Wildlife Management Concepts

Before you can evaluate wildlife habitat and make management recommendations, you need to understand some basic concepts about habitats and their relationships with different wildlife species. This section describes some of these basic concepts. Since most of the contest will be based on these concepts, it is important that you study and understand them.

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

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

Concepts

- Habitat requirements
- Featured species
- Species richness
- Plant succession and its effect on wildlife
- Vertical structure
- Juxtaposition and interspersion
- Edges and contrast
- Area-sensitive species
- Migration and home range
- Carrying capacity
- Pond dynamics and balance
- Wildlife damage management
- Food webs

Concept 1

Habitat Requirements

Wildlife have life requirements that must be supplied by the available habitats to ensure their well being. These are known as habitat requirements. The four basic habitat requirements are food, cover, water and usable space. Each species has its own set of specific requirements. For example, the gray squirrel uses acorns for food, while the woodpecker eats insects. Mallards use grass and forb cover for nesting, while thrashers nest in shrubs. Habitat requirements for wildlife change during the seasons of the year. The food they eat in the winter may be much different than what they eat in the summer. The cover they need for nesting may be very different than the cover they need during a winter storm.

Concept 2

Featured Species

There are two basic goals in wildlife habitat management. One is to provide the best habitat possible for featured wildlife species. The other, which is explained on the next page under the concept ***Species Richness***, is to provide habitat for as many different wildlife species as possible in one area.

When evaluating habitat for featured species, you must first decide which species to favor. This can be done in several ways. Landowners may have specific objectives for certain species, or the general public may have concerns about a particular kind of game or endangered species. Once the species have been selected, identify the habitat requirements for each species and evaluate the capability of the area to provide those requirements. If the area can't supply or only partially provides the necessary habitat, management practices may be used to improve the habitat for the selected species.

It is usually best to select management practices that will provide the habitat requirements that are most lacking, thus limiting the population. For instance, if a species requires trees for cover with water nearby and the habitat you are evaluating has plenty of trees but no water, a management practice that supplies water will improve the habitat more effectively than will planting trees. When determining which management practices to apply, remember that management practices to improve habitat for some wildlife species may be detrimental to other wildlife species. It is impossible to manage habitat for any one species without influencing other species in some manner.

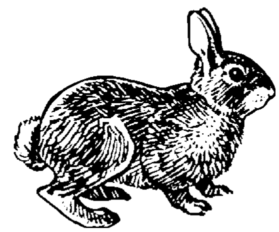
Concept 3

Species Richness

Species richness is the number of different kinds of wildlife species found in an area. One goal in habitat management may be to provide habitat for as many species and as many individuals within a species as possible, as contrasted to managing for a featured species (see Concept 2).

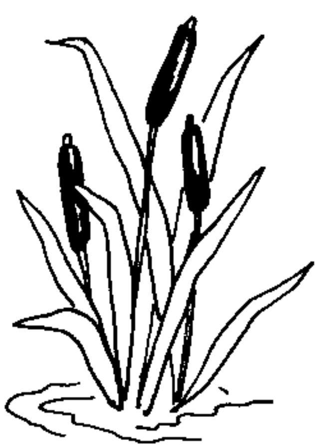
Lands that are high in species richness usually have many of the following characteristics:

1. **A mixture of areas in different successional stages**
2. **A balance of edges with unbroken blocks of vegetation in one successional stage**
3. **Unbroken (unfragmented) areas of at least 10 to 40 acres**
4. **Edges with low contrast (soft edge)**
5. **A wide variety of vegetation layers present within each area (vertical structure)**



These characteristics can be used to estimate the relative number of different wildlife species that may be present in separate areas. They also can be used to identify management practices that could increase species richness.

It is important to realize that when you manage for species richness, sometimes you cannot also provide the best habitat for featured species. Instead of providing the best habitat possible for a few species, the goal is to provide some habitat for as many species as possible.



Concept 4

Plant Succession and Its Effect on Wildlife

Manipulating vegetation and water is the basis of habitat management. Every acre of soil and water has a definite sequence of plant species that occurs over time. The different stages of this sequence are called successional stages. We can generally predict the type of vegetation that will occur in each stage until a final or "climax" stage is reached. When not disturbed, the climax vegetation will remain the same for long periods of time. If people or nature disturb the vegetation, soil or water level, succession may be set back, and the cycle will continue forward once again. **Note: Different wildlife species are often associated with different stages of plant succession. Not all species require the climax stage.**

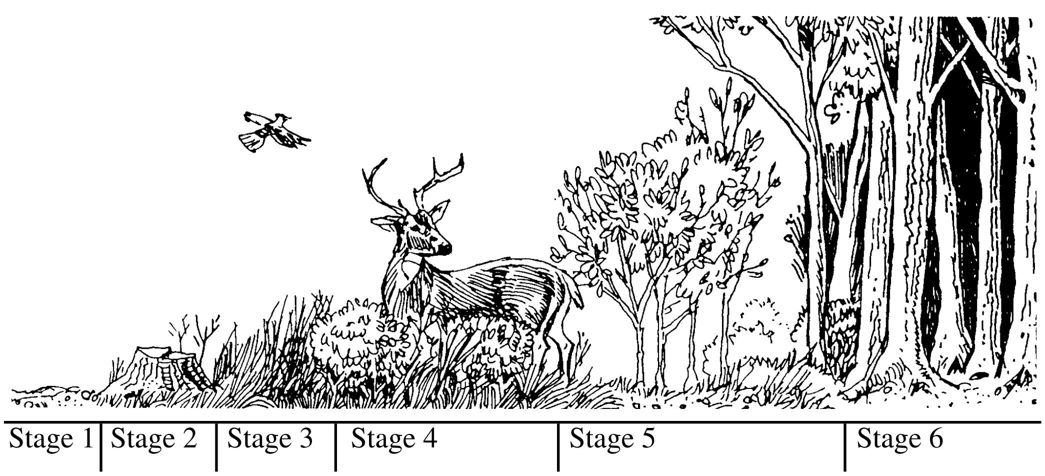
In this handbook, areas in different stages of plant succession are often referred to as areas with different vegetation types or habitat types. In general, the stages of plant succession that occur on land (Figure 1) are as follows:

1. **Bare ground**
2. **Annual forbs and grasses**
3. **Perennial forbs and grasses**
4. **Shrubs**
5. **Young forest or woodland (less than 40 years old)**
6. **Mature forest or woodland**

A single step in vegetation succession may take weeks, months, years or even centuries, depending on a variety of natural and human-caused factors. If vegetation is disturbed, succession will revert to an earlier stage and begin anew. Disturbance can be caused by natural factors such as fire, wind or ice storms, and insect or disease outbreaks.

Be aware that many wildlife species **require** periodic disturbance to meet their habitat needs. Therefore, wildlife managers frequently alter natural succession through disking, prescribed burning and timber harvest — all of which mimic many natural disturbances.

Figure 1



Concept 5

Vertical Structure (Vertical Edge)

Vegetation can be classified by how it grows. Grasses and forbs generally grow close to the ground. This herbaceous vegetation, along with small shrubs and tree seedlings, compose the understory of a forest. A middle layer, or midstory, contains the taller shrubs and young trees. The tallest stratum in a mature forest consists of trees and is called the overstory. (Figure 2)

How different layers of vegetation are arranged in relation to each other is important to many wildlife species. For example, some species may require an herbaceous layer for food but also need a tree canopy for cover. Not all areas in the same stage of succession are alike. A forest in stage 6 of succession may have a variety of layers made up of grasses, forbs, shrubs and trees, while another stage 6 forest may have only one distinct layer of tall trees. The trees may be widely spaced or close together, with or without a shrub layer. This directly affects the habitats of many species and determines whether or not a wildlife species is found in a particular area.

Figure 2

Concept 6

Juxtaposition and Interspersion

Juxtaposition (specific arrangement or placement of habitats) and interspersion (mixing of different habitats) are defined by how different successional stages or vegetation types are situated in relation to each other (e.g., size, shape, distribution of habitats). Most wildlife species need more than one successional stage to provide all their habitat requirements, while only a few species can find all their habitat requirements in only one successional stage. To be of value to wildlife (especially species with small home ranges), the required successional stages must be close to each other or linked by corridors (see WMP 6) to allow for safe travel. This concept is so important that Aldo Leopold wrote in his classic text ***Game Management*** (1933), "The maximum population of any piece of land depends not only on its environmental types or composition, but also on the interspersion of these types in relation to the cruising radius of the species. Composition and interspersion are thus the two principal determinants of potential abundance on game range." A mixture of habitats in a patchwork mosaic represents good interspersion, and increased interspersion results in increased *edge* (see Concept 7). Placing necessary habitats adjacent to each other (juxtaposed) is the optimum arrangement. A way to measure interspersion is explained in *Activity II* on page 90. Perhaps the most important consideration in habitat management is providing suitable habitat on every acre possible (maximizing usable space).

Photo 1. Area with low interspersion

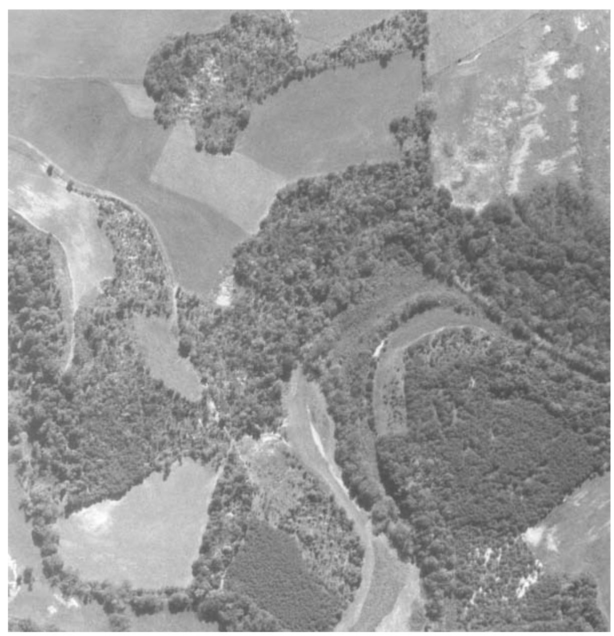


Photo 2. Area with high interspersion

Concept 7

Edges and Contrast

The boundary where two or more types of vegetation or successional stages meet is called an edge. Sometimes there is an abrupt change where one type of vegetation stops and another begins (i.e., hard edge, see Photo 3), or the change can be less distinct, with a gradual transition from one stage to another (i.e., soft edge, see Photo 4). In places where a gradual change occurs, the edge resembles both successional stages or vegetation types. Where abrupt changes occur, the edge is narrow. Edges attract many different wildlife species because a variety of food, cover and other habitat requirements are arranged close together.

Edges that are produced when extremely different successional stages of vegetation meet (i.e., hard edge) are defined as having high contrast. There is high contrast where an area in stage 2 (annual forbs and grasses) meets an area in stage 6 (tall mature trees) of plant succession. A boundary between stages 2 and 3 (i.e., soft edge) has low contrast. Edges with low contrast normally have more species of plants and wildlife associated with them than do edges with high contrast. In general, edge benefits wildlife species with low mobility and small home ranges more than species with high mobility and large home ranges. Edges with low contrast will benefit those wildlife species needing interspersion of several successional stages. Finally, it is most important to understand that "edge," in and of itself, is not necessarily good. The quality, quantity and arrangement of the habitats that form the edge(s) are the most important factors.

Photo 3. Abrupt change in habitat types with high contrast (i.e., hard edge).

Photo 4. Gradual change between two habitat types (i.e., soft edge).

Concept 8

Area-Sensitive Species

Edge is not beneficial for all wildlife species. Some species need large, unbroken (unfragmented) areas in a certain successional stage to provide some or all of their habitat requirements. Such species are referred to as ***area sensitive***. For these species, large areas of vegetation in one successional stage are desirable. For example, the grasshopper sparrow requires fields of at least 100 acres.

Concept 9

Migration and Home Range

Some wildlife species travel during certain seasons of the year. These movements are called ***migration***. Migration distances may be short or very long, depending on the species. These species must find the necessary habitats along their routes in order to survive. The following are examples of migration:

1. Ducks that nest in the northern United States and Canada must fly south to warmer climates to find food sources and wetlands that are not frozen during winter.
2. In winter the mountains of the western United States are covered in deep snow. Mule deer and elk cannot get to the vegetation they usually eat. To find food, they travel to lower elevations where the snow is not as deep.

Other animals reside in the same area all year. The area of constant use is called an animal's ***home range***. For example, a bobwhite quail spends most of its life on approximately 80 acres of average-quality habitat. If the habitat is better than average and the quail can meet all their needs in a smaller area, their home range will decrease in size.

Concept 10

Carrying Capacity

There is a limit to how many animals can live on a given piece of property. That limit is called the ***carrying capacity***. The quantity and quality of food, cover, water and space determine the carrying capacity. (Figure 3) If one basic requirement is in short supply, the carrying capacity is lowered. We call the requirement(s) that is in shortest supply, or absent altogether, the limiting factor(s). A manager can increase a property's carrying capacity by improving the kind or amount of food, cover, water or space that is in short supply.

Carrying capacity varies from year to year and from season to season. It is usually greatest from late spring through fall. This is when most young are born and grow. With the coming of winter or a summer drought, food and cover gradually diminish, as does the habitat's carrying capacity.

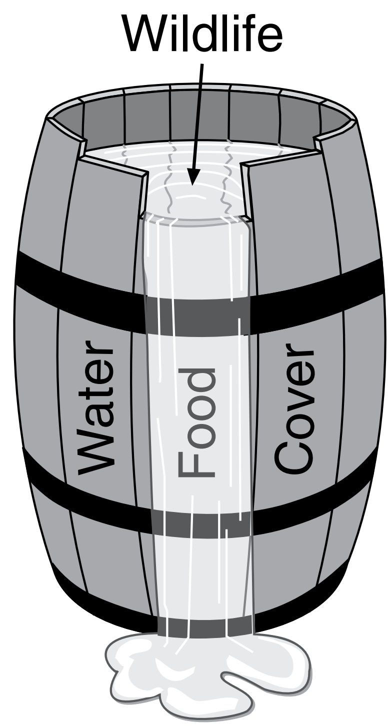


Figure 3

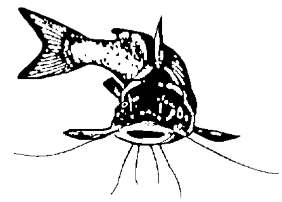
More animals are produced each year than will survive to the next. Surplus animals are generally lost to predation, starvation and/or disease. Young wildlife and animals in poor health experience the highest death (mortality) rates. Hunting and fishing are two ways to use the surplus. The obvious way to increase the number of animals is to increase the number born and reduce the number that die. However, if the habitat cannot support any more animals, those efforts will fail.

A long-term increase in population can be accomplished only by increasing the carrying capacity.

Photo 5. Where deer are overabundant, their food supply is reduced and less nutrition is available. A "browse line" is usually evident in these areas.

Concept 11

Pond Dynamics and Balance



No two ponds are ever exactly alike. Even ponds located side-by-side in the same watershed can look very different and respond differently to management efforts. These visual differences are usually associated with water quality and algal bloom differences. Management efforts are meant to control water quality, improve fishing and attract wildlife.

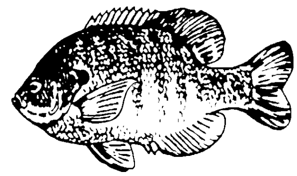
Dissolved oxygen, alkalinity, hardness and pH are water quality factors that can be managed in ponds. Water quality affects the natural production of food in the pond and the health of the fish.

Oxygen from the atmosphere dissolves in water through the action of wind and waves or is produced by plants in the water through the process of photosynthesis. Oxygen is only slightly soluble in water, and its solubility is dependent on water temperature (cooler water holds more dissolved oxygen). Dissolved oxygen is measured in parts per million (ppm). Ponds seldom have more than 10 or 12 ppm dissolved oxygen, even on sunny or windy days. Dissolved oxygen below 4 ppm is stressful to most warm-water fish species (e.g., bass and bluegill), while 6 ppm is stressful to cold-water species (e.g., trout). When dissolved oxygen is below 2 ppm, many species of warm-water fish will die, and below 4 ppm, trout might die. Aquatic plants, particularly planktonic algae (or phytoplankton), produce most of the oxygen dissolved in the pond water during daytime photosynthesis. Therefore, dissolved oxygen concentrations tend to increase throughout the day. At night, everything living in the pond (fish, plants, insects, bacteria, etc.) consumes oxygen, and the dissolved oxygen concentrations fall. Under normal conditions dissolved oxygen will not fall below 4 ppm overnight. Ponds can be aerated to increase oxygen and decrease carbon dioxide when needed.

Alkalinity, hardness and pH of pond water are related to soil and vegetation in the watershed and the pond. Many soils are acidic and need to be limed to adjust the pH, alkalinity and hardness upward to a range that will promote the growth of planktonic algae and other natural food organisms. A pond should have a pH that fluctuates between 6.5 and 9 and an alkalinity and hardness of at least 20 ppm. Ponds with low pH, alkalinity and hardness should be limed based on soil tests of the pond mud. Usual liming rates can range from one to five tons per surface acre.

Plankton is the term used for all microscopic and near-microscopic life that floats in water. Plankton is divided into plant (phytoplankton) and animal (zooplankton) groups. Phytoplankton (microscopic algae) are the base of the pond food chain (see Concept 13). Zooplankton and aquatic insects feed on phytoplankton; and they, in turn, are eaten by small fish. Small fish are eaten by larger fish and so on. The key to producing abundant and healthy fish populations is managing phytoplankton through fertilizing and liming (if necessary). Suspended mud in ponds blocks sunlight and algal blooms cannot be established. In this case, muddy pond water must be cleared before a phytoplankton bloom can be achieved.

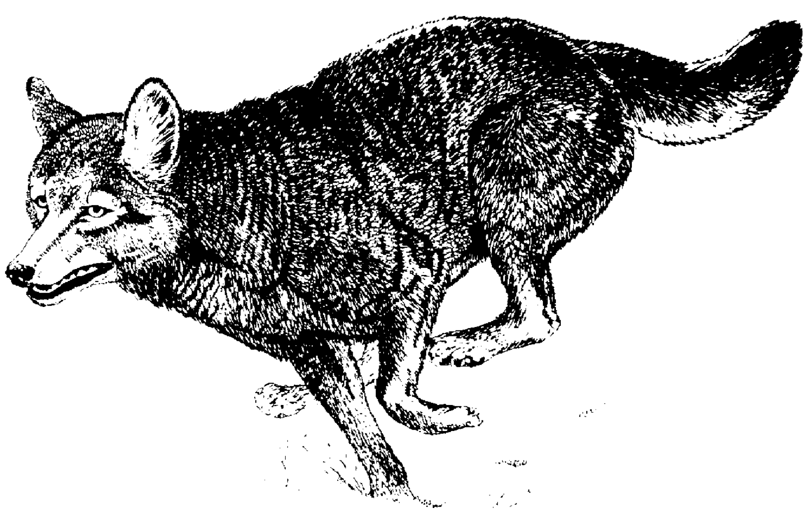
A pond is balanced when a balance between prey and predator fish is established and maintained. Each state has specific stocking recommendations designed to establish balanced pond populations after the first year or two. In most warm-water ponds, bluegill is the prey species, and largemouth bass is the predator species. In cold-water ponds, trout is usually the predator species and insects and small fish are the prey. Balance between predator and prey is achieved by establishing an adequate food chain for the prey species and controlling the prey and predator species numbers through fishing. Removal of the predator species is accomplished by selectively harvesting certain sized individuals to maintain a population that has adequate numbers of the various size classes of the predator species. In this way, the prey species is controlled through selective feeding by the predator species.



Concept 12

Wildlife Damage Management

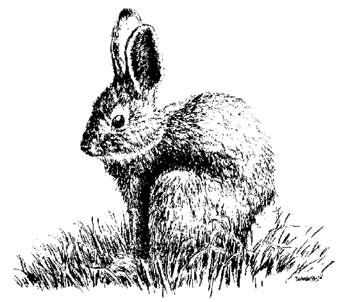
Wildlife damage management is the art and science of working with wildlife, humans and habitats to minimize or eliminate damage or danger to people's health or property or other wildlife species. Behaviors of individual wild animals may be troublesome because of health hazards, the destruction of crops or other natural resources, or because the animals are a general nuisance. Professional wildlife biologists often must repel, frighten, catch (trap), release, poison, shoot and/or kill individual animals in order to reduce or eliminate damaging behaviors. Examples of wildlife causing damage include deer damaging soybean crops or ornamental plants in the yard; raccoons raiding trash cans; bats or squirrels in the attic; skunks or snakes under the house; cormorants eating catfish fingerlings at an aquaculture facility; or starlings roosting in urban trees and defecating on sidewalks, creating a health hazard. Wildlife damage management specialists are professionals who solve such problems for compensation.

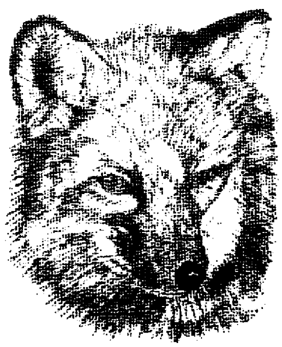


Concept 13

Food Webs

Plants are primary producers in a ***food chain*** because they supply food at the lowest level of a food chain. It takes an enormous number of individual plants at the bottom of a food chain to support the next level — primary consumers, who are plant-eating animals (herbivores). Primary consumers include rabbits, mice, groundhogs, 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 hawks, owls, snakes, foxes and bobcats. Secondary consumers are eaten by tertiary consumers, which may be predators or scavengers such as wolves, mountain lions, snapping turtles and turkey vultures. Note that these categories are very broad and general. Many animals fit into more than one group (omnivores) and might include black bears, coyotes and people. The relationship between predators and prey can be very complex, as many animals fit into different levels of various food chains. This relationship is called the food web.

Any of the food web components mentioned above can be broken down by decomposers (i.e., 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.