

# 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
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- Pond Dynamics and Balance and Stream Habitat
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## 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 specie 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 white-tailed deer. Whitetails thrive in areas with considerable interspersed cover. Thus, habitat for white-tailed deer usually includes several vegetation (or cover) types. These vegetation types might include mature oak-hickory forest, old fields undergoing succession, regenerating pine forest, brushy thickets and agricultural fields. Although some people may use the term “habitat type” interchangeably with “vegetation type,” this is confusing and should be avoided.

Habitat requirements for wildlife often change through the year. Food and cover resources needed during one season may be much different 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 weeks to 3 weeks of age, they roost above ground, and—as mast becomes available in the fall—wild turkeys are frequently found in mature hardwood forests when available.



Photo courtesy Craig Harper

## Focal Species

There are two basic goals in wildlife habitat management. One is to provide the habitat requirements for a particular, or focal, wildlife species. The other, which is explained later in this manual under Species Richness and Diversity, is to provide habitat requirements for multiple wildlife species in the same area.

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

It is usually best to select wildlife management practices that provide the habitat requirements most lacking and, thus, are limiting the population (limiting factors). For instance, if a species requires trees for cover with water nearby, and the area you are evaluating has plenty of trees but no water, a management practice that will supply water will improve the area more effectively than planting trees. When determining which wildlife management practices to apply, remember that wildlife management practices that improve habitat for some wildlife species may be detrimental to other wildlife species. It is

impossible to manage an area for any one species or group of species that require similar habitat without influencing other species in some manner. For example, if you plan a 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.

## 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



Photo courtesy Craig Harper

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example, in the Eastern Deciduous Forest, grasses and forbs germinate from the seedbank after a field is disked. Within 20 years, without continued disturbance, trees will be growing on the site and a young forest will be established. In other areas where precipitation is considerably less, succession still occurs but more slowly. Also, the structural change in vegetation through succession is much less than where grasses and forbs give way to shrubs and tall trees. For example, in the Great Plains Short-grass 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

non-native sod-forming grasses have unnaturally altered or interrupted succession in nearly every region of the country. Because of their dense nature at ground level, the seedbank is suppressed and response (thus succession) is limited.

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

Descriptions of a typical successional stage found in different regions of the 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:

Photo courtesy Craig Harper



**Stage 1 – Bare ground.**

Photo courtesy Craig Harper



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

Photo courtesy Craig Harper



**Stage 5 – Young forest.**

Photo courtesy Chris Wolkowski



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

Photo courtesy Craig Harper



**Stage 6 – Mature forest.**

Photo courtesy Craig Harper



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

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



Photo courtesy Craig Harper

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.



Photo courtesy Craig Harper



Photo courtesy Craig Harper

## 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 suc-

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Photo courtesy John Weir



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

## Edge

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

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

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

- the types or stages present provide some

Photo courtesy Craig Harper



- 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 successional cover for quail and turkeys, there would be as many birds in the middle of the opening as along the edge. As a result, there would be more usable space for the birds and the carrying capacity of the property would be increased (see biological carrying capacity). The edge is not what is necessarily important, but rather the composition and structure of the vegetation.



## Area Sensitive Species

Fragmentation is the disruption of vegetation types either 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, Movements and Migration

A home range is the area in which an animal lives. For every species, home range size is related to habitat quality. Daily movements include those for normal day-to-day activities. In higher-quality habitat, home ranges tend to be smaller

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

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

## Carrying Capacity

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

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

More animals are produced each year than will survive. Surplus animals are lost to predation, starvation, competition or disease. Young



Photo courtesy Dean Northcutt

wildlife and animals in poor health experience the highest mortality rates. Hunting and fishing remove some animals and help prevent overpopulation for some species.

In suburban areas, the biological carrying capacity may be able to support a given number of animals. However, humans may demand the density of certain wildlife be lower because of wildlife damage issues. For example, white-tailed deer populations can thrive in suburban areas where the biological carrying capacity is relatively high because deer have adapted to feed successfully on ornamental plants. However, homeowners have low tolerance for deer feeding on expensive landscape plants. Thus, the deer population must be reduced to limit damage. In this case, the cultural carrying capacity is lower than the biological carrying capacity.

## Pond Dynamics, Pond Balance 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.

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



Photo courtesy Dwayne Elmore

the stream, other species, such as salmon, must migrate to the ocean and return to the stream to spawn.

## Food Webs

A food web is a network of interconnected food chains, which are the 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

Photo courtesy Alan Windham



particles. A decaying plant, for example, will be broken down into nutrients that enrich the soil. This process supports the growth of more plants.