold.

## Dominant Vegetation

In the woodland region, pinyon pine and juniper trees are species most often associated with the final stage of plant succession. In the southern areas of this region, species of oaks such as live oak, Spanish oak and shin oak represent the final stage of plant succession. Woodland shrubs include bitterbrush, mountain mahogany, scrub oak and sumac. In addition, in areas where there has been a disturbance, mesquite may dominate.

Dwayne Elmore

**Oak savannah and woodlands are maintained by frequent fire and contain abundant grass cover.**

Dwayne Elmore

**In the absence of fire, juniper often is the dominant plant which hosts an entirely different set of wildlife species than found in more open woodland.**

Also in the woodland region, areas dominated by sagebrush may be found interspersed with tree-dominated areas similar to those described in the intermountain sagebrush region.

A variety of perennial and annual grasses and forbs can be found in the herbaceous layer. The amount of grass, forbs and shrubs depends on the amount of trees in the area. Canopy cover is one of the primary factors influencing understory vegetation in forest and woodland vegetation. Usually the herbaceous layers decrease as the amount of trees increase.

The vegetation associated with riparian areas is often much different than the surrounding vegetation. The vegetation is more abundant and composed of different species. Riparian areas are dominated by cottonwoods, willows, tamarisk, Russian olive, silver buffaloberry, boxelder, and a variety of grasses and forbs. In the southern part of the woodland region, hackberry, Spanish oak and live oak occur. The variety and abundance of vegetation compared to the surrounding areas makes riparian areas very attractive to wildlife.

Typical invasive plants in the woodland regions include leafy spurge cheatgrass, Canada thistle, dalmation toadflax, and yellow toadflax.

## Farming and Ranching

Water for irrigation is limited and necessary to grow crops in this region. Where available, water is

diverted from rivers and streams to grow crops such as corn, wheat, barley, alfalfa and grass pasture and hay. Farming is important only in small, localized areas in valleys and on flat terrain. Livestock grazing is common in the region. Grazing management may be used to exclude livestock from sensitive areas or to manage disturbanceal stage to benefit wildlife by adjusting stocking rate, season of use or grazing system.

## Plant Succession Stage

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

## Species Recommended for Judging

American kestrel
black-capped chickadee
bluegill
coyote
desert cottontail
largemouth bass
mallard
mourning dove
mule deer
Northern bobwhite
Northern flicker
Northern raccoon
red-tailed hawk
spotted towhee
Western bluebird
white-tailed deer
wild turkey

## Woodland

| Food Groups | American kestrel | black-capped chickadee | bluegill | coyote | desert cottontail | largemouth bass | mallard | mourning dove | mule deer | Northern bobwhite | Northern flicker | Northern raccoon | red-tailed hawk | spotted towhee | Western bluebird | white-tailed deer | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aquatic Plant | | | | | | | x | | | | | | | | | | |
| Bark | | | | | x | | | | x | | | | | | | x | |
| Birds | x | | | x | | x | | | | | | x | x | | | | |
| Buds | | | | | x | | | | x | x | | | | | | x | x |
| Carrion | | | | x | | | | | | | | x | | | | | |
| Crayfish | | | x | | | x | x | | | | | x | | | | | |
| Earthworms | | | x | | | x | | | | | | | | | x | | |
| Eggs | | | x | x | | | | | | | | x | | | | | |
| Fish | | | x | | | x | | | | | | x | | | | | |
| Forbs | | | | | x | | | | x | x | | | | | | x | x |
| Frogs & Salamanders | | | x | x | | x | | | | | | x | | | | | |
| Fungi | | | | | | | | | x | | | | | | | x | |
| Grain | | | | | x | | x | x | | x | | x | | | | x | x |
| Grass | | | | | x | | | | x | | | | | | | x | x |
| Hard Mast | | | | | | | x | | x | x | x | x | | x | | x | x |
| Insects and Spiders | x | x | x | x | | x | x | x | | x | x | x | | x | x | | x |
| Leaves & Twigs | | | | | x | | | | x | x | | | | | | x | x |
| Lizards | | | | x | | | | | | | | | x | | | | x |
| Mammals | x | | | x | | x | | | | | | x | x | | | | |
| Seeds | | x | | | | | x | x | | x | x | x | | x | | | x |
| Snails | | | | | | | x | | | | | | | | | | x |
| Snakes | | | | x | | x | | | | | | x | x | | | | |
| Soft Mast | | x | | x | x | | x | | x | x | x | x | | x | x | x | x |
| Tubers | | | | | | | | | | | | x | | | | | x |

## Woodlands

| | American kestrel | black-capped chickadee | bluegill | coyote | desert cottontail | largemouth bass | mallard | mourning dove | mule deer | Northern bobwhite | Northern flicker | Northern raccoon | red-tailed hawk | spotted towhee | Western bluebird | white-tailed deer | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Decrease Harvest | | | X | X | X | | | | X | X | | X | | | | X | X |
| Establish Field Buffers | X | | | X | X | | | | X | X | | X | X | | X | X | X |
| Establish Native Grasses and Shrubs | X | | | X | X | X | | | X | X | X | | X | X | X | X | X |
| Fish or Wildlife Survey | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Forest Management Techniques | X | X | | X | | X | | | X | X | X | X | X | X | X | X | X |
| Increase Harvest | | | X | X | | X | | | X | | | X | | | | X | X |
| Leave Grain Unharvested | | | | | | | X | X | X | X | | X | | | | X | X |
| Manage disturbance | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Nesting Structures | X | X | | | | X | | | | | | | | | X | | |
| Plant / Manage Food Plots | | | | | X | | X | X | X | X | X | | | | | X | X |
| Plant Shrubs | X | X | | X | X | X | | | X | X | X | X | X | X | X | X | X |
| Plant Trees | X | X | | | | | | X | X | | X | X | X | | X | X | X |
| Ponds: Construction | | | X | | | X | | | | | | | | | | | |
| Ponds: Deepen Edges | | | X | | | X | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | X | | | X | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | X | | | X | | | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | X | | | X | | | | | | | | | | | |
| Ponds: Restock | | | X | | | X | | | | | | | | | | | |
| Create Snags | X | X | | | | X | | | | | | X | X | X | X | | |
| Tillage Management | X | | | | | | X | X | X | X | | X | X | | | X | X |
| Water Control Structures | | | X | | | X | X | | | | | X | | | | | |
| Water Developments for Wildlife | | | | | | | X | X | X | | | X | | | | X | X |
| Wildlife Damage Management | | | | X | | | | | X | | X | X | | | | X | X |

# Wildlife Species

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

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

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

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

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

Remember, when assessing whether to recommend a WMP, current conditions should be considered. You are determining if the practice should be implemented, given the current habitat conditions, within the year. Also, it is important to realize the benefit of a practice may not be realized anytime soon. For example, trees or shrubs planted for mast may not bear fruit for several years.

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song sparrow
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American marten
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common muskrat
coyote
desert cottontail
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Eastern fox squirrel
Eastern gray squirrel
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largemouth bass
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rainbow trout
rough-skinned newt
Western hognose snake

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

# Birds

## American kestrel

### General information

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

### Habitat requirements

*Diet*: primarily insects and small mammals associated with open areas

*Water*: obtain necessary water from diet and do not need water for drinking

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

### Wildlife management practices

*Establish Field Buffers*: to increase cover for prey around row crop fields

*Establish Native Grasses and Forbs*: where necessary to provide increased early successional habitat for prey; Stages 2 and 3 should be interspersed with Stages 5 and 6

*Forest Management Techniques*: forest regeneration will provide open areas for hunting for a couple of years

*Manage disturbance*: prescribed fire, chaining and herbicide applications are recommended to maintain Stage 4 and stimulate Stages 2 and 3; grazing management should leave enough herbaceous canopy to support insects and small rodents; grazing management should maintain trees in riparian areas

*Nesting Structures*: where adequate nesting cavities are lacking; boxes can be placed on fence posts in open areas

*Plant Shrubs*: in large open areas on idle lands for cover for hunting prey

*Plant Trees*: for future perching sites and cavities for nesting

*Create Snags*: for perches, nest cavities and a food source (insects)

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

## American robin

### General information

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

### Habitat requirements

*Diet*: insects and worms in warm seasons; soft mast from shrubs and trees in winter; seldom use artificial feeders

*Water*: require water daily in warm seasons; obtain water from low-lying areas, ponds, even yard irrigation and rain-filled gutters

*Cover*: shrubs, evergreen trees, and deciduous trees used for nesting and escape; evergreen trees often used for early nests

### Wildlife management practices

*Manage disturbance*: prescribed fire, disking, grazing and mowing can be used to set back succession and improve structure for robins

*Mowing*: can be used to maintain suitable structure for robins in urban areas

*Plant Shrubs*: for soft mast; examples might include dogwoods, hollies, golden currant and winterberry

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

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

# Black-capped chickadee

## General information

Black-capped chickadees occur throughout the upper two-thirds of the U.S. They are found in Stages 4, 5 and 6, and nest in cavities in dead or hollow trees. Black-capped chickadees eat insects and spiders from the branches and bark of trees and shrubs. They also will visit bird feeders. They are often seen on the edges of forested areas.

## Habitat requirements

*Diet*: ants, caterpillars and spiders from branches, leaves, and bark of trees and shrubs; also seeds from bird feeders and soft mast from shrubs

*Water*: obtain necessary water from snow and surface water

*Cover*: nest in cavities, usually in a dead or hollow tree; they can excavate a cavity only in soft wood or rotted wood and will use woodpecker holes, natural cavities and man-made boxes; thick shrub and tree canopies provide necessary cover

## Wildlife management practices

*Forest Management Techniques*: timber stand improvement practices can improve understory structure by increasing shrub cover within a stand when canopy cover exceeds 80 percent

*Manage disturbance*: grazing management should prevent livestock from degrading shrub cover

*Nesting Structures*: can be used in areas where nesting cavities are limiting

*Plant Shrubs*: to provide additional Stage 4 in large areas of Stages 2 and 3

*Plant Trees*: plant softwood trees in large areas of Stages 2 and 3

*Create Snags*: trees may be killed where nesting cavities are limited to stimulate creation of additional cavities

# Black-throated sparrow

## General information

Black-throated sparrows are associated with Stage 4, specifically, sparsely vegetated desert scrub including mesquite cacti, chaparral and juniper in the southwestern region of the U.S. Their diet is mainly seeds and insects. Black-throated sparrows nest low to the ground in small shrubs.

## Habitat requirements

*Diet*: insects, seeds and green herbaceous vegetation

*Water*: require water frequently during dry and cool seasons, especially when green herbaceous vegetation and insects are not available

*Cover*: nests are made from small twigs, grass and stems placed in small shrubs near the ground; shrubs and cacti are used for hiding cover

## Wildlife management practices

*Manage disturbance*: mowing, chaining, roller beating and/or prescribed fire can be used to keep areas in Stage 4; grazing management regimes that promote desert shrub vegetation beneficial for black-throated sparrows may be used

*Water Developments for Wildlife*: can be beneficial where water is limiting

# Blue-winged teal

## General information

Blue-winged teal prefer calm water in association with ephemeral wetlands, inland marshes, lakes and ponds. They inhabit shorelines more than open water and primarily nest within a few hundred feet of wetlands in the prairie pothole region of the Northern Great Plains. Nests are found primarily in dense grassland cover. Hayfields will sometimes be used for nesting, assuming adequate grass stubble remains. Blue-winged teal are surface feeders and prefer to feed on mud flats or shallow water where floating and shallowly submerged vegetation

is available, along with abundant small aquatic animal life. Shallow wetlands with both emergent vegetation and open water are required for brood habitat. During spring and fall migration, shallow wetlands and flooded fields are used for loafing and feeding. These ducks are the first in North America to begin fall migration on their way to Central and South America.

### Habitat requirements

*Diet*: aquatic vegetation, seeds and aquatic insects; feeding primarily confined to wetlands

*Water*: relatively shallow wetlands required for brood rearing, feeding and loafing

*Cover*: dense native grass cover used for nesting; brood habitat consists of a mix of open water and emergent vegetation

### Wildlife management practices

*Establish Native Grasses and Forbs*: for nesting cover where suitable cover is lacking

*Leave Grain Unharvested*: can be beneficial if flooded

*Manage disturbance*: prescribed fire, disking and herbicide applications can be used to keep wetlands and associated upland nesting habitat in the desired structure; grazing management should prevent livestock access to nesting vegetation adjacent to wetlands

*Plant/Manage Food Plots*: planting native wetland food plants and some agricultural crops can provide additional food resources during migration and winter if the area is shallowly flooded when the ducks arrive

*Tillage Management*: delaying cropland tillage in spring may allow nesting in standing stubble

*Water Control Structures*: allow managers to manipulate water levels to enhance habitat

*Water Developments for Wildlife*: flooded fields provide important areas for teal during migration; constructing small dikes for temporary flooding provides shallow sheet water teal prefer for feeding and loafing

## Brewer's sparrow

### General information

Brewer's sparrows are found in the northern Rocky Mountains of the Yukon and British Columbia and in the Great Basin south to southern California and New Mexico. Their habitat contains sagebrush in the Great Basin and alpine meadows in the Rocky Mountains. They are associated with Stage 4, but shrub-dominated areas less than one-half acre are not usually used.

### Habitat requirements

*Diet*: a variety of insects and spiders from leaves and branches of shrubs; seeds of forbs and grasses

*Water*: necessary water is obtained from diet, but will use other water sources when available

*Cover*: nest in dense sagebrush 20 inches to 30 inches high; amount and height of shrub is important for suitable habitat; shrubs also used for hiding

### Wildlife management practices

*Manage disturbance*: grazing management regimes that promote shrub growth is beneficial

*Plant Shrubs*: in open areas for cover

## Broad-winged hawk

### General information

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

### Habitat requirements

*Diet*: rodents and other small mammals (such as mice, chipmunks, squirrels, shrews, moles) but also snakes, lizards, caterpillars, grasshoppers, beetles, crickets, crawdads and some small birds

*Water*: obtain necessary water from diet

*Cover*: nest among tall trees in Stage 6 with openings and water nearby; will sometimes nest in old crow, hawk or squirrel nests; they hunt throughout the forest, especially where small canopy gaps occur

### Wildlife management practices

*Forest Management*: timber stand improvement should encourage understory development and enhance habitat for a variety of prey species

*Manage disturbance*: grazing management should exclude cattle from forested areas to retain an understory that provides cover for a variety of small prey mammals

*Plant Shrubs*: in areas where tree cover is lacking such as large open fields

*Plant Trees*: to provide nest sites

*Water Developments for Wildlife*: will enhance habitat for a variety of prey species

## Brown thrasher

### General information

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

### Habitat requirements

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

*Water*: water requirements are not known

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

### Wildlife management practices

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

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

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

## California quail

### General information

Found most commonly in areas of chaparral, sagebrush scrub and grassland oak habitats. California quail require shrubby cover for roosting, escape cover, loafing and early successional habitat for foraging. In general, California quail prefer habitat consisting of 50 percent Stage 4, interspersed with 25 percent Stage 1, and 25 percent Stages 2 and 3. Adult California quail eat mostly seeds, leaves and flowers from grasses, shrubs and trees. The diet of juveniles, however, consists largely of invertebrates.

### Habitat requirements

*Diet*: about 70 percent of diet consists of seeds and green foliage from legumes and grasses, particularly annual grasses; diet supplmented with soft mast and seeds from a variety of shrubs; juveniles less than 3 weeks of age eat insects; by 12 weeks of age, diet is same as adults

*Water*: obtain necessary water through diet except during periods of heat and drought when drinking water is required

*Cover*: require cover near feeding areas or habitat quality declines dramatically; shrubby cover used for roosting, escape cover and loafing; nest on the ground in thick grass and forbs

### Wildlife management practices

*Decrease Harvest*: may be necessary when surveys show a decline in the local population

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

*Establish Native Grasses and Forbs*: in areas that lack adequate nesting habitat and food sources

*Leave Grain Unharvested*: grain is eaten when available

*Manage disturbance*: prescribed fire, disking, herbicide application, mowing, chaining, roller beating and grazing management can be used to maintain Stage 4 interspersed with Stages 1, 2 and 3; prescribed fire is particularly important to create Stages 1, 2 and 3 for feeding areas; grazing management should prevent livestock from destroying cover near water areas

*Plant/Manage Food Plots*: grain will be eaten by quail when available

*Plant Shrubs*: native shrubs should be established where woody cover is lacking

*Plant Trees*: species such as oaks may be planted in areas lacking woody cover

*Tillage Management*: delayed tillage of cropland in spring may allow nesting if residual standing cover is available

*Water Developments for Wildlife*: guzzlers, catchment ponds, windmills, and spring developments can be beneficial to quail when or where water is limiting

# California thrasher

## General information

California thrashers are found in Stages 4 and 5 chaparral habitat in the Mediterranean region. The shrub cover they use requires fire for maintenance, but thrashers are not typically found in recently burned areas until desirable shrub structure develops following fire.

## Habitat requirements

*Diet*: spiders, beetles, Jerusalem crickets and other insects may constitute more than 90 percent of diet during breeding season; during the rest of the year, a variety of seeds and hard and soft mast from shrubs are eaten

*Water*: exact water requirements are unknown, but since California thrashers occur throughout arid regions, it is unlikely they require open water; they will, however, drink from sources of open water when available

*Cover*: dense shrubby cover is required for nesting

## Wildlife management practices

*Forest Management Techniques*: forest regeneration provides dense shrub cover

*Manage disturbance*: prescribed fire and chaining can convert Stage 6 into Stages 4 and 5, but it may take a few years before habitat is suitable; grazing management should prevent livestock from damaging riparian scrub habitat

*Plant Shrubs*: in areas where Stages 4 and 5 are lacking

# Canada goose

## General information

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

## Habitat requirements

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

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

*Cover*: nest in a variety of places such as mats of bulrushes, tops of muskrat houses, and most of all, in relatively thick cover on islands, usually within 200 feet of water's edge

## Wildlife management practices

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

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

*Nesting Structures*: in some areas or regions, elevated artificial nesting platforms may be established, preferably on islands and/

or peninsulas surrounded by open water, to help increase nesting success

*Water Control Structures*: can be used to manipulate water levels and maintain 80 percent open water and 20 percent emergent vegetation

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

*Wildlife Damage Management*: may be needed where Canada geese damage lawns, golf courses and crop fields

# Common nighthawk

## General information

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

## Habitat requirements

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

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

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

## Wildlife management practices

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

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

# Crissal thrasher

## General information

Crissal thrashers are found in the southwestern region of the U.S. south to Mexico. They prefer dense, low scrubby vegetation such as desert and foothill scrub and riparian brush. Crissal thrashers nest in shrubs 2 feet to 8 feet above ground. Nest is constructed of twigs.

## Habitat requirements

*Diet*: forage on the ground and eat a variety of insects, spiders, seeds and soft mast

*Water*: standing water is essential and needed daily

*Cover*: thick shrub cover for nesting and loafing

## Wildlife management practices

*Manage disturbance*: grazing management is needed to ensure adequate lower herbaceous and shrub layers are present to provide food and cover; this is particularly important in riparian areas where bands of thick shrub vegetation are found adjacent to drainage ways (arroyos); usually, dormant-season grazing can result in more use of woody vegetation; livestock water facilities should be placed in upland areas to discourage congregation of livestock and overuse in riparian areas

*Plant Shrubs*: in agricultural and riparian areas where needed

*Water Developments for Wildlife*: catchment ponds, windmills, spring developments and guzzlers can benefit crissal thrashers

# Dickcissel

## General information

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

## Habitat requirements

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

*Water*: water obtained from food
*Cover*: early successional habitat with a mixture of grasses and forbs; grain fields frequented during winter

### Wildlife management practices:

*Delay Crop Harvest*: delayed hay harvest in areas with insufficient native grassland will allow nests to hatch and hatchlings to leave nests prior to harvest
*Establish Field Buffers*: to increase usable space around row crop fields
*Establish Native Grasses and Forbs*: where early successional habitat is limiting; forb component is important
*Leave Grain Unharvested*: will provide additional food during migration
*Manage disturbance*: prescribed fire and herbicide applications should be used to manage early successional habitat
*Tillage Management*: may provide additional food during migration

## Dusky grouse

### General information

Dusky grouse (previously considered blue grouse) occur predominantly in mountainous areas in the western U.S. and Canada. They require Stages 3 and 4 in the summer and Stages 5 and 6 in the winter. Dusky grouse roost in forest edges near shrub vegetation where they forage. Their nests are usually on the ground, often under shrubs or near fallen logs.

### Habitat requirements

*Diet*: soft mast, seeds, forbs and insects from spring to fall; needles of coniferous trees may be eaten in winter
*Water*: obtain necessary water from dew and diet
*Cover*: nest on the ground near forest edges, often under shrubs or next to fallen logs

### Wildlife management practices

*Decrease Harvest*: may be necessary when surveys show a decline in the local population
*Establish Native Grasses and Forbs*: particularly for agricultural fields going out of production and where early successional habitat is limiting
*Forest Management Techniques*: forest regeneration will increase Stages 3 and 4 for foraging near nesting and roosting areas; timber stand improvement can be used in stands not ready for regeneration to increase Stages 3 and 4
*Manage disturbance*: prescribed fire, chaining and herbicide applications can maintain Stages 3 and 4; grazing management should prevent areas from being grazed mid-April through mid-June where dusky grouse nest
*Plant Shrubs*: to provide soft mast and buds where needed
*Plant Trees*: coniferous trees may be planted to provide a winter food source where needed

## Eastern bluebird

### General information

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

### Habitat requirements

*Diet*: insects, spiders and small amounts of soft mast
*Water*: obtain necessary water from diet but may use other water sources when available
*Cover*: nest in cavities of trees and fence posts; old woodpecker cavities are especially important; readily nest in nesting boxes, which have had a major impact in restoring bluebird populations in some areas

### Wildlife management practices

*Establish Field Buffers*: to increase usable space around row crop fields
*Establish Native Grasses and Forbs*: when less than 75 percent of the area is composed of Stages 2 or 3

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

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

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

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

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

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

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

# European starling

## General information

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

## Habitat requirements

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

*Water*: require water during warm seasons

*Cover*: nest in tree cavities, old buildings

## Wildlife management practices

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

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

# Gambel's quail

## General information

Gambel's quail are found in arid regions of Arizona, New Mexico, southern Colorado, Utah, southern Nevada and California. Gambel's quail prefer Stages 2 and 3 interspersed with Stage 4, particularly brushy and thorny vegetation of southwestern deserts. Gambel's quail are also found along the edge of agricultural fields, especially those adjacent to arroyos and irrigation ditches. Dense shrubs and cacti intermingled with small open areas are also used. The amount of late winter and early spring precipitation largely determines the quality and quantity of spring food. In essence, more rain equals more quail.

## Habitat requirements

*Diet*: succulent green plants; seeds of forbs (especially legumes), grasses, shrubs and trees; saguaro, cholla and prickly pear cacti fruits; a variety of soft mast and insects

*Water*: require water during warm seasons if succulent green plants are not available for food; will usually not travel more than one-third mile for water

*Cover*: nest in the thickest shrub and/or herbaceous vegetation available; roost in tall shrubs and trees such as mesquite, scrub

oak, desert hackberry, cholla, one-seed juniper, littleleaf sumac, catclaw acacia and various yuccas; shrubs provide important cover for loafing during the day

### Wildlife management practices

*Decrease Harvest*: may be necessary when surveys show a decline in the local population

*Leave Grain Unharvested*: to provide additional food resource in fall/winter

*Manage disturbance*: over much of the region where Gambel's quail are found, there are few wildlife management practices considered practical for improving food other than proper livestock grazing management; grazing management is important to ensure enough residual herbaceous vegetation is available for nesting cover

*Plant/Manage Food Plots*: grain plots can provide additional food and cover; best when located next to high-quality cover

*Plant Shrubs*: in areas Stage 4 is lacking

*Water Developments for Wildlife*: guzzlers, catchment ponds, windmills and spring developments can be beneficial where water is limiting

## Grasshopper sparrow

### General information

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

### Habitat requirements

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

*Water*: water requirements are unknown but probably obtained through diet

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

### Wildlife management practices

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

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

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

## Great horned owl

### General information

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

### Habitat requirements

*Diet*: great horned owls forage at night; the diet is extremely varied but commonly includes small- to medium-sized mammals including rabbits, skunks, squirrels and others, as well as reptiles, amphibians, large insects and fish

*Water*: water obtained from diet

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

### Wildlife management practices

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

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

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

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

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

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

*Create Snags*: where perching sites are limited

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

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

# Greater prairie-chicken

## General information

Greater prairie-chicken require very large tracts of native rangeland containing diverse grass and forb communities in Stages 2 and 3 that is free of tall vertical structures (including trees). They prefer flat to gently rolling terrain with some cropland. Croplands are not necessary, but may furnish seasonal foods, especially in the northern part of the U.S. Less than 25 percent of the landscape should be composed of crops.

## Habitat requirements

*Diet*: seeds, grains, insects and herbaceous greens; during the first few weeks after hatching, the young eat insects

*Water*: water is obtained from diet

*Cover*: thick, tall grass cover is used for nesting and winter cover; if not periodically disturbed, grasses often become too thick and are less valuable for nesting cover

## Wildlife management practices

All necessary food can be found in grasslands. Management of grasslands as explained under "Cover" will supply ample food.

*Decrease Harvest*: may be necessary if populations are declining

*Delay Crop Harvest*: time crop harvest so nests will not be disturbed

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

*Establish Native Grasses and Forbs*: needed where large expanses of high-quality grassland are not available

*Leave Grain Unharvested*: unharvested grain and small annual food plots can provide a supplemental food source prairie-chickens; if high-quality grasslands with diverse forb communities are present, these practices are not necessary for survival

*Manage disturbance*: fire is an essential aspect of prairie ecology and must be applied to the landscape for long-term stability of prairie-chickens; prescribed burning every 3 years to 5 years improves plant vigor and reduces excessive buildup of old vegetation in areas not grazed; chaining and mowing can revert succession to Stage 3; chainsawing can be used to remove trees; grazing management should protect nesting and winter cover; some areas should be left ungrazed during the nesting season (May through June); grazing management should ensure the entire prairie or grassland is not uniform in structure or plant composition; areas of dense nesting cover adjacent to forb and insect-rich areas are ideal

*Plant/Manage Food Plots*: can provide supplemental food source when native foods are lacking

*Tillage Management*: do not till grain stubble in fall where croplands are adjacent to grasslands

**Special:** Prairie-chickens require sites with short vegetation that offer good visibility for breeding displays. They gather on these sites in the spring, and males display in front of females to win a mate. These areas are called "booming grounds."

# Greater sage-grouse

## General information

Very large tracts of sagebrush-dominated rangeland (Stage 4). Within this vegetative community, a diverse stand of native grasses and

forbs is critical to optimize habitat for greater sage-grouse.

### Habitat requirements

*Diet*: in spring and summer, sage-grouse prefer insects and green forbs; in late fall and winter, they eat sagebrush

*Water*: water requirements are obtained through diet, but sage-grouse will use free-standing water if available

*Cover*: nests on the ground, often under sagebrush; sage-grouse use sagebrush adjacent to open meadows in the summer; sagebrush is critical for winter cover

### Wildlife management practices

It is critical to maintain sagebrush in areas grouse traditionally use in winter. Ranchers commonly reducing the amount of sagebrush with herbicides, controlled burning, and mowing to increase the amount of forage available for livestock. For sage-grouse and other wildlife species dependent on sagebrush, the location and extent of such treatment should be considered carefully. Any sagebrush treatment should be small in size and retain large areas of intact sagebrush. **NO** treatment to reduce sagebrush should be conducted in wintering or nesting areas.

*Decrease Harvest*: may be necessary if populations are declining

*Establish Native Grasses and Forbs*: in limited areas where native grasses and forbs are absent

*Manage disturbance*: grazing management should maintain adequate grass and forb cover in nesting and brood-rearing habitat; improper grazing can increase sagebrush canopy to the point there is an inadequate understory

*Plant Shrubs*: where there is not at least 15 percent sagebrush cover

*Water Developments for Wildlife*: may be established if no water source is available

**Special:** Sage-grouse use open areas surrounded by sagebrush for courtship displays. The same areas are used traditionally every spring and are called "leks." Factors such as wet soils, or lack of soil (gravelly), often maintain these open areas in plant succession similar to Stages 2 or 3 for long periods of time. In general, it is recommended to protect lek sites and the sagebrush within several miles of them

## Hairy woodpecker

### General information

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

### Habitat requirements

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

*Water*: obtained from diet

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

### Wildlife management practices

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

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

*Create Snags*: for a food source and potential nest cavities

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

## House finch

### General information

House finches are native to the western U.S., but are an introduced species in the eastern U.S. Their current range is the entire U.S. They

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

### Habitat requirements

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

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

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

### Wildlife management practices

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

*Establish Native Grasses and Forbs*: to provide forb seed in rural areas where early successional habitat is limited

*Manipulation of Succession*: mowing (suburban areas) and prescribed fire (rural areas) can maintain Stages 2 and 3

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

*Plant Shrubs*: adjacent to open areas for nesting and hiding cover

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

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

## House sparrow

### General information

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

### Habitat requirements

*Diet*: variety of insects, soft mast, buds, forbs, weed seeds and waste grain

*Water*: free-standing water is required daily in warm seasons

*Cover*: nest in natural cavities, low branches of trees and bushes 5 feet to 7 feet above the ground, and on any projection or ledge they can find on buildings or other structures

### Wildlife management practices

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

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

## House wren

### General information

House wrens are found throughout the U.S. during the breeding season, and migrate to the deep southern U.S. during winter months. In

urban settings, house wrens prefer older residential areas with large shrubs (Stage 4) and trees (Stages 5 and 6). Wrens also use forested (Stages 5 and 6) and open areas (Stages 2 and 3) at higher elevations, as well as stands of aspen (Stages 5 and 6). House wrens nest in a variety of elevated cavities, as high as 30 feet above the ground. They forage both on the ground and above the ground.

### Habitat requirements

*Diet*: spiders, grasshoppers, crickets, beetles, caterpillars, ants, bees, ticks, earthworms and millipedes; artificial feeders are usually not used

*Water*: necessary water is obtained from the diet

*Cover*: nest in natural cavities in trees old buildings and other structures

### Wildlife management practices

*Nesting Structures*: nest boxes may be provided where adequate nesting sites are lacking; boxes should be placed high on a tree trunk or under the eaves of a house; the hole should be small to keep out house sparrows, starlings and other birds; for specifics on nest box design and placement, visit your local Extension office

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

*Plant Trees*: where trees are lacking for cover and nesting

## Ladder-backed woodpecker

### General information

Ladder-backed woodpeckers are found in wooded canyons, cottonwood groves, pine and pine oak woodlands, desert scrub and desert grasslands dominated by mesquite throughout the southwestern U.S. south to British Honduras. They are associated with Stages 4, 5 and 6 in riparian and other areas with trees. In the Hot Desert and Prairie Brushland regions, they use areas with large mesquite, palo verde, agave, cholla cactus and yuccas.

### Habitat requirements

*Diet*: insects including ants, beetle larvae, caterpillars and cotton worms found on small trees, shrubs and various cacti

*Water*: necessary water obtained from diet

*Cover*: nest in holes excavated in trees, shrubs, and stalks of agave and yucca cactus

### Wildlife management practices

*Forest Management Techniques*: timber stand improvement can improve the structure of developing woodlands and provide snags for cavities and food resources

*Manage disturbance*: grazing management should maintain vigor of existing trees and willows; in riparian areas, grazing in spring and summer when herbaceous vegetation is actively growing results in less use of woody vegetation than at other times of year; grazing management in dry regions often includes development of livestock watering facilities in upland areas to discourage overuse of riparian areas

*Plant Shrubs*: in riparian areas shrubs are lacking

*Plant Trees*: for cover and a future food source where trees or shrubs are lacking

*Create Snags*: for nesting sites

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

## Lark bunting

### General information

Lark buntings prefer short grass prairies during the breeding season, though they are also found in mixed grass prairies. They nest on the ground, primarily in native prairie. Lark buntings migrate into the southern Great Plains and Mexico during winter where they frequent grasslands, deserts, shrublands and cultivated fields.

### Habitat requirements

*Diet*: insects are the primary item in the diet, but seeds, soft mast and grain are consumed as well, especially during the winter

*Water*: necessary water is obtained from food

*Cover*: adequate grass cover is necessary, particularly during the nesting season

### Wildlife management practices

*Delay Crop Harvest*: delaying hay harvest until after nesting is complete is beneficial

*Establish Native Grasses and Forbs*: often necessary where native prairie and grassland has been converted to non-native species

*Manage disturbance*: prescribed fire is a critical for maintaining native prairie habitat for this and many other grassland birds; grazing management for livestock should provide adequate nesting habitat

## Mallard

### General information

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

### Habitat requirements

*Diet*: aquatic plants, insects and other invertebrates, hard mast (especially acorns), grains and other seed are primary components in the diet; ducklings eat mostly aquatic insects; most food is associated with wetlands, but mallards will readily dry-feed in agricultural fields during winter

*Water*: see cover requirements below

*Cover*: nest in grass and forb vegetation (sometimes they nest under shrubs) preferably within one-half mile of a wetland that provides open water with some adjacent emergent aquatic vegetation; brooding cover is open water with considerable emergent aquatic vegetation for protection from predators; ideally, wetlands have a minimum of 50 percent open water and 10 percent to 20 percent emergent vegetation; in wintering areas, mallards rest on open water bodies, such as streams, rivers and warm-water sloughs

### Wildlife management practices

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

*Establish Native Grasses and Forbs*: (in some regions) where nesting cover is limiting

*Forest Management Techniques:* can be used to increase mast production for mallard

*Leave Grain Unharvested*: to provide a winter food source

*Manage disturbance*: prescribed fire is recommended to rejuvenate dense vegetation in nesting areas and to increase or maintain proper water and vegetation interspersion in wetlands; grazing management should provide areas with tall, healthy, herbaceous vegetation that are not disturbed during the nesting season

*Nesting Structures*: (in some regions) in areas where there is high nest predation on mallards, elevated nesting platforms can increase nest success

*Plant/Manage Food Plots*: shallowly flooded grain plots can provide beneficial food source for migrating and wintering mallards

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

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

*Water Developments for Wildlife*: shallow impoundments and dugouts can be important for migrating and wintering mallards; flooding grain fields, planted food plots, and oak woodlands in winter makes food more avail-

able and provides a feeding area with more protection from predators

# Mourning dove

## General information

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

## Habitat requirements

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

*Water*: free-standing water required daily

*Cover*: shrubs and trees are used for nesting and loafing

## Wildlife management practices

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

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

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

*Manage disturbance*: disking and herbicide applications will provide bare ground; prescribed burning will maintain Stage 3 and expose seed for feeding; chaining will reduce shrub cover; chainsawing/feller bunchering may be used to open forest and allow sunlight to reach the forest floor

*Plant/Manage Food Plots*: in areas lacking grain

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

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

*Create Snags*: for perching/loafing sites in open areas

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

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

# Northern bobwhite

## General information

Bobwhites require Stages 2, 3 and 4, well interspersed. Ideally, habitat is composed of scattered patches of shrubby cover with a diversity of native grasses and forbs. Native grasses, such as bluestems, are used for nesting cover, while more recently disturbed sites rich in forbs and insects are used for brood rearing. In some parts of the country, savannas provide excellent habitat. Savannas have very few trees with an understory of grass, forbs and shrubs maintained by frequent fire (2 years to 4 years). Savannahs may be pine (as in southeast mixed and outer coastal plain forest) or oak (as in cross timbers portion of the Great Plains and eastern deciduous forest). Some agricultural crops can provide seasonal food for bobwhites, but they are not a substitute for diverse native plant communities.

## Habitat requirements

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

*Water*: necessary water is obtained through the diet

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

## Wildlife management practices

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

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

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

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

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

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

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

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

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

*Tillage Management*: eliminate fall tillage to provide waste grain

# Northern flicker

## General information

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

## Habitat requirements

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

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

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

### Wildlife management practices

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

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

*Manage disturbance*: prescribed fire will consume the litter layer and facilitate foraging on the ground

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

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

*Plant Trees*: in large expanses without trees

*Create Snags*: to provide possible nesting cavities

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

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

## Northern goshawk

### General information

Northern goshawks are found throughout the northern, central and western regions of the US. They prefer dense, mature woodlands where they nest 20 feet to 80 feet above ground on a large horizontal limb of a mature tree. Nests are often used for up to five consecutive years. As a raptor, goshawks are fierce predators, commonly eating large birds, squirrels, rabbits and hares. Goshawks perch while hunting and descend on prey. They will pursue prey for quite a distance when necessary. Goshawks do not prefer to be around human establishments.

### Habitat requirements

*Diet*: most small- and medium-sized birds and mammals

*Water*: obtain necessary water from diet

*Cover*: Stages 5 and 6 forest; nest in mature trees

### Wildlife management practices

*Forest Management Techniques*: forest regeneration (single-tree selection only) and timber stand improvement practices will enhance conditions for prey; snags should be retained during forest management techniques and may be created for perches

*Plant Trees*: in large areas void of trees to eventually provide habitat for goshawks

## Northern harrier

### General information

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

### Habitat requirements

*Diet*: small mammals, birds and reptiles

*Water*: necessary water obtained from diet

*Cover*: cover requirements of early successional prey (primarily small rodents) should be considered

### Wildlife management practices

*Delay Crop Harvest*: in spring to avoid ground nests

*Establish Native Grasses and Forbs*: where early successional cover is limiting

*Manage disturbance*: prescribed fire should be used to rejuvenate and maintain early successional habitat; grazing management should maintain a diverse structure of vegetation conducive to prey and the efficiency of hunting for Northern harrier; chainsawing can be used to remove trees and revert an area to an earlier successional stage that is to be maintained in Stages 2 through 4

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

# Nuttall's woodpecker

## General information

Nuttall's woodpecker inhabits oak woodlands in particular but can be found in a variety of deciduous woodlands throughout the Mediterranean zone. They are rarely found in coniferous forests. Riparian areas can provide quality habitat and are particularly important in the southern portion of their range. While foraging for insects, Nuttall's woodpeckers most often forage in oak, willow and cottonwood trees.

## Habitat requirements

*Diet*: 80 percent insects and other invertebrates and 20 percent plant material including seeds and soft mast

*Water*: water requirements unknown

*Cover*: deciduous forest; cavities are excavated in softwoods (willow, cottonwood)

## Wildlife management practices

*Forest Management Techniques*: timber stand improvement can promote desirable species and create snags; existing snags should be retained when implementing forest management techniques

*Nesting Structures*: nest boxes will occasionally be used

*Plant Trees*: to create Stages 5 and 6 in large areas of open land

*Wildlife Damage Management*: may be needed in residential areas

# Ovenbird

## General information

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

## Habitat requirements:

*Diet*: insects and spiders

*Water*: usually obtain necessary water from diet but will also use other water sources when available

*Cover*: mature forest with well-developed herbaceous understory

## Wildlife management practices

*Forest Management Techniques*: timber stand improvement will encourage increased groundcover important for nesting and foraging

*Manage disturbance*: grazing management should prevent livestock grazing in forested areas

*Plant Trees*: in areas where less than 75 percent of the area is in Stages 5 or 6 forest

# Prothonotary warbler

## General information

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

## Habitat requirements:

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

*Water*: necessary water is obtained through the diet

*Cover*: forested wetlands and other mature bottomland hardwood forests; dead standing timber help ensure presence of cavities

## Wildlife management practices

*Forest Management Techniques*: timber stand improvement can stimulate vertical structure where absent

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

*Plant Trees*: in open bottomlands where forest cover is lacking and natural regeneration is not sufficient

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

# Red-eyed vireo

## General information

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

## Habitat requirements

*Diet*: insects, spiders and soft mast

*Water*: necessary water is obtained from diet

*Cover*: midstory and overstory of stage 6 mixed deciduous forest

## Wildlife management practices

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

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

# Redhead

## General information

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

## Habitat requirements

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

*Water*: see cover requirements below

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

## Wildlife management practices

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

*Water Control Structures*: should be installed if not present to promote growth of tall emergent aquatic vegetation (Stage 3 wetland) adjacent to Stage 2 wetlands with an abundance of floating and submerged aquatic vegetation (3 feet to 5 feet deep)

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

# Red-tailed hawk

## General information

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

## Habitat requirements

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

*Water*: necessary water is obtained from diet

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

## Wildlife management practices

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

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

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

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

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

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

*Create Snags*: in open areas to facilitate hunting

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

# Ring-necked pheasant

## General information

Ring-necked pheasants are non-native game birds introduced into North America from Asia. They exist in a wide variety of vegetation types but are most successful in the Midwest where there is substantial agriculture interspersed with Stages 2, 3 and 4.

## Habitat requirements

*Diet*: a wide variety of plant material including seeds, grains, grasses, leaves, fruits and nuts; grains are used heavily in agricultural areas; insects constitute an important food item for females during the breeding season and young pheasants during the first several weeks after hatching

*Water*: necessary water is obtained in the diet

*Cover*: dense residual grass and forb cover for nesting and escape; shrubs and trees may be used for roosting

## Wildlife management practices

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

*Delay Crop Harvest*: delay hay harvest to avoid nest destruction

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

*Establish Native Grass and Forbs*: where there is not enough Stage 3 to provide adequate cover for nesting and escape

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

*Leave Grain Unharvested*: to provide additional food source through winter

*Manage disturbance*: prescribed burning to rejuvenate dense decadent Stages 3 and 4; grazing management to protect grasslands from overgrazing; chainsawing and herbicide applications to remove trees and revert Stages 5 or 6 to Stages 3 or 4

*Plant/Manage Food Plots*: to provide additional food source where food is limited

*Plant Shrubs*: where roosting and escape cover is limited in open and agricultural regions

*Plant Trees*: where roosting cover is limited in open and agricultural areas

*Tillage Management*: to provide cover and waste grain through fall and winter

*Wildlife Damage Management Techniques*: may be necessary where pheasants (a non-native species) compete with native grassland species for available habitat

# Rock pigeon

## General information

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

## Habitat requirements

*Diet*: waste grain and weed seeds; in urban areas, rock pigeons live mostly on human handouts

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

*Cover*: barn lofts, window ledges, roof tops, bridges and a variety of other structures

## Wildlife management practices

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

# Ruby-throated hummingbird

## General information

There are 18 species of hummingbirds found in North America. The ruby-throated hummingbird is the most widespread species. Other than a couple of exceptions, hummingbirds migrate into Central and South America during the winter months. Hummingbirds are found in Stages 2 through 6 rich in flowering plants. In urban settings, they prefer areas with large trees and nearby flowering plants. A hummingbird's nest is a small cup built of lichens and other vegetation. Hummingbirds require high energy foods. Nectar is high in sugars that supply needed energy. Insects are an important source of protein.

## Habitat requirements

*Diet*: nectar from flowers and insects found on flowers

*Water*: necessary water obtained from diet

*Cover*: trees and shrubs for nesting; flowers for feeding

## Wildlife management practices

*Artificial Feeders*: artificial feeders filled with sugar-water (1 part sugar to 4 parts boiled water) may be used where flowers are limited; multiple feeders may reduce problems with territoriality; never give honey-water to hummingbirds because honey ferments faster than sugar and quickly develops a mold that can kill hummingbirds

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

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

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

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

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

# Ruffed grouse

## General information

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

## Habitat requirements

*Diet*: diet varies somewhat with location, but primary items include buds, hard and soft mast, insects and other invertebrates, and leaves of forbs

*Water*: necessary water obtained from diet

*Cover*: 6- to 20-year-old stands (Stage 5) are required for cover provided by the high stem density; mature stands (Stage 6, especially with a dense midstory) in close proximity to young stands may be used for feeding on acorns and other hard mast; a variety of forest types and age classes are used for nesting

## Wildlife management practices

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

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

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

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

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

# Sage thrasher

## General information

Sage thrashers are found mostly in shrub-dominated (Stage 4) valleys and plains of the western U.S. They prefer sagebrush and generally are dependent on large patches and expanses of sagebrush during the breeding season. Sage thrashers nest within sagebrush close to the ground.

## Habitat requirements:

*Diet*: spiders, insects, crickets, caterpillars, beetles and grasshoppers; some soft mast from deciduous shrubs also are eaten

*Water*: necessary water is obtained from the diet

*Cover*: sagebrush required for nesting and escape cover; nest constructed of twigs and grass

## Wildlife management practices

*Manage disturbance*: chaining and roller beating can maintain low shrub growth and keep succession in stage 4; grazing management can encourage sagebrush

*Plant shrubs*: where shrub cover is less than 60 percent

# Scaled quail

## General information

Scaled quail are found in arid grasslands with a shrub and cactus component in the southwestern U.S. The arid environment is characterized by sparse herbaceous cover in most years. However, areas with abundant cover have higher scaled quail densities. Scaled quail will use grain crops if available, but they are not neces-

sary if there is good native habitat. Proper grazing management is an important component in maintaining habitat for scaled quail.

### Habitat requirements

*Diet*: varies depending on availability and season; seeds comprise a major portion; insects are also readily consumed and are critical for chick survival; green herbaceous material, grain crops and soft mast of various native plants are also consumed

*Water*: necessary water may be obtained from diet, however, free-standing water from ponds, tanks and streams may increase survival during drought years

*Cover*: brushy cover (shrubs or cacti) overhead with an open structure at ground level is critical, particularly for nesting; scattered patches of shrub and cactus with a good cover of native warm-season grasses provide excellent cover

### Wildlife management practices

*Decrease Harvest*: may be necessary if populations are declining

*Establish Field Buffers*: to provide cover around crop fields

*Establish Native Grasses and Forbs*: where nesting and brood cover is lacking

*Leave Grain Unharvested*: to provide additional food source through winter

*Manage disturbance*: prescribed fire can increase herbaceous cover needed for food and cover; chaining, roller beating and disking can set succession back to more favorable conditions if herbaceous food and associated insects are limited; grazing management can maintain Stages 3 and 4

*Plant Shrubs*: where there is less than 60 percent brushy cover

*Tillage Management*: to provide waste grain

*Water Developments for Wildlife*: guzzlers and dugouts can provide supplemental water, especially in drought years

## Sharp-tailed grouse

### General information

Sharp-tailed grouse prefer Stage 3 interspersed with Stages 2 and 4. Ideal habitat contains two-thirds grassland and one-third shrubs and small trees. Cropland is not required but if present, can supply important foods. A mix of native grasslands, haylands, croplands, and areas of shrubs and trees provide good habitat for sharp-tailed grouse.

### Habitat requirements

*Diet*: young grouse eat insects and small seeds; adults eat a variety of leaves, buds, seeds and grains; buds of shrubs and small trees are the most important food during winter

*Water*: necessary water is obtained from diet

*Cover*: nests are on the ground in grass or sparse shrub cover; thick shrubs and tall herbaceous vegetation needed for winter cover; tall dense vegetation associated with wetland edges is also used for winter cover

### Wildlife management practices

*Decrease Harvest*: may be necessary if populations are declining

*Delay Crop Harvest*: to avoid disrupting nests

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

*Establish Native Grasses and Forbs*: where high-quality native grassland habitat does not comprise at least 60 percent of the area considered

*Leave Grain Unharvested*: to provide additional food source through winter

*Manage disturbance*: prescribed fire is recommended to increase grassland vigor, which will increase availability of insects and seeds; grazing management should maintain a diverse structure throughout the grassland; some dense grassland areas should be maintained to provide nesting cover; more sparse areas containing forbs and insects should be adjacent to nesting areas for brood habitat; on sandy soils, both of these conditions may be present together; proper stocking rate is critical; delay grazing and harvest on portions of grasslands to provide tall undisturbed cover during the critical nesting season (May through June)

*Plant/Manage Food Plots*: annual food plots may be planted to provide winter food where food sources are limited

*Plant Shrubs*: small groups of shrubs may be planted in natural draws and idle land ar-

eas where cover and winter food are lacking; woody cover should not be planted on upland sites that historically did not support woody cover

*Tillage Management*: grain stubble should be left through winter to provide a food source; stubble heights of 6 inches or more is preferred

**Special:** Sharp-tailed grouse require bare or grassy ridges and natural rises that offer good visibility for breeding displays. Grouse gather on these sites in the spring where males dance in front of the females to attract a mate. These areas are called "dancing grounds." Maintain areas of thick grass and shrub cover within several miles of dancing grounds.

# Song sparrow

## General information

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

## Habitat requirements

*Diet*: weed seeds, insects, soft mast

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

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

## Wildlife management practices

*Artificial Feeders*: millets and sunflower seeds are favorites

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

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

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

# Spotted towhee

## General information

Spotted towhees are found through the Midwest and western U.S. in brushy cover (Stage 4) and where the structure of Stages 5 and 6 are favorable. Nests are placed on the ground amongst the shrub cover. Towhees primarily forage on the ground, where they primarily search for invertebrates.

## Habitat requirements

*Diet*: ants, beetles, caterpillars, grasshoppers; also various forb seed and green foliage of forbs, grasses and shrubs

*Water*: necessary water is obtained from the diet

*Cover*: shrubs loafing, foraging, nesting and escape

## Wildlife management practices

*Forest Management Techniques*: forest regeneration will create brushy young forest cover favorable for foraging, nesting and cover for 5 years to 10 years; timber stand improvement can stimulate brushy understory growth within Stages 5 and 6

*Manage disturbance*: prescribed fire within small areas (40 acres maximum, 10 acres to 20 acres preferred) of old Stage 4 vegetation will promote resprouting shrubs; chaining, roller beating or mowing small areas in old decadent stands of Stage 4 vegetation will also promote resprouting shrubs; grazing management should leave adequate herbaceous vegetation needed for food

*Plant Shrubs*: in large areas of Stages 2 and 3 to provide Stage 4 for nesting and cover

# Western bluebird

## General information

Bluebirds are found in early successional habitat (Stages 2 and 3) interspersed with woods and shrubs (Stages 4, 5 and 6), which are used for perching and nesting (where cavities are available). Large open areas without interspersion of hedgerows, fencerows and woodlots may not receive as much use by bluebirds as

those areas with more structural diversity. Bluebirds forage in open areas, but typically near trees, shrubs or a fence that provide perches.

### Habitat requirements

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

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

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

### Wildlife management practices

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

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

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

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

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

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

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

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

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

## Western kingbird

### General information

Western kingbirds inhabit early successional habitat including grasslands, pastures, cultivated fields, desert shrub areas, savannahs and urban areas. Scattered trees and/or shrubs are used for nesting cover, and human activity often improves habitat because trees and structures provide potential nest sites.

### Habitat requirements

*Diet*: more than 90 percent of their diet is comprised of insects; soft mast from various plants is occasionally eaten

*Water*: water requirements unknown

*Cover*: trees and shrubs for nesting and perching; nests may also be placed on buildings, windmills, utility poles and antennas; native grass/forb cover for foraging

### Wildlife management practices

*Establish Field Buffers*: to increase prey around crop fields

*Establish Native Grasses and Forbs*: in areas with less than 50 percent Stages 2 and 3

*Manage disturbance*: prescribed fire and mowing can maintain Stages 2 and 3; grazing management should protect trees and shrubs and not overgraze Stages 2 and 3

*Plant Shrubs*: in large areas without sufficient nesting cover

*Create Snags*: to provide perching sites

## White-winged dove

### General information

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

### Habitat requirements

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

*Water*: free-standing water is required daily
*Cover*: tall shrubs and trees for nesting and loafing; nests are made of twigs placed on branches of shrubs or trees; nests may also be placed on the ground

## Wildlife management practices

*Delay Crop Harvest*: delayed crop harvest in the spring may allow more successful nests
*Establish Native Grasses and Forbs*: where additional forb cover is needed for food
*Leave Grain Unharvested*: will provide additional food from a variety of small grain crops such as millets, grain sorghum, wheat and oats
*Manage disturbance*: prescribed fire will enhance feeding areas, maintain Stage 3 and set back Stages 4 and 5; disking and herbicide applications will provide bare ground; grazing management can maintain Stages 2 and 3
*Plant/Manage Food Plots*: where additional food, specifically grain, is needed
*Plant Shrubs*: in large areas of Stages 2 and 3 where there are few trees or shrubs for nesting and loafing; may be planted along field borders, along fencerows or other idle area
*Create Snags*: where needed to create perching sites
*Tillage Management*: delayed cropland tillage in the spring will allow standing stubble to be used for nesting; eliminate tillage in the fall to allow access to waste grain
*Water Developments for Wildlife*: where water is limited or absent; dugouts, guzzlers or windmills can provide free-standing water

# Wild turkey

## General information

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

## Habitat requirements

*Diet*: various hard mast including acorns and beechnuts; soft mast including blackberries and black cherry; insects and other invertebrates including spiders and snails; miscellaneous seeds; leaves from forbs and grasses; grain from a variety of agricultural crops; chufa tubers
*Water*: obtain water from diet but will use free-standing water when available
*Cover*: mature forest, regenerating forest, brushy areas and old-fields with rank cover for nesting; nest is a shallow depression on the ground lined with leaves and/or grass and is usually well concealed amongst vegetation or against some object (such as a tree, log or brush); mature forest, Stages 2 and 3 forb cover, and grain fields for feeding; trees or tall shrubs for roosting

## Wildlife management practices

*Decrease Harvest*: may be necessary if populations are declining in suitable habitat where hunting pressure has been excessive
*Establish Field Buffers*: to increase usable space around row crop fields
*Establish Native Grasses and Forbs*: where less than one-quarter of the area is composed of Stages 2 and 3
*Forest Management Techniques*: forest regeneration methods can enhance nesting habitat, provide additional brood cover, soft mast, and miscellaneous seed for 2 years to 3 years after harvest; timber stand improvement practices can improve the structure of the understory for nesting and brood rearing, increase production of soft mast and miscellaneous seed, and enable the crowns of desired trees to grow and produce additional mast
*Increase Harvest*: where populations can sustain additional harvest pressure for hunting recreation and/or where populations need to be lowered
*Leave Grain Unharvested*: (especially corn and grain sorghum) to provide a high-energy food source during fall and winter; especially important during years of poor acorn production
*Manage disturbance*: prescribed fire, disking, herbicide application, chaining, roller beat-

ing and grazing management can be used to maintain and rejuvenate Stages 2 to 4 when habitat quality begins to decline; grazing management should prevent livestock from degrading habitat by overgrazing and damaging planted trees and shrubs

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

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

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

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

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

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

# Wood duck

## General information

Wood ducks are primarily found along rivers and large creeks within bottomland hardwood forests, Stage 3 wetlands and swamps with emergent woody vegetation adjacent to Stage 2 wetlands, and shallowly flooded Stages 5 and 6 hardwood forest. Wood ducks nest within cavities. Usually, nest sites are within or adjacent to flooded timber; however, wood ducks have been known to nest up to one mile from water. Cavity availability is critical for a sustainable population. Thus, artificial cavities are readily used by wood ducks and have been, most likely, the number one reason for the increase in wood duck populations during the past 50 years.

## Habitat requirements

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

*Water*: obtain water through diet and drink free-standing water regularly; see cover requirements below

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

## Wildlife management practices

*Forest Management Techniques*: timber stand improvement in bottomland hardwoods that can be flooded can lead to larger crowns of favored trees and increased mast production; woody stem density should increase following TSI and improve cover in those stands that can be flooded

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

*Manage disturbance*: grazing management should prevent livestock from damaging trees and shrubs planted for wood ducks

*Nesting Structures*: nest boxes should be erected where there is a lack of natural cavities; nest boxes for wood ducks should be at least 100 yards apart and should not be placed within sight of each other if possible

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

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

*Plant Trees*: mast trees planted adjacent to or within open areas suitable for flooding may provide future food and nesting cavities

*Create Snags*: to provide potential cavity nesting sites

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

*Water Control Structures*: should be installed in existing dikes if there are none present

*Water Developments for Wildlife*: specifically, shallow impoundments should be created where topography allows, to create feeding and nesting space for wood ducks

# Yellow-rumped warbler

## General information

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

## Habitat requirements

*Diet*: ants, caterpillars and beetles

*Water*: necessary water obtained from diet, but free-standing water is used when available

*Cover*: coniferous or mixed forest during nesting season; occasionally nest in shrubs; nest is made of twigs, bark strippings and weed stems and placed on small branches 5 feet to 50 feet above the ground; brushy thickets are used for feeding, loafing and escape during winter

## Wildlife management practices

*Forest Management Techniques*: timber stand improvement can improve forest structure for nesting and feeding

*Manage disturbance*: grazing management should not allow livestock to damage shrub cover

*Plant Shrubs*: where shrub cover is lacking in winter range

*Plant Trees*: where forest structure is limited during the nesting season

# Mammals

## American beaver

### General information

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

### Habitat requirements

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

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

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

### Wildlife management practices

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

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

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

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

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

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

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

## American marten

### General information

Martens are found primarily in mature coniferous or deciduous-coniferous forest of the upper Great Lakes, Rocky Mountains, and the mountains of the Pacific region and New England. Martens are carnivorous. They give birth and raise young in dens of hollow trees, stumps or rock crevices.

### Habitat requirements

*Diet*: primarily voles, snowshoe hares, ruffed grouse, and squirrels; will also opportunistically eat eggs, amphibians, soft mast and carrion

*Water*: necessary water obtained from diet
*Cover*: mature conifer forests, but also mixed hardwood forests; dens in hollow logs, stump holes and rock crevices

### Wildlife management practices

*Decrease Harvest:* may be necessary when trapping pressure is limiting population
*Forest Management Techniques*: timber stand improvement can diversify understory structure and composition and increase abundance of prey; snags should be retained for prey
*Increase Harvest*: where populations can sustain additional trapping pressure
*Plant Trees*: where additional forest cover is needed

## Big brown bat

### General information

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

### Habitat requirements

*Diet*: night-flying insects, especially beetles
*Water*: free-standing water is required daily when they are active
*Cover*: buildings and hollow trees are often used for daytime roosts; bat houses may also be used for daytime roosting; caves, mines and buildings are used for hibernation

### Wildlife management practices

*Manage disturbance*: to maintain more than 50 percent open areas for foraging
*Nesting Structures*: may provide additional roost sites
*Plant Trees*: where few trees are present to promote future old trees that may provide roost sites
*Create Snags*: to provide roost sites; only in areas where they pose no danger to human structures or health when they fall
*Water Developments for Wildlife*: where available open water is not available, small ponds and shallow impoundments may be constructed for drinking and to attract insects; water developments should be constructed with nothing above the water (such as fencing or bracing) so bats have an unobstructed flight path
*Wildlife Damage Management*: may be necessary when roosting or hibernating in areas occupied by humans

## Black bear

### General information

Black bears primarily use mature deciduous or mixed deciduous/coniferous forest interspersed with early successional openings containing soft mast. Young regenerating stands, shrub thickets with dense brushy cover, and riparian corridors are also used. They are generally secretive and avoid human contact; however, black bears are highly adaptable and may occur in and around human dwellings and become problematic, especially if food is available. Black bears are primarily nocturnal, but may be seen anytime during the day. They hibernate in winter (even in warm climates like Florida and Louisiana) and have large home ranges (several square miles) that vary based on sex, age and/or time of year (breeding season, fall foraging areas, denning habitat). In general, adult

male home ranges (up to 50 square miles) are much larger than female home ranges. Solitary females and females with cubs have considerably smaller (15 square miles) home ranges. Black bears are omnivorous, however more than 90 percent of their diet consists of vegetative matter. Liberalizing or restricting females in the harvest influences population growth. Regulation of bear population densities is influenced by public tolerance toward bear/human conflicts, property damage, livestock and agricultural damage, and the desire to see bears.

## Habitat requirements

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

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

*Cover*: mature hardwood or mixed hardwood/conifer forests for foraging; brushy areas and young regenerating forest for loafing and escape; early successional openings primarily for foraging, usually for soft mast; rock crevices, excavations, hollow trees, dense mountain laurel/rhododendron thickets for hibernation

## Wildlife management practices

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

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

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

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

*Manage disturbance*: Prescribed fire can stimulate groundcover and soft mast and maintain Stages 3 and 4

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

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

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

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

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

# Black-tailed prairie dog

## General information

The black-tailed prairie dog is the most widely distributed of the North American prairie dogs. They live in densely populated colonies (20 to 35 per acre) among subterranean burrows within grassland (Stages 2 or 3) or sparse shrubland (Stage 4) communities. Some areas of colonies will be bare ground (Stage 1) where

there is a high prairie dog density. They often establish colonies near intermittent streams, water impoundments, homestead sites, corrals and windmills. They do not tolerate tall vegetation well and avoid brush and timbered areas. In tall and mixed-grass rangelands, prairie dogs have a difficult time establishing a colony unless large grazing animals (bison or livestock) have closely grazed the vegetation (livestock grazing management). Heavily grazed or trampled areas are often selected by prairie dogs. Periodic disturbance is required to maintain suitable conditions for prairie dogs, particularly in high rainfall areas where succession moves past Stage 3. Prairie dogs occupied up to 700 million acres of western grasslands in the early 1900s. In Texas, the largest prairie dog colony on record measured nearly 25,000 square miles. Since 1900, prairie dog populations have been reduced by as much as 98 percent in some areas and eliminated in others. Today, only about 2 million acres of prairie dog colonies remain in North America. Colonies must be linked to other adjacent colonies (generally less than 1 mile) as colonies periodically move or disappear only to be repopulated by nearby colonies. Therefore, multiple adjacent colonies are critical for long-term population persistence. While prairie dogs can cause substantial damage to agriculture, prairie dogs are a keystone species on native range and part of a healthy range system. The loss of prairie dog colonies affects many other plant and animal species.

### Habitat requirements

*Diet*: green grasses and forbs

*Water*: necessary water is obtained from diet

*Cover*: open spaces of Stage 3 with relatively short vegetation; burrows provide escape cover

### Wildlife management practices

*Decrease Harvest*: on native range where shooting or other population reduction methods have reduced prairie dog colonies to the point where they are approaching unsustainable levels

*Establish Native Grasses and Forbs*: to provide forage where limited

*Increase Harvest*: where populations can withstand increased hunting for recreation

*Manage disturbance*: prescribed fire, grazing management, chaining/roller beating and mowing can set back succession to a suitable grass/forb community

*Wildlife Damage Management*: registered control techniques, such as toxicants (toxic baits), fumigants and shooting can be used to reduce populations where damage is occurring to agricultural interests

## Bobcat

### General information

Bobcats occur throughout the U.S., except for some areas in the northern midwestern states where intensive agriculture occurs or in areas lacking rugged or rocky mountainous terrain or extensive bogs and swamps. Bobcats are carnivorous predators and are seldom active during the day. Bobcats have been found to be a significant cause of mortality to pronghorn and wild turkeys but are not considered a major source of mortality for deer. They are classified as a furbearer game species in many states.

### Habitat requirements

*Diet*: rabbits, rodents, opossums, raccoons, skunks, pronghorns, deer, snakes and many bird species including wild turkeys, ruffed grouse, Northern bobwhite, domestic poultry and other livestock

*Water*: water requirements are not well known, free-standing water is used

*Cover*: dense cover, rocky outcrops and ledges, hollow logs and other sheltered spots for denning; foraging occurs where prey is most numerous

### Wildlife management practices

*Decrease Harvest*: may be necessary when additional bobcats are desired and hunting or trapping efforts may be limiting growth

*Forest Management Techniques*: forest regeneration will provide increased dense cover for additional prey; timber stand improvement can provide enhanced understory development that can lead to increased prey populations; down woody debris (logs) can provide denning sites

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

*Manage disturbance*: prescribed fire, chaining and herbicide application are recommended to maintain and rejuvenate Stage 4 when habitat quality begins to decline for desired prey; grazing management should prevent overgrazing in Stages 4 through 6 that would degrade habitat quality for rabbits, rodents and other prey

*Plant Shrubs*: in areas where additional Stage 4 is needed to attract prey and provide security cover

*Plant Trees:* In areas where additional Stage 5 is needed to attract prey and provide security cover

*Wildlife Damage Management*: may be necessary if poultry or other livestock depredation is a problem

# Common muskrat

## General information

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

## Habitat requirements

*Diet*: roots, tubers and green shoots of emergent aquatic vegetation such as cattails and bulrushes

*Water*: necessary water obtained from diet

*Cover*: primarily Stage 2 wetlands; den in lodges built from cattails and bulrushes, which are usually in dense patches of cattails and bulrushes; loaf on floating logs or tops of lodges

## Wildlife management practices

*Decrease Harvest*: where trapping efforts have reduced population below desirable levels

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

*Manage disturbance*: prescribed fire is recommended to rejuvenate old, decadent wetland vegetation; grazing management should restrict livestock from riparian areas and other wetlands; this may require development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

*Water Control Structures*: are necessary to control water levels so that approximately 80 percent of the wetland has water less than two feet deep so cattails and bulrushes can grow

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

*Wildlife Damage Management*: may be necessary to ameliorate damage to dikes in agricultural areas and waterfowl management areas; populations can be reduced by managing against preferred habitat conditions or by additional harvest

# Coyote

## General information

Coyotes are found throughout the continental U.S. and have even been observed in large cities and urban areas. Grasslands, shrubland and farmland provide optimal habitat for coyotes, but they also use Stages 5 and 6. Coyotes den in a variety of places, including brush-covered slopes, steep banks, rock ledges, thickets and hollow logs. Coyotes are most active at night, during early morning and around sunset, but they may be active throughout the day. Coyotes live in packs, alone or in mated pairs, depending on the time of year. Coyotes have an extremely varied diet that fluctuates with the seasons.

## Habitat requirements

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

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

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

## Wildlife management practices

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

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

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

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

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

*Manage disturbance*: prescribed fire, disking, chaining and herbicide applications are recommended to maintain Stage 3; grazing management should maintain adequate cover for prey

*Plant Shrubs*: in areas where additional Stage 4 is needed to attract prey and provide security cover

*Wildlife Damage Management*: may be necessary where livestock depredation is a problem

# Desert cottontail

## General information

Desert cottontails can be found in woodlands, grasslands, creosote brush and desert areas from California to Texas and from northern Montana to Mexico. In the Hot Desert region, desert cottontails use thick shrub cover interspersed with open areas. Riparian and urban areas also are used. Because cottontails do not travel far, shelter and food must be close together.

## Habitat requirements

*Diet*: a variety of forbs and grasses spring through fall; in winter, bark and twigs of shrubs are important; buds, grain, seeds and soft mast are also eaten when available

*Water*: necessary water obtained from diet

*Cover*: grassland, shrub vegetation and ground burrows for hiding and nesting cover

## Wildlife management practices

*Decrease Harvest*: may be necessary when additional rabbits are desired and hunting and/or trapping efforts are limiting growth

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

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

*Forest Management Techniques*: (Mediterranean Region only) forest regeneration, especially clearcutting, provides optimal brushy cover for a few years

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

*Leave Grain Unharvested*: to provide additional food

*Manage disturbance*: prescribed fire is recommended to maintain Stage 3; prescribed fire and chaining can revert Stage 4 back to Stage 3; burning is not recommended in the Hot Desert region unless sufficient precipitation is available; grazing management can maintain Stages 2 and 3

*Plant/Manage Food Plots*: where rainfall is sufficient, forage plots may be planted adjacent to shrub cover

*Plant Shrubs*: in areas with insufficient Stage 4
*Tillage Management*: cropland tillage may be delayed in spring to allow use of standing stubble for cover; tillage may be eliminated in the fall to allow access to waste grain
*Wildlife Damage Management*: where there is damage to ornamental and garden plants

# Eastern cottontail

## General information

Eastern cottontails occur in the eastern half of the country. They prefer brushy cover interspersed with Stage 3. Eastern cottontails are also found in suburban areas, parks, golf courses and stream corridors. Eastern cottontails represent prey for the majority of carnivorous predators within its range. They are prolific breeders, however, as female may have 7 litters per year, with 3 to 6 young per litter. This is required to perpetuate populations as 70 percent to 80 percent of all rabbits die each year.

## Habitat requirements

*Diet*: forbs and grasses (Stages 2 and 3), browse, and soft mast from spring through fall; in winter, bark of shrubs and trees, as well as buds, grain and browse
*Water*: necessary water obtained from diet
*Cover*: shrub cover, brushpiles, native perennial warm-season grasses and forbs (Stage 3) for loafing and escape cover; burrows are also used for denning and escape

## Wildlife management practices

*Decrease Harvest*: may be necessary when additional rabbits are desired and hunting and/or trapping efforts are limiting growth; low rabbit populations are almost always a result of inadequate habitat, not harvest levels
*Establish Field Buffers*: to increase usable space around row crop fields
*Establish Native Grasses and Forbs*: where high-quality early successional habitat is limiting
*Forest Management Techniques*: forest regeneration, especially clearcutting, provides optimal brushy cover for a few years
*Increase Harvest*: where populations can sustain additional hunting/trapping pressure for recreation and/or where populations need to be lowered
*Leave Grain Unharvested*: to provide additional food, especially corn
*Manage disturbance*: prescribed fire, disking, chaining, and herbicide applications are recommended to maintain or rejuvenate Stages 3 and 4; in areas dominated by mesquite, root plowing combined with seeding grasses and legumes help maintain Stage 3; grazing management should keep livestock out of food plots and leave ample amounts of herbaceous vegetation in other areas used by cottontails for food and cover
*Mowing*: can be used to maintain open areas in urban environments
*Plant/Manage Food Plots*: where additional forage or grain is needed; one one-quarter-acre plot per 10 acres to 15 acres should be sufficient
*Plant Shrubs*: in large areas of Stages 2 and 3 and in agricultural areas with few shrubs; field borders, fence rows and other idle land areas are good places to plant; this is also appropriate for open areas in urban settings
*Tillage Management*: cropland tillage may be delayed in spring to allow use of standing stubble for cover; tillage may be eliminated in the fall to allow access to waste grain
*Wildlife Damage Management*: may be necessary to control damage to ornamental/landscaping and garden plants

# Eastern fox squirrel

## General information

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

## Habitat requirements

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

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

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

## Wildlife management practices

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

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

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

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

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

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

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

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

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

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

# Eastern gray squirrel

## General information

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

## Habitat requirements

*Diet*: a variety of hard and soft mast, miscellaneous seeds, grains, bark, buds and mushrooms; they may also eat eggs

*Water*: necessary water is generally obtained through diet, but free-standing water is also used

*Cover*: Stage 6 forest and woodlands; suburban and urban areas with mature trees; den in tree cavities and also build nests of leaves and twigs

## Wildlife management practices

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

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

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

*Manage disturbance*: grazing management should protect trees and shrubs planted for squirrels and protect woods from overgrazing

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

*Plant Shrubs*: shrubs can be planted across large fields and in "odd areas" of crop fields not planted to crops

*Plant Trees*: plant mast trees where Stage 5 and 6 represent less than 50 percent of the area considered and where Stages 5 and 6 forest contain few or no mast-producing trees

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

# Elk

## General information

Elk occur throughout the western U.S. and populations have recently re-established in some eastern states. They require a mix of Stages 2 and 3 for food, as well as Stages 5 and 6 for cover. Elk form herds that may migrate to different areas and elevations depending on weather and food resources. Elk are primarily grazers and eat a variety of herbaceous vegetation, mainly grasses and forbs, but will eat browse as well. For optimum elk habitat, 25 percent to 50 percent of the landscape should be in Stages 2 and 3, well interspersed with Stages 4 through 6.

## Habitat requirements

*Diet*: predominantly grasses and forbs but also browse, especially when palatable grass and forbs are not available

*Water*: free-standing water used regularly in summer; water should be within one-half mile

*Cover*: Stage 2 and 3 for foraging; Stage 4 through 6 for loafing and calving

## Wildlife management practices

*Decrease Harvest*: may be necessary when hunting pressure is limiting growth of elk population where an increase is desired

*Establish Field Buffers*: provides additional forage around crop fields

*Establish Native Grasses and Forbs*: provides additional forage where early successional habitat is limiting

*Forest Management Techniques*: forest regeneration, especially clearcutting, will provide additional forage for a few years; timber stand improvement can improve forage availability and stimulate improved understory/midstory cover

*Increase Harvest*: where populations can sustain additional hunting pressure for recreation and/or where populations need to be lowered; where populations need to be lowered because of habitat considerations, harvest should concentrate on females

*Manage disturbance*: prescribed fire is recommended to maintain early successional cover and stimulate additional herbaceous forage in Stage 4; grazing management should leave ample forage available for elk; areas recently grazed by livestock are often favored by elk

*Plant/Manage Food Plots*: where and when naturally occurring food sources are limited, food plots may provide additional nutrition, particularly during late summer and winter in some areas

*Plant Trees*: where additional forest cover is needed

*Water Developments for Wildlife*: water developments such as dugouts may be useful if water is not available within one-half mile

*Wildlife Damage Management*: necessary when elk begin to damage hay and crop fields, or when they become a nuisance in suburban areas; both lethal and nonlethal practices can be effective

# Mink

## General information

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

numbers of upland nesting waterfowl or game birds, especially in areas where nesting habitat is limited.

### Habitat requirements

*Diet*: rabbits, mice, muskrats, crayfish, snakes and birds

*Water*: closely associated with water; necessary water probably obtained through diet

*Cover*: wetland edges, riparian areas, dens under log jams and tree roots, old muskrat burrows and rock piles

### Wildlife management practices

*Decrease Harvest:* may be necessary when trapping pressure is limiting population

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

*Manage disturbance*: prescribed fire is recommended to rejuvenate old decadent wetland vegetation that can improve habitat for prey; grazing management should prevent livestock from damaging vegetation and structure along banks of streams, rivers and other wetlands; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

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

*Water Developments for Wildlife*: shallow impoundments can be developed to increase available habitat where appropriate

## Mountain cottontail

### General information

Mountain cottontails occur in the mountainous regions of the western U.S. They use thick shrubs and burrows for nesting and cover, and eat a variety of forbs, grasses and browse. They do not travel far, so food and cover should be close together.

### Habitat requirements

*Diet*: a variety of forbs, grasses, seeds and soft mast in spring through fall; in winter, bark and browse is most important; grains and alfalfa are eaten when available

*Water*: necessary water is obtained from diet

*Cover*: thick shrubs and burrows for nesting and cover

### Wildlife management practices

*Decease Harvest*: may be necessary when additional rabbits are desired and hunting and/or trapping efforts are limiting growth

*Establish Native Grasses and Forbs*: where needed in forest openings to provide forage

*Forest Management Techniques*: forest regeneration, especially clearcutting, will stimulate forbs and grasses and provide Stage 4 cover for a few years

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

*Manage disturbance*: prescribed fire and chaining can be used to rejuvenate Stage 4 and encourage additional forbs and grass interspersed with shrub cover; grazing management should maintain adequate forbs and grass for rabbits

*Plant/Manage Food Plots*: where additional forage is needed

*Plant Shrubs*: where shrub cover is lacking

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

## Mule deer

### General information

Mule deer inhabit the western U.S. There are several subspecies of mule deer that occupy unique vegetation types from Alaska to Mexico. Mule deer require a mixture of Stages 3 to 6 for food and cover. They are often found in ravines and shrub cover. Mule deer are ruminants (animals with a four-chambered stomach) and are adapted to eating higher quality forages and browse than elk or cattle. Their diet varies with the season and availability.

## Habitat requirements

*Diet*: in spring, grasses and forbs; in summer and fall, forbs, soft mast, grasses and browse; in winter, browse and grasses; in deep snow, browse is predominant; grains and alfalfa are also eaten when available

*Water*: free-standing water is required nearly daily in dry regions and during summer; water should be available within one mile

*Cover*: tall shrubs, forest, rock outcrops and ravines for loafing cover; in parts of the Intermountain Region, 50 percent Stages 5 and 6 interspersed with Stages 3 and 4 is optimal

## Wildlife management practices

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

*Delay Crop Harvest*: hay harvest may be delayed so fawning sites are not disturbed

*Establish Field Buffers*: to increase forage availability (forbs) around row crop fields

*Establish Native Grasses and Forbs*: where early successional cover is limited and additional grasses and forbs are needed for forage

*Forest Management Techniques*: forest regeneration, especially clearcutting, can stimulate herbaceous cover and provide additional brushy cover for a few years; timber stand improvement can stimulate additional herbaceous cover and browse in the understory

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

*Leave Grain Unharvested*: to provide additional food resource, especially near cover

*Manage disturbance*: prescribed fire and chaining are recommended to create and/or maintain Stages 3 and 4; shrub cover should not be set back severely in areas that typically receive deep snow if shrubs are the only available food in winter; grazing management should maintain herbaceous and shrub cover; livestock watering facilities may be necessary in uplands to discourage congregation in and overuse of riparian areas

*Plant/Manage Food Plots*: where and when naturally occurring food sources are limited, food plots may provide additional nutrition, particularly during late summer and winter in some areas

*Plant Shrubs*: where additional shrub cover and browse is needed

*Plant Trees*: where additional forest cover and browse is needed and appropriate

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

*Water Developments for Wildlife*: where water is limited or absent, dugouts and spring developments may be warranted

*Wildlife Damage Management*: to control overabundant deer damaging crops or ornamental shrubs

# Northern raccoon

## General information

Raccoons are very common throughout most of the U.S., except in certain parts of the Rocky Mountains, Nevada, Utah and Arizona. Raccoons are found in a variety of vegetation types but are usually most abundant near riparian areas and wetlands. They are also found in urban areas. Raccoons den in hollow trees, burrows under stumps or brushpiles, or in chimneys, attics and crawl spaces of houses and buildings. They are omnivorous and eat a wide variety of foods. Raccoons can become pests in urban areas and in wetlands where waterfowl nesting is important. Raccoons have also been identified as major predators on game bird nests and young game birds. In such cases, wildlife damage management or increased harvest may be necessary.

## Habitat requirements

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

*Water*: require water frequently during warm seasons

*Cover*: riparian areas, bottomland hardwoods and along other wetlands; natural tree cavities are used for denning and daytime loafing; also dens in ground burrows under

stumps, brush and junk piles, old abandoned buildings and rocky cliffs and ledges

## Wildlife management practices

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

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

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

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

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

*Manage disturbance*: prescribed fire is recommended to rejuvenate old decadent wetland vegetation; prescribed fire and disking can maintain Stages 2 and 3; prescribed fire, herbicide applications and chaining are recommended to revert Stage 4 and Stage 5 to Stages 2 and 3; grazing management should prevent livestock from degrading riparian areas and other wetlands; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

*Plant/Manage Food Plots*: annual grain food plots, especially corn

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

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

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

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

*Water Control Structures*: to control water levels and provide water less than 2 feet deep and stimulate emergent vegetation and enhance habitat for prey

*Water Developments for Wildlife*: shallow impoundments can provide a water source and additional wetland habitat

*Wildlife Damage Management*: may be necessary if raccoons invade garbage cans, occupy residences or buildings, or prey upon poultry; exclusion is cost-effective; cultural modification such as using wildlife-proof trash cans is effective; trap and euthanize is most effective for problem raccoons

# Pronghorn

## General information

Pronghorns are neither antelopes nor goats, though they are often called one or the other. Pronghorns are found in open grassland and sagebrush desert of the western U.S. An even proportion of native grass/forb and shrub cover is desirable.

## Habitat requirements

*Diet*: varies with season; grasses, forbs and cacti in spring and summer; primarily browse in winter

*Water*: free-standing water needed frequently

*Cover*: native grassland and desert sagebrush with flat to rolling terrain that allows long-range visibility

## Wildlife management practices

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

*Establish Native Grasses and Forbs*: where herbaceous vegetation is lacking in large expanses of Stage 4

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

*Manage disturbance*: prescribed fire and chaining is recommended to rejuvenate decadent Stage 4 and stimulate additional herbaceous growth in large expanses of Stage 4; grazing management should prevent overgraz-

ing and maintain adequate herbaceous cover; the key is using the appropriate stocking rate of livestock; fencing should be kept to a minimum and have a minimum of 16 inches between the ground and bottom wire, which should be smooth; the top wire should not be more than 42 inches above ground; large blocks of rangeland should be maintained within cropland areas; no more than 30 percent of a management area should be cropland

*Plant/Manage Food Plots*: in areas where there is adequate rainfall, food plots can provide high-quality forage such as alfalfa for increased nutrition

*Water Developments for Wildlife*: where water is limited or absent within two miles, development of dugouts, windmills and spring developments is warranted

*Wildlife Damage Management*: may be necessary in areas where crop damage is occurring

# Red squirrel

## General information

Red squirrels occur in the Rocky Mountains, Great Lakes and New England regions, and down the Appalachians. They are found primarily in boreal coniferous forest and mixed deciduous-coniferous forest. Red squirrels den in tree cavities but will make ball nests on large tree limbs close to the trunk or in underground burrows if cavities are not available.

## Habitat requirements

*Diet*: pine seeds, hard and soft mast, eggs and mushrooms

*Water*: free-standing water required regularly

*Cover*: coniferous and mixed deciduous-coniferous forest; nest in tree cavities and build nests of shredded bark, grass, leaves, twigs

## Wildlife management practices

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

*Forest Management Techniques*: timber stand improvement can improve species composition and help increase mast production; snags should be retained for possible cavities species and create an opportunity for forest regeneration.

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

*Manage disturbance*: grazing management should exclude livestock from Stages 5 and 6

*Plant Trees*: in areas without Stages 5 and 6

# Snowshoe hare

## General information

Snowshoe hares are found in the northern U.S., the Rocky Mountains, the Sierra Nevada and the Appalachians. They are commonly found in Stages 4 through 6 coniferous and deciduous forest but prefer dense thickets, especially near low wet areas. They forage in recently regenerated forest and forest openings. Snowshoe hares do not use dens, they use matted down areas of grass instead.

## Habitat requirements

*Diet*: forbs, grasses, soft mast in spring and summer; browse and bark in winter

*Water*: probably obtain necessary water through diet

*Cover*: dense thickets and Stages 5 and 6 forest with dense understory; seldom far from dense cover; forest openings and riparian areas; give birth under a shrub or fallen log

## Wildlife management practices

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

*Establish Native Grasses and Forbs*: in forested openings where little early successional cover is available; should be well distributed throughout the forest

*Forest Management Techniques*: forest regeneration will provide dense cover and increased soft mast for several years after harvest; timber stand improvement can enhance understory development and soft mast production in Stage 5 and Stage 6; retain snags to provide den locations

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

*Manage disturbance*: grazing management should exclude livestock from Stages 5 and 6 and not allow overgrazing in forest openings

*Plant Shrubs*: to create thickets for additional cover

*Plant Trees*: to maintain at least 80 percent forest cover

*Wildlife Damage Management*: may be necessary where snowshoe hare populations eat the bark of commercially valuable trees during winter

# White-tailed deer

## General information

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

## Habitat requirements

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

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

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

## Wildlife management practices

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

*Delay Crop Harvest*: hay harvest may be delayed so fawning sites are not disturbed; however, poor-quality hay will result; also, if fawns are found in a hayfield, it is probably symptomatic of poor fawning cover on the property

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

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

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

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

*Leave Grain Unharvested*: to provide additional food resource, especially near cover

*Manage disturbance*: prescribed fire is recommended to maintain Stages 2 through 4 and to revert Stage 4 to Stage 3; also to stimulate the understory for increased forage and soft mast in Stages 5 and 6 of Eastern Deciduous Forest and Southeast Mixed Forest; mowing and chaining can also maintain Stages 3 and 4; in areas dominated by mesquite, root plowing combined with seeding grasses and legumes may be the best way to maintain small areas in Stage 3; grazing management should maintain forbs, grasses, shrubs and trees available for food and cover—this is particularly important in riparian areas in the Great Plains Grassland Region

*Plant/Manage Food Plots*: where and when naturally occurring food sources are limited, food plots may provide additional nutrition,

particularly in late summer and winter of most regions

*Plant Shrubs*: where needed to provide additional soft mast, brushy cover, and browse; ravines, field borders, other idle land areas and across large areas of Stages 2 or 3 to provide travel corridors

*Plant Trees*: where appropriate, to maintain at least 30 percent to 40 percent forest cover; and where mast producers are lacking, particularly oaks

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

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

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

# Other Species

## Bluegill

### General information

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

### Habitat requirements

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

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

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

### Wildlife management practices

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

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

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

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

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

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

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

*Ponds: Repair Spillway/Levee*: if not functioning properly

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

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

## Box turtle

### General information

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

### Habitat requirements

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

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

*Cover*: forests with a diverse understory and early successional cover with native grasses and forbs; constructs nests in open areas (Stages 2 and 3) that are warmer because of increased sunlight

### Wildlife management practices

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

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

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

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

# Bullfrog

## General information

The bullfrog's native range extends from the Atlantic Coast to eastern Colorado and eastern Mexico, and from southern Colorado to northeastern Mexico. Bullfrogs are not native west of the Rocky Mountains but have been successfully introduced in many areas. Bullfrogs inhabit permanent bodies of standing or slow-moving water. Bullfrog tadpoles require two years to metamorphose. They prefer shorelines with dense vegetation (Stages 3 and 4 of wetland succession), adjacent to shallow open water (Stage 2) dominated by floating and submerged aquatic vegetation. All habitat requirements are often found in and around a single pond.

## Habitat requirements

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

*Water*: stable water levels are necessary for hibernation and egg development; water levels should be maintained at a constant level

*Cover*: dense emergent aquatic and upland herbaceous vegetation adjacent to water for hiding and foraging

## Wildlife management practices

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

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

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

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

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

# Cutthroat trout

## General information

Cutthroat trout are native to the western U.S. They are found in diverse areas such as the Rocky Mountains, the valleys of the Great Basin and the Pacific Ocean. They prefer rivers and streams with a gravel bottom, but several subspecies mate in lakes and ponds. Cutthroat trout are carnivores, eating a variety of organisms found in streams and lakes.

## Habitat requirements

*Diet*: young eat algae and small crustaceans; grown adults eat crustaceans, eggs, aquatic insects, mollusks, amphibians (tadpoles) and other fish; may also eat terrestrial organisms if they fall into stream but is not a major part of their diet

*Water*: streams, lakes, and ponds where water does not rise above 70 F in summer; ideally streams should have a variety of riffles, runs, and pools; basic requirements include dissolved oxygen (minimum 6 parts per million); pH range between 6.5 and 9.0

*Cover*: prefer streams with overhanging vegetation along the shore that provides shade and reducing water temperature and providing terrestrial organisms for food; rocks, as well as debris on the bottom of the river or lake, provide cover that will hide them from prey

## Wildlife management practices

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

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

*Manage disturbance*: grazing management should maintain thick vegetation on banks and shores; livestock watering facilities should be developed away from streams, rivers, lakes or ponds; fencing along the riparian area or lakeside may also be necessary

*Streams: Dams, Boulders Logs*: gravel and cobble should be placed in streams to provide structure for insects and locations for spawning; structures should not change currents, which could increase bank erosion; boulders and logs may be placed in the stream or lake to provide cover for trout while hunting, as well as cover for prey species. If there are overhanging stream banks that provide cover, this practice may not be needed.

*Streams: Remove Fish Barriers*: because most cutthroat trout populations are migratory, dams can impede their ability to return to spawning grounds; installing fish ladders or removing dams will improve cutthroat trout's ability to migrate

# Largemouth bass

## General information

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

## Habitat requirements

*Diet*: young bass eat insects and other invertebrates (worms, crayfish and zooplankton); adults eat small fish such as bluegill and a variety of minnows, as well as tadpoles, crayfish and even ducklings

*Cover*: submerged rocks, woody debris and near aquatic vegetation where small fish (prey) hide

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

## Wildlife management practices

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

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

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

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

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

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

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

*Ponds: Repair Spillway/Levee*: if not functioning properly

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

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

# Pacific salmon

## General information

Pacific salmon spend part of their lives in cold streams and rivers in the Pacific Northwest and another part of their life cycle in the open ocean.

## Habitat requirements

*Diet*: in fresh water, young salmon feed primarily on aquatic insects, other invertebrates, and smaller fish

*Water*: basic requirements include dissolved oxygen (seven parts per million or greater); pH range between 5.5 to 8.5; water temperature should range between 33 F and 65 F with optimum 55 F to 60 F; water temperature should not exceed 70 F at any time (one foot below surface, in the shade)

*Cover*: young salmon require cover for shade and protection from predators.

### Wildlife management practices

*Streams: Dams, Boulders Logs*: low dams, boulders or logs can be used to create pools that provide areas for resting and hiding in streams and rivers that have considerably more riffles than pools

*Streams: Remove Fish Barriers*: culverts or large dams that prevent fish from migrating upstream to spawning areas should be removed or replaced; these are a major threat to salmon populations

## Rainbow trout

### General information

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

### Habitat requirements

*Diet*: fish, aquatic insects, crustaceans and mollusks; may also eat terrestrial organisms that fall into the water, but this is not common

*Water*: streams, lakes and ponds where the water does not rise above 70 F in summer; ideally stream should have 50 percent riffles and 50 percent pools; basic requirements include dissolved oxygen (minimum of six parts per million); pH should range between 6.5 and 9.0

*Cover*: rocks, as well as debris on the bottom of the river or lake, provide cover for hiding from prey or fishermen

### Wildlife management practices

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

*Increase Harvest*: refer to wildlife management practices for specifics on fish harvest; managers have begun reducing rainbow trout populations to minimize predation on or competition for resources with native fish species; increasing the harvest can reduce the rainbow trout population

*Manage disturbance*: grazing management should maintain thick vegetation on banks and shores; livestock watering facilities should be developed away from streams, rivers, lakes or ponds; fencing along the riparian area or lakeside may also be necessary

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

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

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

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

*Ponds: Repair Spillway/Levee*: if not functioning properly

*Ponds: Restock*: if too few are present

*Streams: Dams, Boulders Logs*: gravel and cobble should be placed in stream to provide structure for insects and locations for spawning; structures should not change currents, which could increase bank ero-

sion; boulders and logs may be placed in the stream or lake to provide cover for trout while hunting, as well as cover for prey species

*Stream: Remove Fish Barriers*: because most native rainbow trout populations are migratory, dams can impede their ability to return to spawning grounds; installing fish ladders or removing dams will improve rainbow trout's ability to migrate

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

# Rough-skinned newt

## General information

The adult rough-skinned newt prefers moist coniferous and hardwood forests in Stages 5 and 6, but also can be found in open valleys, Stages 3 and 4. Newts require permanent water, such as ponds or slow-moving streams, for courtship, breeding, egg-laying and larvae development. Eggs are laid singly on aquatic vegetation or submerged twigs. Aquatic larvae transform in late summer or over winter and transform the following summer. Adult rough-skinned newts are generally terrestrial, often seen crawling over land in the daytime and becoming aquatic when breeding. However, some populations hide in daylight and are active at night. Some adults are primarily aquatic. Newts are often seen moving in large numbers to breeding sites during the breeding season. Some newts spend the dry summer in moist areas under woody debris, rocks or animal burrows. Adults emerge to feed after fall rains. In some populations, adults remain in ponds throughout summer and migrate back onto land in fall when the rain starts. Often, they will form large aggregates of thousands of newts in the water. Adult newts have rough or granular skin, which produces toxins that repel most predators. These newts may assume a swaybacked defense pose with a coiled tail, exposing the bright ventral surface to warn potential predators. Toxin-resistant garter snakes are the only known animals that prey on rough-skinned newts.

## Habitat requirements

*Diet*: larvae feed on aquatic invertebrates; adults eat amphibian eggs and larvae, aquatic and terrestrial invertebrates, worms and slugs

*Water*: permanent water such as ponds and slow-moving streams for breeding and larval development

*Cover*: shallow water with aquatic vegetation or submerged woody debris is needed for attachment of eggs; soft logs, rocks and bark are necessary for adult escape cover

## Wildlife management practices

*Ponds: Construction*: where none are present

*Ponds: Reduce Turbidity*: reseed watershed to establish herbaceous vegetation surrounding the pond and in the watershed that drains into the pond to reduce siltation; muddy water blocks sunlight needed to produce aquatic vegetation, which is necessary for oxygen production for gill-breathing larvae

*Ponds: Repair Spillway/Levee*: if not functioning properly

*Streams: Dams, Boulders or Logs*: add structure to streams to increase pools and decrease flow

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

# Western hognose snake

## General information

Western hognose snakes prefer scrubby flat or gently rolling prairies with sandy soil. Often these sandy sites are characterized by sparse vegetation in most years (Stages 2 through 4). Hognose snakes mimic rattlesnakes when threatened but are not dangerous. If their initial threat does not work, they will sometimes fake death by rolling over and exposing their undersides. Western hognose snakes burrow into loose soil to find food and spend the winter.

## Habitat requirements

*Diet*: toads, reptiles, birds, mice and eggs

*Cover*: grasslands and shrubland

*Water*: necessary water obtained from diet

**Wildlife management practices**

*Establish Native Grasses and Forbs*: where native prairie has been converted to non-native grasses

*Manage disturbance*: prescribed fire and chaining are recommended to reduce woody vegetation where needed and maintain native short grass prairie; grazing management should leave adequate herbaceous cover for prey populations

# Wildlife Management Practices (WMPs)

In this section, various practices used to manage wildlife and their habitat are described in further detail. They are listed in alphabetical order. The descriptions are brief and general and are not meant to be comprehensive.

Identify and learn the practices recommended for the species listed in the Regions you are studying. When preparing for a competitive event, it is only necessary to learn information pertaining to the WMPs appropriate for the species included in the region that will be used in the event. Several practices are commonly used in certain regions, but not in others. Study only the appropriate practices listed on the chart found for the region you are studying. It is always wise to learn as much as possible about any practice before recommending it. Additional reading and guidance from other wildlife resources and wildlife management professionals will help you better understand these practices and their effect on wildlife and habitat.

Some of the practices may seem contradictory. For example, ***Ponds: Deepen Edges*** discourages the growth of emergent aquatic vegetation, while ***Water Control Structures*** could encourage growth. **Landowner objectives should determine which practices you recommend.** Note that some practices may not be applied in all regions, even though you may be dealing with the same species. For example, ***Forest Management*** is not appropriate for mourning dove in the shortgrass prairie, but it may be in other regions. Remember, when deciding whether or not to recommend a WMP, you are assessing current conditions and determining if a WMP needs to be applied within the next year. Keep in mind however, the benefits of a WMP may not be seen for years. For example, planting mast trees to produce a food source for wood ducks is a sound practice, but those seedlings will not produce acorns for five to 20 years, depending on the species of oak planted. At times, the best recommendation is maintaining an area in its current condition. This can include protecting the area from development and applying various WMPs that will help maintain the area in the desired condition.

In this manual, costs and budgets are not considered when recommending practices. However, in actual situations, wildlife managers must consider economics when planning and recommending WMPs.

## Index to Wildlife Management Practices (WMPs)



### Urban Wildlife Management Practices

# Control Non-Native Invasive Vegetation

## General description

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

Examples of non-native trees that should be controlled include tree-of-heaven, mimosa and paulownia. Examples of non-native shrubs that should be controlled include Russian olive, privets, bush honeysuckle, saltcedar and multiflora rose. Examples of non-native vines that should be controlled include kudzu, Japanese honeysuckle and Oriental bittersweet. Examples of non-native grasses that should be controlled include tall fescue, bermudagrass, johnsongrass, cogongrass and cheatgrass. Examples of non-native forbs that should be controlled include sericea lespedeza, sicklepod, cocklebur and spotted knapweed. Examples of invasive wetland plants include alligator weed, purple loosestrife, phragmites, hydrilla, water hyacinth, Eurasian watermilfoil, and reed canarygrass.

John Gruchy

**Non-native perennial cool-season grasses, such as this tall fescue, provide little habitat for wildlife. Eradicating these undesirable grasses will help improve early successional habitat more than any other practice.**

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

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

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

## Effect on habitat

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

# Decrease Harvest

## General description

It is the responsibility of state and federal wildlife agencies to set hunting, trapping, and fishing seasons and bag and creel limits. However, landowners can choose to take the maximum allowed or less than that, depending on personal management objectives.

### *Bass*

Needed when seine samples and fishing records of a pond reveal:

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

### *Bluegill*

Needed when seine samples and fishing records of a pond reveal:

- many recently hatched bluegill
- very few medium-sized bluegill
- bass less than one pound and in poor condition
- no young bass

### *Trout*

Needed when seine and fishing records of a pond reveal:

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

### *Game birds and mammals*

Regulated hunting and trapping is a primary tool used to keep several game species within the carrying capacity of available habitat. This is obviously true for species that have relatively few natural predators in a given area or region such as white-tailed deer. However, it may be necessary to decrease harvest levels for other species such as Northern bobwhite and greater prairie-chicken, or when harvest data and/or observation data indicate species populations are declining in areas with good habitat and where hunting pressure has been excessive. It is important to realize decreasing regulated hunting and trapping opportunities and harvest levels are seldom the reason for declining wildlife populations. Relatively low or declining wildlife populations are almost always a result of poor habitat, whether as a result of existing site quality or degradation and/or destruction of habitat quality in the surrounding area.

# Delay Crop Harvest

## General description

When landowners have an interest in wildlife, it may be beneficial to avoid harvesting crops or hay during nesting and fawning seasons to reduce nest destruction and mortality. It is important to note crop yield and quality are often reduced dramatically when harvest is delayed. This is especially true when hay harvest is delayed until seedheads form. A much more important consideration than delaying crop harvest is making sure adequate usable space is available across the property for the focal wildlife species. This may mean reducing the acreage cropped or hayed to increase acreage available for wildlife.

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

Blake Brown

**Switchgrass grown for biofuels is normally harvested in November. Where wildlife is a consideration, native grass grown for biofuels should be harvested in March to provide cover through winter. Delaying the harvest until March does not appreciably reduce yield.**

## Effect of practice

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

# Establish Field Buffers

## General description

Field buffers are strips of grasses and forbs around crop fields. These strips are designed to trap sedimentation and nutrient run-off. They also can provide excellent nesting, brooding and escape cover for many wildlife species. Field buffers should be a minimum of 30 feet wide, but wider is better. Field buffers up to 120 feet wide are highly desirable and recommended to provide adequate usable space for wildlife dependent upon early successional habitat. Where wildlife is considered, field buffers should be composed of native grasses and forbs, which may be planted or allowed to establish naturally from the seedbank. Scattered brambles and shrubs may also be used and are highly beneficial for several wildlife species.

**Note**: *Establish Native Grasses and Forbs* and/or *Plant Shrubs* should **not** be recommended in order to *Establish Field Buffers*. However, if there are existing field buffers of undesirable non-native species, *Control Non-Native Invasive Vegetation* **should** be recommended. Only recommend additional field buffers if there are crop fields without buffers or additional buffers are needed around a field. This practice is recommended for row crops only (especially soybeans and grain crops). It should **not** be recommended around hay fields.

Craig Harper

**Field buffers around crop fields provide increased usable space for species that require early successional cover. Field buffers don't have to be planted. Here, broomsedge and blackberry have established from the seedbank.**

## Effect on habitat

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

# Establish Native Grasses and Forbs

## General description

Native grasses and forbs are recommended primarily to increase or enhance early successional habitat for a number of wildlife species. Non-native grasses (such as tall fescue and bermudagrass) are not recommended for wildlife because they do not provide suitable habitat structure for most wildlife, and their competitive nature often prevents native grasses and forbs from becoming established. Warm-season grasses and forbs grow primarily during late spring and summer. Cool-season grasses and forbs make primary growth in the spring and fall and often go dormant during the summer depending on weather conditions.

Native grasses and forbs can be planted, or they can be established by killing existing non-native cover with selective herbicides and allowing native seed lying dormant in the seedbank to germinate. **Note: If native grasses and forbs are planted, it is imperative to eradicate undesirable non-native grasses and forbs prior to planting. This will require herbicide applications. In this situation, you should also recommend *Control Non-native Invasive***

**Examples of desirable native warm-season grasses**

- bluestems, switchgrass, sideoats grama and indiangrass

**Examples of desirable native cool-season grasses**

- wildryes and low panicgrasses

**Examples of undesirable non-native warm-season grasses**

- bermudagrass, cogongrass, johnsongrass, crabgrass, dallisgrass and goosegrass

**Examples of undesirable non-native cool-season grasses**

- tall fescue, orchardgrass, bromegrasses and timothy

**Examples of desirable native forbs and brambles**

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

**Examples of undesirable non-native forbs**

- sericea lespedeza, curly dock, spotted knapweed, sicklepod and cocklebur

***Vegetation.***

Early successional habitat is required by many wildlife species that do not use woods such as Northern bobwhite, greater prairie chicken, grasshopper sparrow and dickcissel. Additional early successional habitat is particularly needed for those species and others in areas that are predominately forested and where the majority of existing early successional habitat is dominated by non-native species. The amount of early successional habitat required is dependent on the focal species. Some species such as Eastern cottontails, will use and thrive in relatively small areas of early successional habitat, while other species such as greater prairie chicken require several square mile of contiguous native grasses and forbs.

Early successional habitat must be maintained. Prescribed fire, disking and grazing are recommended to prevent deterioration of the vegetative structure through litter buildup and excessive woody plant succession. It is good to burn, disk, or graze a different area each year to provide a diversity of plant structure and composition across the property to serve the different needs of wildlife dependant upon early successional habitat. Usually burning and disking are conducted just prior to spring green-up or in late summer/early fall, so nests and young wildlife are not disturbed. **Ideally, early successional habitat should not be mowed.**

Craig Harper

**Native grasses and forbs can be promoted for additional early successional habitat. Here, big and little bluestem and indiangrass complement the blackberry, beggar's-lice, partridge pea, pokeweed, and various asters growing on the site.**

Craig Harper

**Ideally, early successional habitat should be managed with prescribed fire. If prescribed fire is not possible, disking and selective herbicides are the best alternatives. Mowing is the least desirable management practice and should be avoided if possible.**

## Effect on habitat

- Native grasses and forbs provide nesting, bedding, roosting and/or escape cover for several songbird species, bobwhites, wild turkeys, cottontails and other small mammals as well as white-tailed deer. These areas are also important for predators such as hawks, owls, coyotes and others.
- Ground-nesting birds usually build their nests at the base of a native grass bunch/clump.
- Although some wildlife such as elk readily eat native grasses, forbs provide a greater food source for more species. Not only is the foliage of forbs eaten, but the seed produced by many forbs such as native lespedezas, ragweed, sunflowers and pokeweed is a most important food source for many birds and mammals. Forbs also provide optimal cover for brooding quail and wild turkeys.
- Areas burned or disked during the previous year provide an open structure at ground level, which is desirable for young quail and turkeys as they can walk about easily between the bunches of grasses and under the canopy of forbs, eating insects and other invertebrates and gleaning seed of various forbs off the ground.
- Areas burned or disked at least two years previously provide dead, dry vegetative material that birds use for building nests.
- Native grasses and forbs can be used to develop a riparian buffer. Riparian buffers are important for protecting water quality and can provide excellent cover and travel corridors for wildlife as well. The recommended width is 100 feet, but width may vary with size and order of the stream, as well as topography and landowner objectives.

Craig Harper

**Infrared-triggered cameras are a great tool to estimate populations of several wildlife species. When conducting a survey for white-tailed deer, corn is often used to bait deer in front of cameras in late summer or late winter when the quality or quantity of natural foods is relatively low. This helps ensure a majority of the deer using the area are "captured" and included in the survey.**

# Fish or Wildlife Survey

## General description

### *Fish surveys*

Population balance is first established in ponds by stocking the correct number of fish. After the first year, pond balance should be checked during early summer by seining at intervals around the pond. Four to five seine sweeps in an average pond is usually enough. Balance is determined by comparing age groups, condition and numbers of bass and bluegill caught in the seine and from fishing records. Recent reproduction of both bass and bluegill in the seine indicate the fish population is balanced. Fish caught by hook-and-line can be evaluated on body condition (fat, skinny, size of head in relation to body, etc.). Trout do not often reproduce in ponds, so overall health of the fish is used as an indicator of pond balance. Unwanted species (bullheads, crappie, etc.) may also be caught in the seine or when fishing, indicating the fish population may be killed (with Rotenone) or drained.

Seining is usually not effective for collecting fish in streams. Fish in streams are usually col-

lected by fishing or are electro-shocked. Electro-shocking involves running a small electrical current between two conducting rods, which are moved up and down the stream. Stunned fish float to the surface and the age, condition and numbers are recorded to determine stream balance. The fish are then returned to the stream.

### *Wildlife surveys*

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

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

# Forest Management Techniques

## General description

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

### *Forest Regeneration*

Regenerating a forest stand involves harvesting the trees within the stand through various silvicultural methods, *with the intention of renewing and maintaining that forest stand*. Stand age and health, as well as landowner objectives determine when a stand should be regenerated. Harvesting the trees allows additional sunlight into the forest, which stimulates seedling germination and growth. Thus, a young forest is established. This process changes the structure of the forest and the composition of plants growing in the forest understory. Thus, some wildlife species benefit, while others do not. For example, rabbits and bobwhites readily use the cover and food resources provided in a recently clearcut stand of mixed hardwoods, while Eastern gray squirrels that were using that stand prior to harvest would have to move to an adjacent stand. At the same time, other species, such as wild turkeys and white-tailed deer, would use both the recently harvested stand as well as an adjacent mature stand of mixed hardwoods. When managing habitat for species that require young forest cover, it is crucial to regenerate stands over time and that regenerating stands be well dispersed across the area being managed.

**Note: *Forest regeneration* should be recommended as a silvicultural tool to regenerate stands and provide young forest cover— not to create "openings" or early successional habitat**. Regenerated forests result in new forests, **not** openings. Where additional early successional habitat is needed, and the area is currently forested, *Forest Regeneration* should **not** be recommended automatically. Instead, *Manipulation of Succession (chainsawing)* and *Establish Native Forbs and Grasses* should be recommended.

The regeneration method recommended depends upon forest type and composition, site quality, and landowner objectives.

**Clearcutting removes all the overstory trees in a stand. This allows full sunlight onto the site. Natural regeneration is immediate. This 2-year-old mixed hardwood-pine forest provides food and cover for species such as black bear, bobcat, brown thrasher, Eastern cottontail, great horned owl, white-tailed deer, wild turkey, and others.**

Craig Harper

**Not all trees are harvested initially when using the shelterwood method. This allows managers to leave trees that might provide an important food source, such as oaks, blackgum, black cherry, persimmon, and others. This is a very important consideration when managing for wildlife that eat acorns and other mast.**

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

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

**Seed-tree** regeneration method leaves a few good seed-producing stems per acre to regenerate a new stand. This method is often used in pines and other species with lightweight, wind-carried seed. The seed trees are usually harvested after the crop of new trees becomes established.

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

**Single-tree selection** regeneration method harvests only select, individual trees out of the stand, not groups of trees. This method can create a diverse structure with small gaps in the forest canopy. This method generally regenerates shade-tolerant species in closed-canopy forests and is not applicable in all regions.

Craig Harper

**The seedtree method is most often used with pines. Scattered trees are left standing after the initial harvest. Wind scatters seed from these remaining trees across the harvested area and new pines establish naturally. During the process, early successional habitat is provided as the new stand develops.**

Pines are often planted after harvest to establish a new stand. Hardwood stands are almost always regenerated naturally and not planted.

Regardless of regeneration method used, it is important to make sure food, cover, and water for certain wildlife species are always in close

Dwayne Elmore

**Group selection creates relatively small (<2 acres) canopy gaps within a stand. New trees regenerate naturally (without planting) in the openings. These small openings diversify the structure within the stand and are used by many wildlife species.**

**Select, single trees are removed in single-tree selection. This method favors shade-tolerant species in hardwood stands. Thus, it is sometimes practiced in northern hardwood stands where species such as sugar maple, American beech, and white pine are managed. Single-tree selection is also practiced effectively in longleaf pine stands.**

**Standing dead trees (snags) should be left when practicing forest management to provide cavities and perches for various wildlife species. Where additional snags are needed, Create Snags should be recommended.**

proximity. Typically, regenerated stands should be adjacent to more developed stands to provide travel corridors and space for wildlife that do not use young stands. Also, whenever stands are harvested, it is important to leave standing dead trees (snags) for wildlife that might use them. Where snags are not available and when managing for species that use snags and down woody material, it may be desirable to create some snags when the stand is harvested by killing some trees and leaving them standing. Trees can be killed and left standing by girdling the tree with a chainsaw or hatchet and applying herbicide to the wound.

## Effect on Habitat

- Harvesting timber generally sets back succession and produces new forest growth with greater stem density, which provides nesting and escape cover for several wildlife species.
- Clearcut, shelterwood, and seed-tree reverts Stage 6 to Stage 5 with an abundance of herbaceous plants persisting until 5 or 6 years post-harvest when they are shaded out by the developing trees. During this time, forage and soft mast may be increased considerably.
- Group selection and single-tree selection maintains the structure of Stage 6, but an increase in understory growth will enhance nesting structure for some species and provide additional forage and soft mast.
- Enhances cover for many prey species, which provides food for predators.
  Retaining snags and cavity trees when harvesting trees provides nesting, roosting, denning and perching sites.
- The tops and slash of harvested trees remaining on the site provide what is called down woody debris. This material is very important for several reasons. As the material rots, nutrients from the organic material are returned to the soil for additional plants and animals to use. Not removing these nutrients from the site is critical for ecological function. From a wildlife perspective, several reptiles and amphibians live in and under the decaying logs. Many small mammals also nest and den in and under decaying logs. Birds such as wild turkeys and ruffed grouse commonly nest adjacent to the brushy material and logs left behind, which simulate a tree knocked over during a storm. Male ruffed grouse also use down logs as platforms to "drum" on and attract females. The brushy debris left behind after a logging operation also provides important cover for various species and actually helps forest regeneration as newly emerging seedlings are protected from deer browsing.

## Timber Stand Improvement (TSI)

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

Craig Harper

**Timber stand improvement (TSI) can be implemented to remove undesirable tree species and increase growth of selected trees that remain in the stand. By allowing additional sunlight into the stand, groundcover is stimulated, providing additional cover and food resources in the stand which can be maintained with fire.**

## Effect on habitat

- Increased herbaceous growth in the understory enhances brooding cover and provides additional forage, browse and soft mast.
- Increased woody stem density in the midstory improves cover for some species such as ruffed grouse.
- When adjacent competing trees are removed, trees retained following TSI are able to grow larger crowns and produce additional mast.
- Down logs and other woody debris left following TSI provide sites for feeding, denning, drumming, reproducing, hiding and resting for several species.

# Increase Harvest

## General description

It is the responsibility of state and federal wildlife agencies to set hunting, trapping, and fishing seasons with bag and creel limits. Within that limit, landowners can choose to take the maximum allowed if necessary to meet management objectives.

### *Bass*

Needed when seine samples and fishing records of pond reveal:

- many recently hatched bluegill
- very few medium-sized bluegill
- bass less than one pound and in poor condition
- few or no young bass; increase bass harvest cautiously; target bass less than one pound and spread the harvest over the summer

### *Bluegill*

Needed when seine samples and fishing records of pond reveal:

- no recent bluegill hatch
- many medium-sized bluegill in poor condition
- bass are few, large and in good condition
- target medium-sized bluegill, using seine harvest or shoreline rotenone

Craig Harper

**Increased harvest may be necessary where populations approach or exceed carrying capacity of the area being managed. When population reduction for white-tailed deer is necessary, the harvest should concentrate on females which will reduce animal numbers and can adjust the sex ratio.**

***Trout***

Needed when seine or fish records reveal:

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

***Game birds and mammals***

Needed when animals show signs of stress and overpopulation such as destruction of habitat by overgrazing or overbrowsing, poor body condition and weight loss, low reproductive rate,and increase in prevalence of parasites and diseases. Regulated hunting and trapping is the most effective and efficient practice to remove surplus animals and keep wildlife populations in balance with available habitat. When scientific data indicate animals are above carrying capacity, it is often necessary to increase harvest.

# Leave Grain Unharvested

## General description

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

Craig Harper

**By leaving strips or blocks of grain unharvested, additional food is available for wildlife. This can be an important consideration, especially in areas where winters are harsh.**

## Effect on habitat

Provides additional food resource, which can be particularly important when naturally occurring foods are in low supply and/or in years with poor acorn production.

# Manage Disturbance

## General description

Succession is the orderly and predictable series of changes in plant species composition

Craig Harper

**Where additional early successional habitat is needed in wooded areas, but forest management is not desired or an option, trees may be cleared using a chainsaw. On this property, trees were cut, not harvested, and the site has been burned every 2 years to maintain early succession.**

through time and occurs in all natural communities. Wildlife habitat is most often managed by setting back succession in an effort to retain the successional stage(s) beneficial for the focal wildlife species. There are essentially four general methods for manipulating succession: **mechanical methods**, **fire**, **grazing**, and **herbicide applications**. Each of these may be applicable for manipulating succession in any region for various species, but they may not produce the same effect. One or more may be recommended over another depending on the situation. In some instances, more than one method may be applied.

For the written and oral segments of the contest, the recommended methods for manipulating succession should be specified and reasons given as to why they are recommended.

## I. Mechanical methods

### Disking

Disking sets back succession by mixing the upper soil layer and incorporating organic material into the soil, facilitating decomposition and stimulating the seedbank. Disking is a relatively inexpensive and effective practice for reducing grass coverage, encouraging germination and growth of forbs and exposing bare ground. Areas in Stages 2, 3 and 4 (depending on size and height of shrub cover) can be disked to maintain/promote growth of annual and perennial forbs and grasses. Disking should be performed on a rotational basis, usually in winter. In planted pines, disking can be used in Stages 5 and 6 to reduce unwanted woody stems and encourage herbaceous growth. Similar to controlled burning, timing of disking and disking intensity influence vegetation composition and structure. Disking should be used instead of mowing when and where possible and should be used where burning is not possible. While disking is often used to create firebreaks to facilitate controlled burning, it should not be recommended in order to burn. Disking should not be prescribed for dominated by perennial non-native grasses (such as tall fescue and bermudagrass). Instead, *Control Non-native Invasive Vegetation* should be recommended for those areas.

Craig Harper

**Disking sets back succession, facilitates decomposition, provides bare ground, and stimulates the seedbank, encouraging early successional species.**

#### Effect on habitat

- In Stages 2 and 3, maintains herbaceous vegetation.
- Promotes fresh herbaceous growth and enhances forage availability for many wildlife species.
- In Stages 3 and 4, reverts succession to Stage 2.

### Chainsawing / Feller-bunchering

A chainsaw or feller-buncher may be used to kill and/or remove trees in forests, savannahs and woodlands where trees are not needed or where additional areas of early succession are needed for the focal wildlife species.

**Note**: Implementing this practice implies that once the trees are removed, the area is to be managed in something other than trees such as native forbs and grasses and forbs or food plots. Do not recommend *Forest Management* to achieve this management goal. If an additional practice is intended, such as *Establish Native Grasses and Forbs* or *Plant/Manage Food Plots*, it should be recommended as well.

#### Effect on habitat

- Reduces tree density and encourages early successional plant communities.

### Chaining / Roller Beating

Chaining involves pulling a very large chain strung between two bulldozers running parallel to each other (50 to 100 feet apart) to knock down shrubs and small trees. Roller beating

Todd Black

**Where fire is not an option and/or on areas where trees have gotten too large to allow disking, drum-chopping can be used to set back succession.**

Craig Harper

**Mowing, or "bushhogging," sets back succession. However, accumulation of thatch provides undesirable conditions for many wildlife species and limits germination of the seedbank. Mowing is not a desirable practice to set back succession.**

involves bulldozers pulling a roller with large, sharp metal blades to knock down and chop large shrubs and small trees. Roller beating is an alternative to chaining and has almost the same effect on vegetation. Both techniques are used where rugged terrain, rocks or large shrubs prevent the use of a mower. This practice is not used to manipulate understory vegetation in woodlands or savannas. Soil compaction is a concern and can be a problem when using bulldozers in certain regions. Prescribed fire is the preferred method to set back succession and maintain the desired vegetative composition and structure.

## Effect on habitat

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

# Mowing / Mulching

Mowing is most often accomplished with a large rotary mower mounted behind a tractor. Sometimes, a mulching machine is used to mow large shrubs and small trees. To avoid disrupting nesting birds and destroying reproductive cover or winter cover, mowing should not be conducted until late winter/early spring. When used to manage fields or other early succession habitat, mowing should be conducted only when it is apparent that undesirable woody species are encroaching in the field. In other words, mowing grassy fields is unnecessary. Mowing and mulching machines are often not desirable because they create a deep thatch layer that creates undesirable conditions at ground level for young game birds and ground-feeding songbirds. A thatch layer also limits germination of the seedbank and can reduce plant diversity. When possible, prescribed burning and disking should be implemented instead of mowing or mulching.

## Effect on habitat

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

## II. Fire (Prescribed Fire)

Prescribed fire can be the most effective and efficient method for managing succession. Prescribed fire is recommended to maintain Stages 2 through 4 and to influence understory composition and structure within Stages 5 and 6. Prescribed fire should be used to manage early successional habitat instead of mowing or mulching wherever burning is possible.

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

Craig Harper

**Prescribed fire is the desired method for setting back succession and manipulating the composition and structure of the understory or groundcover in forests, woodlands, and savannas where fire historically occurred. While fire intensity and season of burning influence fire effects, fire frequency is the most important consideration.**

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

**Burning should be conducted only when danger of wildfire is low (when the wind, temperature, and humidity allow a controlled burn) and should be conducted under the close supervision of forestry or wildlife professionals experienced with prescribed fire.**

### Effect on Habitat

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

## III. Grazing Management

Livestock and wildlife grazing must be managed to enhance wildlife habitat. This practice should be recommended when evidence of live-

Dwayne Elmore

**Grazing can also be used to manipulate succession. Stocking rate greatly influences the vegetation composition and the resulting structure.**

Craig Harper

**Herbicide applications can also be used to set back succession and are often necessary to control non-native invasive vegetation. Selective herbicide applications, as shown here, can be used instead of mowing and help to transition plant species composition toward more favorable species by killing undesirable species.**

stock is present or information on livestock use is given. Grazing management may be used to exclude livestock from sensitive areas or to manage disturbance to benefit wildlife by adjusting stocking rate, season of use or grazing system. Livestock may be used to manipulate the height and structure of native warm-season grasses to enhance wildlife habitat. Grazing should not be used to manipulate non-native forage pasture (such as tall fescue, orchardgrass, bermudagrass) for wildlife because these grasses are detrimental to wildlife, displacing otherwise suitable habitat. Livestock distribution can be controlled with fencing, herding or fire. Regardless of pasture type, proper stocking rate must be practiced to prevent improper grazing. The term improper grazing is used to describe livestock grazing that fails to meet land objectives such as soil conservation, plant species diversity, maintenance of wildlife habitat and adequate livestock nutrition.

### Effect on habitat

- Stocking rate, which is the amount of land allotted to each animal for the entire grazable portion of the year, is the **most** important consideration concerning livestock grazing management.
- Proper stocking rate and/or rotational grazing can be used to alter the vegetation structure and composition to favor wildlife.
- Restricting livestock from riparian areas may improve habitat structure and composition for many wildlife species. Fencing can help reduce siltation, turbidity and stream bank erosion, while reducing stream and pond pollution from livestock wastes.

## IV. Herbicide Applications

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

### Effect on habitat

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

# Nesting Structures

### General description

Some species den, nest and/or roost in cavities they don't excavate themselves (such as bluebirds, wood ducks and screech owls). If natural cavities are not available, artificial cavi-

Craig Harper

**Nest boxes provide artificial cavities for several species of birds. Nest boxes have been instrumental in helping bluebird and wood duck populations recover from drastic low levels in the early 1900's.**

ties (nest boxes) can be used. Many species need a certain kind of cavity (certan diameter of hole, depth, area) in a certain location (field, woods or water) and at a certain distance above ground (height in feet). The particular design and placement of nest boxes often determines which wildlife species use the structures. Nest boxes should be monitored to ensure use by targeted species. Contact your county Extension office for specific designs of nest boxes and other artificial nesting/ roosting structures.

**Note**: Nesting structures for Canada geese are not recommended because resident Canada geese have become too numerous and are a nuisance. In addition, nesting structures are not normally recommended for mallards. Instead, creation of high-quality nesting habitat (native warm-season grasses) is required to impact population recruitment.

### Effect on habitat

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

## Plant / Manage Food Plots

### General description

Planting grain and forage food plots can be beneficial for many wildlife species (game and non-game, birds and mammals) primarily by providing supplemental food, but also by providing additional cover in some circumstances. **Grain food plots** are annual warm-season plantings that include corn, grain sorghum, and millet, as well as other seed such as buckwheat,

Craig Harper

**Warm-season grain plots, such as this corn, can provide an important source of energy through winter for many wildlife species.**

Craig Harper

**Warm-season forage plots, such as these soybeans, can provide an excellent source of protein (leaves) during summer and an energy source (beans) in winter.**

Craig Harper

**Cool-season food plots provide nutritious forage fall through spring when availability of naturally occurring forages may be relatively low. Depending on what is planted, such as winter wheat, a nutritious seed source is also available late spring through summer.**

sunflowers, soybeans and cowpeas. **Forage food plots** may be annual or perennial, warm- or cool-season plots. Popular forage plantings include clovers, wheat, oats, rape, chicory, winter peas, soybeans, cowpeas and lablab. Some plantings may provide both forage and grain/seed, such as wheat, soybeans, buckwheat, and cowpeas. In most circumstances, food plots should be well dispersed throughout the property being managed.

Generally, 1 to 5 percent of a property being managed for wildlife may be in food plots. Food plots may be long and narrow (300 to 400 feet long and 15 to 20 feet wide) or blocky in shape (depending on the focal wildlife species and the type of food plot planted), preferably located where two or more vegetation types meet (such as between a woodlot and an old-field, perhaps near a creek) and well distributed across the area being managed. If possible, food plots should be located adjacent to natural cover (such as brushy fencerows, hedgerows and other thicket-type areas). Exclusion cages should be erected in all forage plots to monitor planting success and amount of grazing pressure. Food plots are not planted for upland wildlife only (such as rabbits, quail, turkeys and deer), but also for waterfowl. Canada geese often feed in warm-season grain food plots and in winter wheat. Plots of millets, corn, rice or grain sorghum may be flooded a few inches deep in the fall to provide an additional food source for ducks through winter. It is important to note, food plots should be considered supplemental to existing natural habitat. The primary objective for food plots should be to provide nutrition for various wildlife species during periods when naturally occurring foods are limited (such as late summer and winter). In addition, food plots are often used to facilitate harvest of some wildlife species, such as white-tailed deer. Plots should not be placed within view of property lines or public roads.

Before planting, the seedbed should be prepared by conventional tillage or with herbicide applications prior to planting seed with a drill or planter. Tillage and herbicide applications, however, should not be recommended as separate practices in order to plant a food plot. The plot should be amended with lime and/or fertilizers as recommended by a soil test, obtained by sending samples of the soil to the Extension office for testing at a soils lab. This is an important step and helps ensure the correct amendments at the correct rate are applied for optimum plant growth.

Perennial forage food plots (such as perennial clovers, alfalfa and chicory) do not have to be planted each year. However, **maintaining perennial forage plots requires as much effort as replanting annual plots**. Perennial forage plots must be mowed periodically and sprayed with the appropriate herbicides and/or pesticides to control weed competition and/or problem insect pests. This is critical in order

to get 4 years to 6 years production from the perennial plot without replanting.

### Effect on habitat

- In areas where row-cropping (corn, grain sorghum, soybeans) is scarce, grain food plots can supply high-energy foods through fall and into late winter. This can be especially important during years with low mast (acorn) production.
- In areas where little herbaceous vegetation is present (such as large areas of Stages 4, 5 and/or 6) and/or where herbaceous vegetation is of no value to wildlife (such as fields of tall fescue, orchardgrass, bermudagrass, etc.), forage plots can supply high-protein foods, especially during late summer and through winter and spring.

Dwayne Elmore

**This planting of longleaf pines is providing important early successional habitat. In time, the forest will close and a different set of species will occupy the site.**

## Plant Trees

### General description

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

**Note:** It may not be appropriate to plant trees in some areas. Some species of wildlife such as prairie-chickens avoid trees. Thus, in prairies that were historically treeless, planting trees is detrimental to many grassland species of wildlife.

### Effect on habitat

- Provides hard or soft mast production, depending on the species planted.
- Large areas can be planted for reforestation.
- Provides additional nesting, perching, denning and roosting sites.
- Trees can be planted to develop a riparian buffer along creeks, rivers, lakes and other wetland areas. Riparian buffers are important for protecting water quality and can provide excellent cover and travel corridors for wildlife as well. The recommended width is 100 feet, but width may vary with size and order of the stream, as well as topography and landowner objectives.

## Plant Shrubs

### General description

When properly located, shrubs can provide a tremendous source of cover and soft mast that will benefit many wildlife species. In large open areas, planting blocks or multiple rows of shrubs is beneficial for those species requiring additional shrub cover for nesting, loafing or escape. Fruiting shrubs are beneficial for many species and can be planted in fencerows, hedgerows, field/woods borders, odd areas (such as field corners and gullies), riparian areas and any other areas where soft mast may be lacking. Establishing hedgerows of shrubs to break-up fields is very beneficial, especially when planted adjacent to high-quality early successional cover and/or a good food source (such as grain field). Shrubs should be planted in winter while they are still dormant. Shrubs should **not** be planted

in the woods where there is not adequate sunlight for growth and development. Where additional shrub cover is needed in forested areas, *Forest Management (TSI)* should be recommended.

## Effect on habitat

- Can provide additional food and cover for many wildlife species in areas where specific species of shrubs are lacking.
- Shrubs are an important component of travel corridors, which allow wildlife to move safely across open fields between two areas of cover.
- Establishing hedgerows with shrubs may be used to increase interspersion of cover types and create smaller fields in proximity that can be managed differently to meet the various food and cover requirements for different wildlife species.
- Shrub plantings may be useful in some urban settings where desirable cover and/or soft mast are lacking.
- Shrubs can be planted to develop a riparian buffer along creeks, rivers, lakes and other wetland areas. Riparian buffers are important for protecting water quality and can provide excellent cover and travel corridors for wildlife as well. The recommended width is 100 feet, but width may vary with size and order of the stream, as well as topography and landowner objectives.

Craig Harper

**Shrub plantings, such as this hawthorn, provide nesting cover, escape cover, and an important source of soft mast.**

# Ponds: Construction

## General description

Ponds can be created using dams, dikes and levees to provide relatively permanent water for fish and wildlife. Although wildlife may use them, ponds are typically managed for fish. Pond design varies, depending on the purpose for constructing the pond and the region where it is constructed. The local Extension office or Natural Resource Conservation Service office can provide design details.

This practice should be recommended when creating new ponds with relatively permanent water.

When constructing ponds, artificial reefs can be included for additional cover. These structures are usually constructed of rock piles, sections of plastic or cement pipe (a minimum of 6 inches in diameter and 18 inches long) and brushpiles. Artificial reefs are normally recommended only for ponds larger than 10 surface acres. NOTE: The practice **Pond: Restock** should not be checked when **Pond: Construction** is prescribed.

## Effect on Habitat

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

**Note**: Although many wildlife species may use ponds for various reasons, this practice is intended primarily for fish habitat. For the purposes of this contest, when additional water or wetland habitat is needed for wildlife species, *Water Developments for Wildlife* should be recommended. This avoids management conflicts when both fish and wildlife species are being managed on the same property. For example, steep sloping sides benefit fish, while gentle sloping banks with abundant emergent vegetation benefit many wildlife species.

# Ponds: Deepen Edges

## General description

In ponds with excessive aquatic vegetation along the margins of a pond, the edges should be deepened to a minimum of two to three

Dwayne Elmore

**While the shallow upper end of this pond is providing habitat for waterfowl and amphibians, it is not necessarily productive for a balanced fish population.**

feet with steep side slopes. If the pond can be drained, this can be accomplished with a bulldozer or tractor with a rear blade. If the pond cannot be drained, a backhoe can be operated from the top of the pond bank. Soil can be removed from the site or piled around the bank and then smoothed out and planted to native grasses and forbs.

### Effect on habitat

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

## Ponds: Fertilize/Lime

### General description

Ponds can be fertilized to increase available natural food organisms and prevent rooted aquatic weeds from becoming established. However, not every pond should be fertilized. Fertilization should **not** be used in ponds infested with weeds, ponds with excessive water flow, turbid (muddy) ponds, or ponds that will not be fished heavily. Fertilization is needed in fish ponds with water clear enough that you can see clearly to 18 inches below the water surface. Before beginning a fertilization program, total alkalinity and pH of the pond water should be tested. Ponds below 20 mg/l total alkalinity will need liming in order for fertilizers to be effective.

Fish ponds should be fertilized in the spring when the water temperature reaches 60 F. For ponds with moderate hardness (50 mg/l to 100 mg/l calcium hardness), apply 15 pounds of 12-52-4 (or its equivalent) powder, or one gallon of 11-37-0 liquid fertilizer, or 15 pounds of granular (0-46-0) per acre at two-week intervals, or until a good green color (phytoplankton bloom) develops in the pond. Make additional fertilizer applications (at the same rate per surface acre) every three to four weeks, or when the water clears (becomes less green). Fertilization may be continued until water temperatures drop below 60 F in the fall. Methods for applying fertilizer vary with the type of fertilizer used. Granular fertilizer must be distributed from a fertilizer platform. Liquid fertilizer should be mixed with pond water and broadcast from a boat for large ponds or from the bank of small ponds. Water soluble powdered fertilizers can be broadcast from a boat or from the bank.

### Effect on habitat

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

## Ponds: Reduce Turbidity / Reseed Watershed

### General description

Turbid or muddy water limits fish production because natural food organisms need sunlight to grow. Turbidity can be caused by sediment being washed in from the pond banks or watershed, cattle using the pond, feeding activities of bottom-dwelling fish such as carp or buffalo fish or negatively charged clay particles suspended in the water column.

Most events of turbidity are caused by sedimentation (erosion) from the watershed or the pond bottom (cattle or fish) and will usually clear in a relatively short period of time. Reducing erosion in the watershed is best accomplished by reseeding the watershed immediately around the watershed where there is evidence of erosion. Turbidity due to pond sediments can be

controlled by restricting cattle to a small area of the pond and eliminating bottom-dwelling fish.

Turbidity from suspension of negatively charged clay particles is a more difficult problem. The addition of positively charged compounds such as limestone, gypsum or alum crystals can cause the clay particles to settle. However, the choice of which product and how much to use has to be based on effectiveness, availability, cost and the ability of the pond owner to apply the product correctly.

### Effect on habitat

- Improves water quality by removing or settling silt.
- Allows sunlight to stimulate phytoplankton.
- May enhance cover for some wildlife, depending on how and where the watershed is reseeded.

Craig Harper

**Trees must be removed from dams to prevent the dam from leaking and eventually breaking.**

## Ponds: Repair Spillway/Levee

### General description

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

### Effect on habitat

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

## Ponds: Restock

### General description

Restocking a pond is a drastic measure and should only be considered after other management approaches have been attempted. Ponds containing wild fish species such as carp, shad, green sunfish or bullhead catfish should be restocked with a balanced predator / prey combination. Restocking should be done only after all fish in the pond have been removed, either by draining or applying a fish toxicant. In warmwater ponds, bluegill fingerlings should be stocked in late fall and bass fingerlings are stocked the following June. Although various states have different stocking recommendations, typical stocking rates are 1,000 bluegill and 100 bass per surface acre if the pond is to be fertilized, or 500 bluegill and 50 bass per surface acre if the pond will not be fertilized.

### Effect on habitat

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

## Create Snags

### General description

Snags are standing dead trees. They provide cavities used by many birds and mammals.

Dwayne Elmore

**Snags (left) can be created by girdling the tree and spraying the wound with the appropriate herbicide. When trees die, additional sunlight enters the stand and stimulates groundcover.**

In forested areas, snags and down woody material are usually available.

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

### Effect on habitat

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

## Streams: Dams, Boulders or Logs

### General description

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

### Effect on habitat

- Used to create pools for fish to hide and rest.
- If designed properly, can be used to reduce some kinds of stream erosion. Used in areas with considerably more riffles than pools.

## Streams: Remove Fish Barriers

### General description

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

### Effect on habitat

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

## Tillage Management

### General description

Tilling cropland can be delayed in spring to allow wildlife to use standing stubble for nesting. Tillage may be eliminated in the fall to allow wildlife access to waste grain. When fall tillage is necessary, avoid inversion tillage (soil is turned over and covers up crop residue) such as moldboard plowing or disking. Instead, implements such as chisel plows that do not turn the soil over should be used.

**Note**: This practice should be recommended only if a grain crop is present.

### Effect of practice

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

Craig Harper

**By delaying tillage from fall into spring, waste grain from harvested crops is available through winter.**

# Water Control Structures

## General description

Various structures made of concrete, metal, or wood are used to control the water level in ponds and wetlands. They are usually placed within a dam or dike. This practice should be recommended when inadequate or no structure is present on an existing dam or dike. This practice can also be used to control the water level of beaver ponds. A Clemson Beaver Pond Leveler can be placed through the beaver dam, restricting the pond level from exceeding a desired height and helping prevent flooding into undesirable areas, such as crop fields, roads, woods, etc.

Craig Harper

**Water control structures allows manipulation of the water level in ponds and areas flooded for wildlife using a dike or levee.**

## Effect on habitat

- Allows ponds to be drained for managing water quality and control of unwanted fish.
- Allows management of water levels to increase or decrease the amount and type of aquatic vegetation in ponds and wetlands.
- Useful for creating a desirable mix (interspersion) of open water and emergent aquatic vegetation in wetlands.
- Can be used to create shallow water areas.
- Can be used to control water levels in flooded timber, drawing water down to prevent tree mortality.

# Water Developments for Wildlife

## General description

Water is a critical habitat component. Some wildlife species obtain necessary water from their diet, while others need a free-standing source of drinking water. Many species require a water source for obtaining food, reproduction, loafing or escaping predators. Developing a source of water is a critical consideration for many wildlife species when little or no water is available. There are several ways to make water available to wildlife.

**Dugouts (small ponds)** can be created with backhoes or bulldozers. These are usually designed to collect water from runoff and/or precipitation, but may be created where there is an existing spring or seep, which facilitates water collection and helps ensure a reliable water supply. Side slopes for these ponds should be gentle to provide easy access for wildlife.

**Ephemeral Pools** are natural depressions which may be seasonally flooded by rainfall. These wetlands provide important habitat for many amphibians (frogs, toads, and salamanders) which breed in these pools during wet periods. During dry periods, these ephemeral pools dry and vegetation often grows within them. When they flood again, this vegetation serves as cover for breeding amphibians and places for their eggs to be attached. Also, wa-

terfowl and other wetland birds use these pools as feeding areas, eating the seeds and aquatic insects associated with the vegetation.

**Shallow impoundments** may be established by constructing earthen dikes to retain water (usually run-off water from precipitation) in natural drainage areas. Placement of the dike is critical to avoid damage from floods and to collect sufficient water. When recommending shallow impoundments for waterfowl, bottomland areas (including grain fields and Stage 6 bottomland hardwoods) and existing wetlands should be considered for flooding. A water-control device in the dike allows the water level to be manipulated. Water can be removed from the field or woods prior to spring (similar to letting the water out of a bathtub) so the field can be planted again or so the trees will not die.

**Note**: When this practice is recommended, it is assumed an adequate water control structure will be included and should **not** be an additional recommendation.

**Guzzlers and windmills** are also used to provide water. Guzzlers are built by covering an area with an apron of fiberglass or some other material that sheds rain. Water is collected in a storage tank and slowly released into a trough from which wildlife can drink.

**Small backyard ponds** can be constructed in suburban backyards to provide water for a variety of wildlife. **Birdbaths** are also useful for providing water in urban settings.

Craig Harper

**Small ponds can be created where water is relatively scarce to provide water and habitat for several wildlife species.**

Craig Harper

**Shallow impoundments can provide excellent habitat for migrating and wintering waterfowl and other wildlife species.**

## Effect on habitat

- Can provide drinking water and wetland habitat.
- Flooded grain fields or Stage 6 bottomland hardwoods in fall/winter can provide important migrating and wintering areas with abundant food resources for waterfowl.
- Temporary flooding can improve existing wetlands for nesting and brooding for some waterfowl such as redheads and can improve existing forested areas for nesting and brooding wood ducks.
- Can provides a source of prey for many predators.

# Wildlife Damage Management Techniques

## General description

Wildlife managers often have to manage wildlife to control damage. Wildlife damage management is most common in urban and suburban areas where wildlife and humans frequently interact. Examples of wildlife damage include woodpeckers hammering on the side of the house, bats or squirrels in the attic, snakes in the house, deer eating ornamental plants in the yard or feeding in soybean crops, bobcats/coyotes/owls preying on livestock or pets, rabbits/raccoons eating vegetable gardens, beavers killing trees or flooding crops and roads, red-winged blackbirds eating crops, bird strikes at airports, rock pigeons defecating on buildings,

Craig Harper

**Windmills are often used in the western US to provide a water source attracted to many wildlife species.**

Craig Harper

**House sparrows often displace bluebirds from nest boxes constructed for bluebirds. This invasive non-native species should be removed whenever possible.**

Dwayne Elmore

**Netting can be used to protect crops, such as grapes and blueberries, from birds and other wildlife.**

starlings roosting in urban trees and defecating on sidewalks, and Canada geese loitering on lawns and golf courses.

To control these problems, wildlife managers use both lethal and nonlethal methods. Fencing and other exclusion devices, habitat modifications, harassment techniques (such as predator decoys), scare tactics (such as propane cannons, dogs) and taste and odor repellents are examples of nonlethal methods. Changing human activity can also be effective. For example, removing the dog food or bird feeder from the deck is the easiest way to keep raccoons, rodents and other wildlife off the deck. Often, nonlethal methods do not work and lethal methods are required. Lethal methods are intended to kill wildlife quickly without suffering and include body-gripping traps, trap-and-euthanize (put to death without pain or suffering), shooting and poisoning.

There are advantages and disadvantages to both lethal and nonlethal management methods. One advantage of lethal methods is they can immediately decrease the numbers of animals in a population that are causing damage or health hazards, thereby immediately reducing the damage or hazard. In some cases, only one or a few animals are causing the problem, and lethal methods can then eliminate the damage once the individual(s) causing the damage are eliminated. Nonlethal methods typically cause the animals causing the problem to move to another location. Although nonlethal methods may reduce or eliminate the problem at one location, the animal(s) causing the problem may relocate and cause the same problem at a different location. An advantage of nonlethal methods is

they are generally more accepted by the public than lethal methods and can be used in areas with high human density. Education can help the public understand the efficacy and sensibility of many lethal methods.

Regardless of the method used, there are some general guidelines that can increase the success of a wildlife damage management program. It is important to absolutely identify the species causing the damage. An integrated wildlife damage management program that employees two or more methods is strongly recommended especially when using nonlethal methods. It is imperative to know all the local, state and federal laws related to the species causing the problem and the wildlife damage management method(s).

**Note**: For the purposes of this contest, it sometimes can be confusing when deciding whether to recommend *Increase Harvest* or *Wildlife Damage Management*. If the problem is related to human structures, livestock or human health, *Wildlife Damage Management* should be recommended. If the problem is related to competition or mortality among wildlife species, *Increase Harvest* should be recommended if the species can be harvested legally. For example, if white-tailed deer are overbrowsing a forest understory and destroying habitat for various songbirds, *Increase Harvest* should be recommended. Likewise, if raccoons have been found to limit wild turkey recruitment, or coyotes have been found to limit fawn survival, *Increase Harvest* should be recommended for raccoons or coyotes. For non-native invasive animal species such as house sparrows, European starlings or rock pigeons, *Wildlife Damage Management* should be recommended to control associated damage as they are not considered game species.

**Coyotes are sometimes problematic for various reasons. Depending on the problem, either Wildlife Damage Management Techniques or Increase Harvest can be recommended. If the problem is associated with livestock, Wildlife Damage Management Techniques should be recommended. If the problem is associated with competition or mortality among other wildlife species, Increase Harvest should be recommended. Trapping is the recommended technique for controlling problematic coyotes.**

# Urban Wildlife Management Practices

## Artificial Feeders

Artificial feeders are used primarily to feed songbirds and butterflies for viewing purposes. A wide variety of feeder designs, methods and foods are available. Most bird species prefer black-oil sunflower seeds and white proso millet. Species such as hairy woodpecker prefer to eat suet (fat) rather than seeds. Some species such as mourning dove and song sparrow, prefer to eat on the ground than on an elevated feeder.

It must be noted that artificial feeders can be hazardous to birds. Because feeders draw birds close together, disease transmission becomes problematic. Salmonellosis, aspergillosis and mycoplasmal conjunctivitis are fatal diseases among songbirds and are readily transmitted at heavily used bird feeders. It is imperative to clean feeders regularly with hot soapy water and a mild bleach solution. In addition, feeders pose danger via non-native predators, specifically house cats. Although house cats may be fed, they still hunt and kill millions of birds and small mammals each year. It is irresponsible to own a cat and leave it outside because of the unnatural pressure they put on native wildlife. Feral cats should be reported to local animal control officials, removed from the area and euthanized.

### Effect of practice

- Provides supplemental food source, primarily for viewing purposes.

## Mowing

### General description

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

### Effect on Habitat

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

Craig Harper

**Backyards can be arranged in various shapes and with various plantings and nest boxes so that they are more attractive and useful for wildlife.**

## Plant Flowers

### General description

Annual and perennial forbs can be planted to attract a number of wildlife species. A variety of species will flower over a longer period. Species and varieties should be selected to provide food and cover through the year where possible. Forbs should be planted in proximity to other cover sources to make them readily available.

### Effect on habitat

- Provides a supplemental source of food and cover.

## Rooftop / Balcony Gardens

### General description

In urban areas, residential green space may be limited. Urbanites can create rooftop or balcony gardens to provide additional food, water and viewing opportunities. Although limited in space, the goal of rooftop or balcony gardens is to create habitat; thus, rooftop or balcony gardens should provide food, water, and cover. Moving water, such as a small waterfall will attract more wildlife than stationary water.

### Effect on Habitat

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

# Interpreting Wildlife Habitat from Aerial Photographs

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

It is important to realize aerial photos do not replace the need for on-site habitat evaluation. While large differences in vegetation types or successional stages (landscape composition) may be evident in aerial photos, vegetation composition and structure cannot usually be discerned. Although a photo containing almost all Stage 6 eastern deciduous forest could be considered better habitat for Eastern gray squirrels than a photo containing almost all Stages 3 and 4, that distinction could not be made for more general species, such as white-tailed deer or wild turkey. The dominant tree species and structure of the understory in the forest would greatly influence habitat quality for deer and turkeys. Likewise, the species of grass, forbs and shrubs would influence habitat quality in Stagse 3 and 4. These fine-scale habitat features must be evaluated on the ground, thus ranking aerial photos as habitat for various wildlife species is often not possible without on-site verification.

When using aerial photos, it is important to be able to identify certain features such as rivers/streams, ponds/lakes, structures (houses, barns, commercial buildings), stages of succession, agricultural land, pasture, hard edge, soft edge, residential/urban areas, roads, power lines, etc. However, the most important information obtained from an aerial photo is the general landscape composition and the interspersion and arrangement of vegetation types and successional stages.

When looking at aerial photos, imagine how the countryside would look if you were a bird flying over or if you were in an airplane. For example, buildings look like squares or rectangles, silos appear round, woods are rough and hayfields are smooth.

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

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

Following are sample aerial photos with features identified and considerations when evaluating aerial photos.

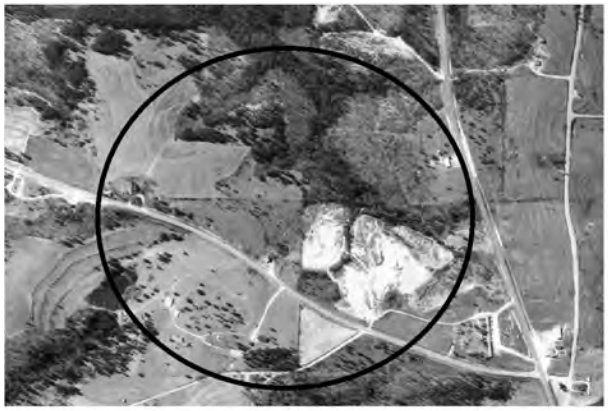


**Photo 1**

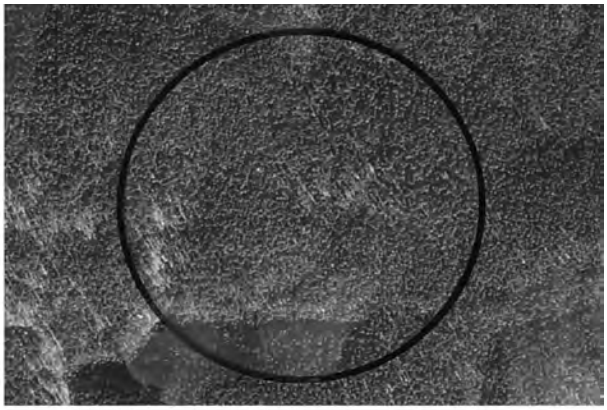


**Photo 2**

**Photo 3**

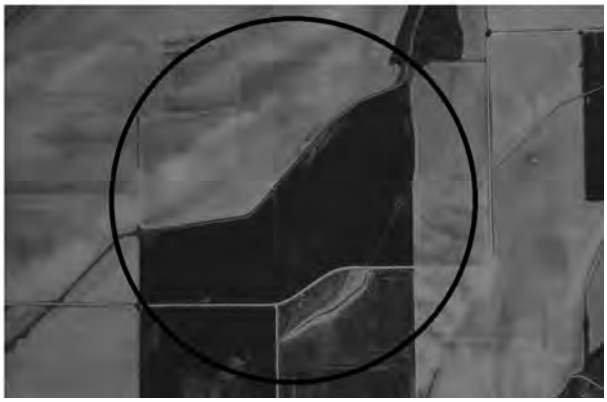


**Photo 4**

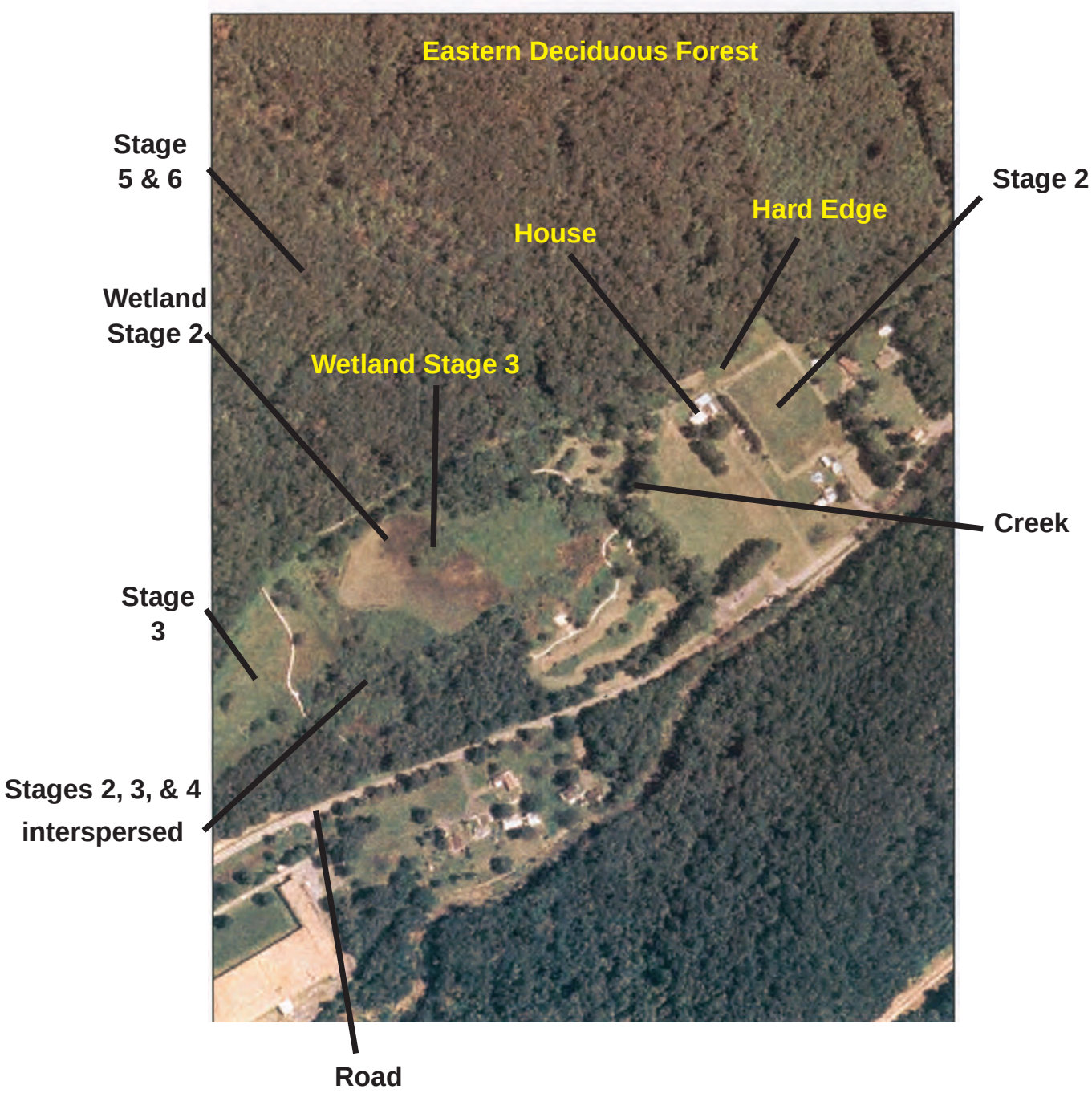
**Photo I** contains mostly Stage 3 with scattered Stage 4 and some mature deciduous trees located along a drainage. There are two main roads and a few secondary roads in the photo. There is a pond in the lower left quadrant. In the lower left center of the photo, there appears to be bare ground area,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

**Photo II** contains all mature deciduous forest. Tree species composition, as well as the structure and composition of the understory, is unknown. Nonetheless, this area would probably provide adequate habitat for wildlife that require mature deciduous forest cover.

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

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

# Sample Features on Aerial Photos



# WHEP Activities and Scoring

Activities I, II and III will be used in the National WHEP Invitational events. These activities may be used as presented, or they may be modified as deemed appropriate for local, regional or state contests.

## Individual Activities

Activities I, III, and IV will be scored on an individual basis. Awards will be presented to the top three individuals for Activities I, III, and IV. The top individuals overall will be identified by the sum of the scores of these activities. The top three individual scores for each individual activity will count toward the total overall team score. For teams of four members, the lowest score will be dropped. For teams of three members, all scores will count.

**Activity I**: On-Site Recommendation of Wildlife Management Practices (30 points)

**Activity III**: General Wildlife Knowledge (30 points)

**Activity IV**: Wildlife Identification (20 points)

In the case of ties for the top individuals (summation of Activities I, III, and IV) scores for Activity I will be used to break the tie.

## Team Activity

Activity II will be scored as a team effort and will include scores for Activity II-A and II-B. The written wildlife management plan (Activity II-A) is worth 140 points. Activity II also includes up to 60 points for Activity II-B, oral defense of the written plan. The maximum score for each individual is 20 points. Only the top three scores will be counted into the total score for Activity II. Thus, Activity II is worth a maximum of 200 points.

**Activity II-A and II-B**: Written Wildlife Management Plan and Oral Defense (200 points)

In the case of ties for the top teams (summation of Activities I, II, III, and IV) scores for Activity II will be used to break the tie. If this does not break the tie, then scores for Activity I will be used.

# Activity I: On-Site Recommendation of Wildlife Management Practices

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

Prior to starting Activity I, 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. Contestants will have one hour to complete Activity I. This is an individual activity, thus no talking is allowed.

# Scoring Activity I: Wildlife Management Practices

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

All boxes are counted in the scoring. For example, for eastern deciduous forest, there are 200 possible correct answers because there are 25 WMPs × 8 possible species on an answer sheet.

## Participants are given credit for:

- putting an "X" in the appropriate boxes; [**Note**: Keep in mind that during a contest, all "X's" marked on the WMP chart may not be used, as the correct answers depend on the information given about the site and the conditions present on site at the time of the contest.] and
- leaving boxes blank where no "X" is indicated on the WMP chart. [That is, 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 I is zero. Blank WMP worksheets for each region are provided in Appendix A for practice use.

**Activity II is a team effort and is worth 200 points.**

# Activity II-A: Written Management Plan (140 Points)

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

For the National WHEP Invitational, 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.

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 two hours to complete this activity.

### Sample Written Wildlife Management Plan Field Condition Sheet

The Three Peaks area has long been favored by outdoor enthusiasts. The area is owned by the Bureau of Land Management (BLM). Managing the area for multiple user groups is often difficult. Users at Three Peaks include hunters, recreational shooters, hikers, bird watchers, ATV riders and remote control airplane fanatics. BLM requests your assistance in developing a management plan for wildlife on the 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 population 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 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 two hours to complete this activity.
Good Luck!

### Sample Written Wildlife Management Plan Worksheet

The sample worksheet on the next page 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 20 points will be given for use of the correct format and inclusion of an accurate sketch of the site. A maximum of 60 points is added for the individual oral presentations for a total of 200 points for Activity II.

## Part 1: Plan Background (20 Points)

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

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

***State the management objectives (10 points)***

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

## Part 2: Plan Development (20 Points)

***Species Habitat requirements (10 Points)***

State the basic habitat needs for each species. For example:

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

***Habitat Assessment (10 points)***

Evaluate the area and state what is present and lacking with respect to the needs of each species. For example:

The area is primarily Stages 5 and 6. Stages 2 and 3 is lacking for Eastern bluebird.

## Part 3: Plan Implementation (70 Points)

This section should indicate the team has an understanding of the appropriate WMPs that should be implemented and the effects of those practices on the habitat and other species managed. For example:

Forest regeneration and chainsawing will open the Stage 6 forest and provide more usable space for bluebirds. Native grasses and forbs should be established to provide suitable foraging areas. 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
## Activity II

Scale for Scoring: 0 = not at all; 2 = poor or poorly; 4 = fair or slightly well; 6 = good or fairly well; 8 = excellent or very well; 10 = outstanding

Team Number _____
Room Number _____
Judge's initials _____

**Part 1: Plan Background (20 points maximum)**

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

**Part 1: Plan Background Subtotal** _____

**Part 2: Plan Development (20 points maximum)**

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

**Part 2: Plan Development Subtotal** _____

**Part 3: Plan Implementation (70 points maximum)**

| | | | | | | |
|---|---|---|---|---|---|---|
| The team included the **appropriate management practices** | 0 | 2 | 4 | 6 | 8 | 10 |
| The team fully explained **when and where** each practice should be implemented. The team demonstrated knowledge of practices effects on existing habitat and benefits to each species | 0 | 8 | 16 | 24 | 32 | 40 |
| The team used the appropriate native plant species in their plan and/or recognized invasive species | 0 | 2 | 4 | 6 | 8 | 10 |
| The team recognized the management compromises necessary to meet the needs of each species and showed understanding of the mutual benefits of implementing certain WMPs | 0 | 2 | 4 | 6 | 8 | 10 |

**Part 3: Plan Implementation Subtotal** _____

**Part 4: Plan Evaluation (10 points maximum)**

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

**Part 4: Plan Evaluation Subtotal** _____

**Part 5: Content (20 points maximum)**

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

**Part 5: Content Subtotal** _____

**Activity II-B**
**Oral Presentation (60 points maximum)** Top three scores to count in team total

Team member A — A: 0 – 20 _____

Team member B — B: 0 – 20 _____

Team member C — C: 0 – 20 _____

Team member D — D: 0 – 20 _____

**Activity II-b Subtotal** _____

Comments:

**FINAL SCORE:**

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 _____

Total Points for Activity II-B _____

Combined top 3 scores _____

**Final Score (200 points max)** _____

# Activity II-B: Oral Defense of Written Plan (60 points)

***(only the top three scores are counted)***

To be successful and score well in Activity II-B, it is important that all team members actively participate in Activity II-A. Comprehensive knowledge of the written plan is necessary to successfully orally respond to judges questions about the team's plan. After completing the written wildlife management plan, each team member will be expected to be able to demonstrate their understanding of the plan. Team members are called individually into a room of two or three judges where they are asked a series of questions to test the individual's knowledge of the teams plan. For example, team members may be asked to explain a certain part of the plan such as the background or the implementation; or they may be asked to further explain certain management practices recommended within the plan. They may be asked to explain the habitat needs of the focal species. Questions can cover anything related to the plan, the focal species and/or management practices recommended.

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

For the oral defense portion of Activity II, each team member is required to individually face a panel of judges and answer a series of questions related to their written plan (Activity II-A). The questions may cover anything related to the appropriate species and WMPs. Following are some sample questions. It is important for each team member to participate in developing the written plan, to understand the habitat needs of each species considered and be able to discuss why any WMP should or should not be implemented.

**Note:** oral reason scores are not included in determining high individual scores.

**Sample questions and requests:**

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

# Judges' Scoring Sheet for Oral Presentations

Activity II-B

Scale for Scoring:
0 = not at all
2 = poor or poorly
4 = fair or slightly well
6 = good or fairly well
8 = excellent or very well
10 = outstanding

Team Number _____
Room Number _____
Judge's initials _____

**Part 1: Subject Matter ( 30 points maximum)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Understanding of species habitat requirements | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Understanding of wildlife management practices and their implementation | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Knowledge of appropriate terms and concepts (succession, edge, interspersion, etc) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**Part 1: Subject Matter Subtotal** _____

**Part 2: Contestant (40 points maximum)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Poise (calm, confident) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Voice (volume, clarity, enunciation) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Grammar | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Body language (eye contact, hand gestures and other movements) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**Part 2: Contestant Subtotal** _____

**Part 3: Response to Questions (30 points maximum)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Accuracy of response | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Logic, reasoning and organization | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Answered honestly and concisely | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**Part 3: Response to Questions Subtotal** _____

**FINAL SCORE:**

Total Points for Part 1 _____
Total Points for Part 2 _____
Total Points for part 3 _____

Total Score (100 Points max) _____

**Final Score = Total Score × . 2** _____

# Activity III: General Wildlife Knowledge (30 Points)

The objective of Activity III is to demonstrate knowledge of the region(s) involved, wildlife management concepts, wildlife management terminology, wildlife management practices and the biology and ecology of the wildlife species found within a region(s). Questions for Activity III may be from information within ***Concepts and Terms***, ***Regions***, ***Wildlife Species***, ***Wildlife Management Practices***, and the ***Glossary***.

Definitions of wildlife foods are provided in Appendix A. For the purpose of WHEP, foods have been placed in groups. Participants should be prepared to indicate which foods are eaten by specific wildlife species, and be familiar with the food group definitions. Foods charts are contained in ***Regions***, and further information on foods can be found in ***Wildlife Species***. Additionally, questions may be asked related to aerial photo interpretation.

## Sample General Knowledge Questions

Activity III will provide 30 multiple choice question, each worth one point. The test may be presented as a PowerPoint program and/or a hard copy. Contestants will have 30 minutes to 45 minutes to complete the test.

1. In the Eastern Deciduous Forest, the final successional stage consists of:

a. deciduous trees such as oaks, hickories and beech
b. a mix of conifers and deciduous trees
c. deciduous trees such as blackgum, red maple, and sycamore
d. deciduous trees such as southern magnolia, American holly and slippery elm

2. Mid-story trees in the Eastern Deciduous Forest include:

a. blackgum, flowering dogwood, hornbeam and redbud
b. flowering dogwood, hornbeam, spicebush and redbud
c. hornbeam, flowering dogwood, redbud and sweetbay
d. shadbush, titi, American hornbeam and flowering dogwood

3. Would the area circled on the photo below be considered suitable habitat for a species that requires early (such as 1 or 2) stages of plant succession?

4. The diet of the Northern bobwhite includes all **except**?

a. forbs
b. fungi
c. hard mast
d. buds

5. Which of the following groups of foods in **not** eaten by this species?

a. forbs, fungi, grain
b. grass, hard mast, soft mast
c. seeds, snails, soft mast
d. fungi, grass, twigs

Dwayne Elmore

# Activity IV: Wildlife Identification (20 Points)

Wildlife managers must be able to identify the species they are managing. The objective of Activity IV is to test the participants' ability to identify wildlife species within the various regions presented in the WHEP manual. Activity IV will ask participants to identify wildlife species included in the stated region(s) selected as well as those included in the ***Urban*** and/or ***Wetlands*** Regions. If the region selected for the contest is ***Wetlands*** or ***Urban***, then wildlife species from the surrounding eco-region could also be included for identification. To practice for Activity IV, participants and coaches are encouraged to use field guides and websites.

Activity IV will be provided as a PowerPoint presentation, hard copy pictures and/or physical specimens (such as skulls, hides, feathers, etc.). There will be 20 pictures/specimens shown to identify by filling in the blank. Each will be worth 1 point. The photograph/specimen provided may be of an adult, juvenile, male or female. Each species will be assigned a number and participants will write the name of the species in the space provided on the answer sheet. Answers must be legible, spelled correctly, with correct capitalization and the full common name of the species as given on page 67 (and below) must be provided. If the judges cannot read the answer, the answer will be considered incorrect.

## Birds

American kestrel
American robin
black-capped chickadee
black-throated sparrow
blue-winged teal
Brewer's sparrow
broad-winged hawk
brown thrasher
California quail
California thrasher
Canada goose
common nighthawk
crissal thrasher
dickcissel
dusky grouse
Eastern bluebird
European starling
Gambel's quail
grasshopper sparrow
great horned owl
greater prairie-chicken
greater sage-grouse
hairy woodpecker
house finch
house sparrow
house wren
ladder-backed woodpecker
lark bunting
mallard
mourning dove
Northern bobwhite
Northern flicker
Northern goshawk
Northern harrier
Nuttall's woodpecker
ovenbird
prothonotary warbler
red-eyed vireo
redhead
red-tailed hawk
ring-necked pheasant
rock pigeon
ruby-throated hummingbird
ruffed grouse
sage thrasher
scaled quail
sharp-tailed grouse
song sparrow
spotted towhee
Western bluebird
Western kingbird
white-winged dove
wild turkey
wood duck
yellow-rumped warbler

## Mammals

American beaver
American marten
big brown bat
black bear
black-tailed prairie dog
bobcat
common muskrat
coyote
desert cottontail
Eastern cottontail
Eastern fox squirrel
Eastern gray squirrel
elk
mink
mountain cottontail
mule deer
Northern raccoon
pronghorn
red squirrel
snowshoe hare
white-tailed deer

## Other Species

bluegill
box turtle
bullfrog
cutthroat trout
largemouth bass
Pacific salmon
rainbow trout
rough-skinned newt
Western hognose snake

# Appendix A

## Eastern Deciduous Forest

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

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

## Great Plains Grassland: Shortgrass Prairie

| | American kestrel | black-tailed prairie dog | bluegill | coyote | largemouth bass | lark bunting | mallard | mourning dove | mule deer | Northern harrier | pronghorn | scaled quail | sharp-tailed grouse | western hognosed snake |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | |

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

| Great Plains Grassland: Tallgrass/Mixed Prairie | bluegill | blue-winged teal | coyote | dickcissel | Eastern cottontail | grasshopper sparrow | greater prairie-chicken | largemouth bass | mourning dove | Northern bobwhite | Northern harrier | ring-necked pheasant | Western hognose snake | white-tailed deer | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | | | |
| Pond: Fertilize / Lime | | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | | |

| **Great Plains Grassland: Tallgrass/Mixed Prairie** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | |
| **Decrease Harvest** | | | | | | | | |
| **Delay Crop Harvest** | | | | | | | | |
| **Establish Field Buffers** | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | |
| **Forest Management Techniques** | | | | | | | | |
| **Increase Harvest** | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | |
| **Manage disturbance** | | | | | | | | |
| **Plant / Manage Food Plots** | | | | | | | | |
| **Plant Shrubs** | | | | | | | | |
| **Plant Trees** | | | | | | | | |
| **Ponds: Construction** | | | | | | | | |
| **Ponds: Deepen Edges** | | | | | | | | |
| **Pond: Fertilize / Lime** | | | | | | | | |
| **Ponds: Reduce Turbidity** | | | | | | | | |
| **Ponds: Repair Spillway/ Levee** | | | | | | | | |
| **Ponds: Restock** | | | | | | | | |
| **Create Snags** | | | | | | | | |
| **Tillage Management** | | | | | | | | |
| **Water Control Structures** | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | |

## Hot Desert

| | American kestrel | black-tailed prairie dog | black-throated sparrow | bluegill | bobcat | coyote | crissal thrasher | desert cottontail | Gambel's quail | ladder-backed woodpecker | largemouth bass | mallard | mule deer | Northern raccoon | pronghorn | red-tailed hawk | white-winged dove |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | | | | |

| Hot Desert | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | |
| Decrease Harvest | | | | | | | | |
| Establish Field Buffers | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | |
| Increase Harvest | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | |
| Manage disturbance | | | | | | | | |
| Nesting Structures | | | | | | | | |
| Plant Shrubs | | | | | | | | |
| Plant Trees | | | | | | | | |
| Ponds: Construction | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | |
| Ponds: Restock | | | | | | | | |
| Create Snags | | | | | | | | |
| Tillage Management | | | | | | | | |
| Water Control Structures | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | |
| Wildlife Damage Management | | | | | | | | |

## Intermountain Foothills

| | American kestrel | coyote | dusky grouse | elk | mallard | mountain cottontail | mourning dove | mule deer | Northern flicker | rainbow trout | red-tailed hawk | spotted towhee | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | | | |
| Streams: Remove Fish Barriers | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | |

| Intermountain Foothills | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | |
| **Decrease Harvest** | | | | | | | | |
| **Delay Crop Harvest** | | | | | | | | |
| **Establish Field Buffers** | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | |
| **Forest Management Techniques** | | | | | | | | |
| **Increase Harvest** | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | |
| **Manage disturbance** | | | | | | | | |
| **Nesting Structures** | | | | | | | | |
| **Plant / Manage Food Plots** | | | | | | | | |
| **Plant Trees** | | | | | | | | |
| **Plant Shrubs** | | | | | | | | |
| **Ponds: Construction** | | | | | | | | |
| **Ponds: Deepen Edges** | | | | | | | | |
| **Ponds: Fertilize / Lime** | | | | | | | | |
| **Ponds: Reduce Turbidity** | | | | | | | | |
| **Ponds: Repair Spillway/Levee** | | | | | | | | |
| **Ponds: Restock** | | | | | | | | |
| **Create Snags** | | | | | | | | |
| **Streams: Dams, Boulders, or Logs** | | | | | | | | |
| **Streams: Remove Fish Barriers** | | | | | | | | |
| **Tillage Management** | | | | | | | | |
| **Water Control Structures** | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | |

## Intermountain Montane

| | American beaver | bobcat | cutthroat trout | dusky grouse | elk | hairy woodpecker | mallard | mule deer | Northern goshawk | rainbow trout | red-tailed hawk | ruffed grouse | spotted towhee | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | | | | |
| Streams: Remove Fish Barriers | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | |

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

## Intermountain Sagebrush

| | American kestrel | Brewer's sparrow | coyote | desert cottontail | greater sage-grouse | mallard | mourning dove | mule deer | Northern flicker | pronghorn | rainbow trout | red-tailed hawk | sage thrasher |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | | | | | | |
| **Decrease Harvest** | | | | | | | | | | | | | |
| **Delay Crop Harvest** | | | | | | | | | | | | | |
| **Establish Field Buffers** | | | | | | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | | | | | | |
| **Increase Harvest** | | | | | | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | | | | | | |
| **Manage disturbance** | | | | | | | | | | | | | |
| **Nesting Structures** | | | | | | | | | | | | | |
| **Plant Shrubs** | | | | | | | | | | | | | |
| **Plant Trees** | | | | | | | | | | | | | |
| **Pond Construction** | | | | | | | | | | | | | |
| **Ponds: Deepen Edges** | | | | | | | | | | | | | |
| **Ponds: Fertilize / Lime** | | | | | | | | | | | | | |
| **Ponds: Reduce Turbidity** | | | | | | | | | | | | | |
| **Ponds: Repair Spillway/ Levee** | | | | | | | | | | | | | |
| **Ponds: Restock** | | | | | | | | | | | | | |
| **Create Snags** | | | | | | | | | | | | | |
| **Streams: Dams, Boulders, or Logs** | | | | | | | | | | | | | |
| **Streams: Remove Fish Barriers** | | | | | | | | | | | | | |
| **Tillage Management** | | | | | | | | | | | | | |
| **Water Control Structures** | | | | | | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | | | | | | |

| Intermountain Sagebrush | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | |
| Decrease Harvest | | | | | | | | |
| Delay Crop Harvest | | | | | | | | |
| Establish Field Buffers | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | |
| Increase Harvest | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | |
| Manage disturbance | | | | | | | | |
| Nesting Structures | | | | | | | | |
| Plant Shrubs | | | | | | | | |
| Plant Trees | | | | | | | | |
| Pond Construction | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | |
| Ponds: Restock | | | | | | | | |
| Create Snags | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | |
| Streams: Remove Fish Barriers | | | | | | | | |
| Tillage Management | | | | | | | | |
| Water Control Structures | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | |
| Wildlife Damage Management | | | | | | | | |

## Mediterranean

| | American kestrel | bluegill | California quail | California thrasher | desert cottontail | largemouth bass | mallard | mourning dove | mule deer | Nuttall's woodpecker | Northern raccoon | spotted towhee | Western kingbird |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | |

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

## Northeast Mixed Forest

| | American kestrel | bluegill | bobcat | brown thrasher | Eastern bluebird | Eastern cottontail | Eastern fox squirrel | hairy woodpecker | largemouth bass | mourning dove | Northern raccoon | ovenbird | ruffed grouse | snowshoe hare | white-tailed deer | wild turkey | wood duck |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/ Levee | | | | | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | | | | |

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

## Pacific Coastal Forest

| | American beaver | bobcat | box turtle | coyote | great horned owl | hairy woodpecker | mallard | Pacific salmon | red squirrel | red-tailed hawk | rough-skinned newt | ruffed grouse | spotted towhee | wood duck | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | | | | | | | | |
| Retain / Create Snags | | | | | | | | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | | | | | |
| Streams: Remove Fish Barriers | | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | | |

| Pacific Coastal Forest | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | |
| **Decrease Harvest** | | | | | | | | |
| **Delay Crop Harvest** | | | | | | | | |
| **Establish Field Buffers** | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | |
| **Forest Management Techniques** | | | | | | | | |
| **Increase Harvest** | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | |
| **Manage disturbance** | | | | | | | | |
| **Nesting Structures** | | | | | | | | |
| **Plant / Manage Food Plots** | | | | | | | | |
| **Plant Shrubs** | | | | | | | | |
| **Plant Trees** | | | | | | | | |
| **Ponds: Construction** | | | | | | | | |
| **Ponds: Reduce Turbidity** | | | | | | | | |
| **Ponds: Repair Spillway/Levee** | | | | | | | | |
| **Create Snags** | | | | | | | | |
| **Streams: Dams, Boulders, or Logs** | | | | | | | | |
| **Streams: Remove Fish Barriers** | | | | | | | | |
| **Tillage Management** | | | | | | | | |
| **Water Control Structures** | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | |

## Prairie Brushland

| | American kestrel | bluegill | brown thrasher | coyote | Eastern bluebird | Eastern cottontail | ladder-backed woodpecker | largemouth bass | mallard | Northern bobwhite | Northern raccoon | spotted towhee | Western kingbird | white-tailed deer | white-winged dove | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | | | | | | |
| Delay Crop Harvest | | | | | | | | | | | | | | | | |
| Establish Field Buffers | | | | | | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | | | | | | |
| Leave Grain Unharvested | | | | | | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | | | | | | |
| Plant / Manage Food Plots | | | | | | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | | | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | | | | | | |
| Tillage Management | | | | | | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | | | | | | |

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

## Southeast Mixed and Outer Coastal Plain Forest

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

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

## Subalpine

| | American marten | black-capped chickadee | cutthroat trout | elk | hairy woodpecker | mule deer | Northern goshawk | rainbow trout | red squirrel | snowshoe hare | yellow-rumped warbler |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | | | | |
| Decrease Harvest | | | | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | | | | |
| Forest Management Techniques | | | | | | | | | | | |
| Increase Harvest | | | | | | | | | | | |
| Manage disturbance | | | | | | | | | | | |
| Nesting Structures | | | | | | | | | | | |
| Plant Shrubs | | | | | | | | | | | |
| Plant Trees | | | | | | | | | | | |
| Ponds: Construction | | | | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | | | | |
| Ponds: Restock | | | | | | | | | | | |
| Create Snags | | | | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | | | | |
| Streams: Remove Fish Barriers | | | | | | | | | | | |
| Water Control Structures | | | | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | | | | |
| Wildlife Damage Management | | | | | | | | | | | |

| Subalpine | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Control Non-Native Invasive Vegetation | | | | | | | | |
| Decrease Harvest | | | | | | | | |
| Establish Native Grasses and Forbs | | | | | | | | |
| Fish or Wildlife Survey | | | | | | | | |
| Forest Management Techniques | | | | | | | | |
| Increase Harvest | | | | | | | | |
| Manage disturbance | | | | | | | | |
| Nesting Structures | | | | | | | | |
| Plant Shrubs | | | | | | | | |
| Plant Trees | | | | | | | | |
| Ponds: Construction | | | | | | | | |
| Ponds: Deepen Edges | | | | | | | | |
| Ponds: Fertilize / Lime | | | | | | | | |
| Ponds: Reduce Turbidity | | | | | | | | |
| Ponds: Repair Spillway/Levee | | | | | | | | |
| Ponds: Restock | | | | | | | | |
| Create Snags | | | | | | | | |
| Streams: Dams, Boulders, or Logs | | | | | | | | |
| Streams: Remove Fish Barriers | | | | | | | | |
| Water Control Structures | | | | | | | | |
| Water Developments for Wildlife | | | | | | | | |
| Wildlife Damage Management | | | | | | | | |

## Urban

| | American robin | big brown bat | common nighthawk | desert cottontail | Eastern bluebird | Eastern cottontail | Eastern gray squirrel | European starling | house finch | house sparrow | house wren | ruby-throated hummingbird | mountain cottontail | Northern flicker | Northern raccoon | rock pigeon | song sparrow | Western bluebird |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | | | | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | | | | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | | | | | | | | | | | |
| **Nesting Structures** | | | | | | | | | | | | | | | | | | |
| **Plant Shrubs** | | | | | | | | | | | | | | | | | | |
| **Plant Trees** | | | | | | | | | | | | | | | | | | |
| **Streams: Dams, Boulders, or Logs** | | | | | | | | | | | | | | | | | | |
| **Water Control Structures** | | | | | | | | | | | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | | | | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | | | | | | | | | | | |
| **Artificial Feeders** | | | | | | | | | | | | | | | | | | |
| **Mowing** | | | | | | | | | | | | | | | | | | |
| **Plant Flowers** | | | | | | | | | | | | | | | | | | |
| **Rooftop / Balcony Gardens** | | | | | | | | | | | | | | | | | | |

## Urban

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | | | | | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | | | | | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | | | | | | | | | | | | |
| **Nesting Structures** | | | | | | | | | | | | | | | | | | | |
| **Plant Shrubs** | | | | | | | | | | | | | | | | | | | |
| **Plant Trees** | | | | | | | | | | | | | | | | | | | |
| **Streams: Dams, Boulders, or Logs** | | | | | | | | | | | | | | | | | | | |
| **Water Control Structures** | | | | | | | | | | | | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | | | | | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | | | | | | | | | | | | |
| **Artificial Feeders** | | | | | | | | | | | | | | | | | | | |
| **Mowing** | | | | | | | | | | | | | | | | | | | |
| **Plant Flowers** | | | | | | | | | | | | | | | | | | | |
| **Rooftop / Balcony Gardens** | | | | | | | | | | | | | | | | | | | |

## Wetlands

| | American beaver | bluegill | bullfrog | Canada goose | common muskrat | largemouth bass | mallard | mink | Northern raccoon | redhead | wood duck |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | | | | |
| **Decrease Harvest** | | | | | | | | | | | |
| **Delay Crop Harvest** | | | | | | | | | | | |
| **Establish Native Grasses and Forbs** | | | | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | | | | |
| **Forest Management Techniques** | | | | | | | | | | | |
| **Increase Harvest** | | | | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | | | | |
| **Manage disturbance** | | | | | | | | | | | |
| **Nesting Structures** | | | | | | | | | | | |
| **Plant Shrubs** | | | | | | | | | | | |
| **Plant Trees** | | | | | | | | | | | |
| **Ponds: Construction** | | | | | | | | | | | |
| **Ponds: Deepen Edges** | | | | | | | | | | | |
| **Ponds: Fertilize / Lime** | | | | | | | | | | | |
| **Ponds: Reduce Turbidity** | | | | | | | | | | | |
| **Ponds: Repair Spillway/ Levee** | | | | | | | | | | | |
| **Ponds: Restock** | | | | | | | | | | | |
| **Create Snags** | | | | | | | | | | | |
| **Water Control Structures** | | | | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | | | | |

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

## Woodlands

| | American kestrel | black-capped chickadee | bluegill | coyote | desert cottontail | largemouth bass | mallard | mourning dove | mule deer | Northern bobwhite | Northern flicker | Northern raccoon | red-tailed hawk | spotted towhee | Western bluebird | white-tailed deer | wild turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | | | | | | | | | | |
| **Decrease Harvest** | | | | | | | | | | | | | | | | | |
| **Establish Field Buffers** | | | | | | | | | | | | | | | | | |
| **Establish Native Grasses and Shrubs** | | | | | | | | | | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | | | | | | | | | | |
| **Forest Management Techniques** | | | | | | | | | | | | | | | | | |
| **Increase Harvest** | | | | | | | | | | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | | | | | | | | | | |
| **Manage disturbance** | | | | | | | | | | | | | | | | | |
| **Nesting Structures** | | | | | | | | | | | | | | | | | |
| **Plant / Manage Food Plots** | | | | | | | | | | | | | | | | | |
| **Plant Shrubs** | | | | | | | | | | | | | | | | | |
| **Plant Trees** | | | | | | | | | | | | | | | | | |
| **Pond Construction** | | | | | | | | | | | | | | | | | |
| **Ponds: Deepen Edges** | | | | | | | | | | | | | | | | | |
| **Ponds: Fertilize / Lime** | | | | | | | | | | | | | | | | | |
| **Ponds: Reduce Turbidity** | | | | | | | | | | | | | | | | | |
| **Ponds: Repair Spillway/ Levee** | | | | | | | | | | | | | | | | | |
| **Ponds: Restock** | | | | | | | | | | | | | | | | | |
| **Create Snags** | | | | | | | | | | | | | | | | | |
| **Tillage Management** | | | | | | | | | | | | | | | | | |
| **Water Control Structures** | | | | | | | | | | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | | | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | | | | | | | | | | |

## Woodlands

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Control Non-Native Invasive Vegetation** | | | | | | | | |
| **Decrease Harvest** | | | | | | | | |
| **Establish Field Buffers** | | | | | | | | |
| **Establish Native Grasses and Shrubs** | | | | | | | | |
| **Fish or Wildlife Survey** | | | | | | | | |
| **Forest Management Techniques** | | | | | | | | |
| **Increase Harvest** | | | | | | | | |
| **Leave Grain Unharvested** | | | | | | | | |
| **Manage disturbance** | | | | | | | | |
| **Nesting Structures** | | | | | | | | |
| **Plant / Manage Food Plots** | | | | | | | | |
| **Plant Shrubs** | | | | | | | | |
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| **Tillage Management** | | | | | | | | |
| **Water Control Structures** | | | | | | | | |
| **Water Developments for Wildlife** | | | | | | | | |
| **Wildlife Damage Management** | | | | | | | | |

# Appendix B. Definitions of Food Groups

**Aquatic Plants:** a plant that grows partly or wholly in water, whether rooted in the mud, or floating without anchorage; plants that require constantly moist conditions without standing water are included in this group; for the purpose of this contest, only examples from the following genera will be considered. algae of various genera; American lotus, ***Nelumbo***; arrowhead/duck potato, ***Saggitaria***; big duckweed, ***Spirodela***; bladderworts, ***Utricularia***; bulrushes, ***Scirpus***; burreeds, ***Sparganium***; cattails, ***Typha***; coontail ***Ceratophylum***; cordgrass, ***Spartina***; duckweed, ***Lemna***; floating hearts, ***Nymphoides***; naiads, ***Najas***; pondweed, ***Potomageton***; rushes, ***Juncus***; sedges, ***Carex***; smartweed, ***Polygonum***; spikerush, ***Eleocharis***; waterlily, ***Nymphaea***; watermeals, ***Wolffia***; watermilfoil, ***Myriophyllum***; waterprimrose, ***Ludwigia*** and waterweed, ***Elodea***

**Bark:** tough outer covering of trees and shrubs

**Birds:** may be represented by feathers, bones, skulls, feet or any part that distinguishes the class

**Buds:** a small protuberance on a stem or branch, sometimes enclosed in protective scales and containing an undeveloped shoot, leaf or flower; the bud may be represented on the branch or stem, or removed from the branch or stem

**Carrion:** stinking, rotting flesh; to be considered in this group, the item must have a definite odor of decomposition, be presented in a plastic bag or have the words "this stinks" on the display; a dry bone, a dry skin, or other body part does not represent carrion, but will represent other food groups; maggots are a natural occurrence with decomposition and may be present on the carrion, but they should not be considered in grouping the specimen as carrion

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

**Crayfish:** small freshwater decapod crustacean that resembles a lobster; regionally, they have many names including crawdads and crawdaddys

**Earthworms:** terrestrial worm that burrows into and helps aerate soil; often surfaces when the ground is cool or wet; used as bait by those who fish

**Eggs:** only the eggs of vertebrate species (mammals, birds, reptiles, amphibians, fish) are considered in this category; invertebrate eggs (insect and spider) represent the group of the adult invertebrate

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

**Fish:** a poikilothermic (cold-blooded) water-dwelling vertebrate with gills

**Forbs:** broad-leaved herbaceous plant, not including grasses, sedges, rushes or ferns; forbs may be represented by a single leaf or by the entire plant including the flower

**Salamanders:** may be represented by the organism in any life stage except the egg

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

**Fungi:** kingdom of plantlike spore-forming organisms that grow in irregular masses without roots, stems, leaves and that lack chlorophyll

**Grains:** will include only wheat, oats, rye, barley, rice and corn; may be represented by the seed, seed head or entire plant including the seedhead

**Grass:** leaves of grasses are usually tall and thin with a mid-rib and parallel veins; grasses may be represented by the entire plant including the seedhead, or by a single leaf or group of leaves

**Hard mast:** includes nuts from walnut, hickory, oak, beech, pecan, almond, and common hazel; may be shown with or without the husk

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

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

**Lichens:** a fungus that grows symbiotically with algae, resulting in a composite organism

that characteristically forms a crust-like or branching growth on rocks or tree trunks; lichens may be shown with a rock or branch or without

**Lizards:** lizards are reptiles of the order Squamata, which they share with the snakes (Ophidians); they are usually four-legged, with external ear openings and movable eyelids

**Mammals:** any mammal regardless of size fits in this category; may be represented by a photograph, live animal, museum mount or any part of the mammal representative of the class, such as teeth or hair

**Mussels:** freshwater mollusks that may be represented by the whole organism or just a single shell or group of shells

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

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

**Seeds:** a fertilized ovule containing an embryo, which forms a new plant upon germination

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

**Snakes:** cold-blooded legless reptiles, which share the order Squamata with lizards

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

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

**Turtle and Tortoise:** animals with a special bony shell developed from their ribs; “turtle” is often used for aquatic species, but aquatic freshwater turtles are also often called “terrapins;” in North America, “turtle” is usually used to refer to all members of the order, including tortoises, which are predominantly land based

# Glossary

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

**annual:** when referring to plants, those that complete their life cycle from seed to mature seed-bearing plant in one growing season

**arid:** dry, receives little precipitation

**basal area:** space or area represented by tree stems at 4.5 feet above ground; for example, a basal area of 60 square feet per acre means that of 43,560 square feet of available space (1 acre), tree trunks represent 60 square feet of that space 4.5 feet above ground

**broadleaf:** a plant with wide blade leaves such as an oak or cottonwood. Seeds are born from flowering parts in contrast to conifers which bear seeds in cones

**browse:** *n*. leaves and ends of twigs of woody species; *v*. to eat browse

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

**cacti:** plants adapted to dry conditions; often store water in leaves and other parts of the plant; usually have small leaves and thorns.

**canopy cover:** the amount of ground covered by the branches, leaves and stems of plants; can specify as herbaceous, shrub, tree or all canopy cover; expressed as a percentage

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

**conifer:** usually refers to needleleaf trees that bear seeds in cones; examples include spruces, pines and firs

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

**decadent:** declining in health and/or productivity

**deciduous:** plants that shed their leaves annually

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

**defecating**: elimination of solid body waste by animals

**detrimental:** having harmful effects

**dominant:** the plant or animal species that is the most common in an area

**drought:** lack of normal precipitation for an extended period of time; long period with little or no rain

**endangered species:** a species in danger of becoming extinct

**environment:** the surroundings that affect the growth and development of an organism including other plants and animals, climate and location

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

**evergreen:** plants that do not lose all their leaves at one time, including some conifers, but also many broadleaf trees and shrubs such as live oak and American holly

**excavate:** to make a cavity or hole

**exclusion:** keeping something out of an area

**fertile:** usually referring to soil high in available nutrients

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

**fluctuate:** to vary, or rise and fall irregularly

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

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

**forb:** broad-leaved herbaceous plant

**glean:** to gather food in a systematic manner

**ground litter:** dead and decaying organic matter found on the ground such as leaves, branches and dead plants

**hardwoods:** usually refers to non-coniferous trees bearing leaves

**herbaceous plants:** grasses, forbs, sedges, rushes and ferns; plants having soft rather than woody stems

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

**insecticide:** chemicals used to control insects

**invertebrates:** animals lacking a backbone; examples include insects, spiders, mollusks and crustaceans

**irrigate:** to water through diversion ditches and pipes

**keystone species**: plant or animal species with a disproportionate influence in its community relative to its abundance

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

**native:** plant and animal species originating historically or migrating naturally to a particular region

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

**omnivore**: an animals that eats both plant and animal material

**perennial:** plant species that grow from a root system that remains alive more than two years

**phytoplankton:** microscopic floating and suspended aquatic plants

**plateau:** an elevated, relatively level expanse of land; sometimes called tableland

**point count:** a census method commonly used to monitor relative abundance of songbirds

**population:** a group of individuals of the same species living in a given area that interact with each other

**regenerate:** to replace lost or damaged parts with new tissue

**rejuvenate:** to stimulate and return to good health and vigor

**riparian:** the area adjacent to and influenced by a water source such as a creek, stream, river, pond, lake, swamp or other wetland

**savannah**: an area with scattered trees maintained by fire and/or grazing

**scarifies**: breaking down the protective coating on various species of seed allowing the seed to germinate; often facilitated by fire or digestion

**secluded:** occurring in a remote or other area where visibility is obstructed or reduced

**sedge:** grass-like plant, often associated with moist areas and usually with triangular stems

**seedbank:** seed occurring naturally in the top few inches of soil

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

**silviculture**: the process of tending and managing a forest

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

**softwood:** usually refers to coniferous trees, though some deciduous trees such as red maple and aspen also have relatively soft wood

**species:** a type of organism whose members can freely interbreed with each other and genetically are very similar; do not necessarily interact or located together

**stagnant:** sluggish; not producing to potential

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

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

**succulent:** having thick fleshy leaves that conserve moisture

**terrain:** referring to topography

**thatch:** accumulation of dead grass and leaves on the ground

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

**woody**: referring to trees and shrubs

**zooplankton**: microscopic animals that float/swim in water