Maryland State Envirothon

Wildlife Study Guide

Revised: September 2011

The Maryland Envirothon

MARYLAND DEPARTMENT OF NATURAL RESOURCES

This Wildlife Study Guide has been designed as a basic guide to wildlife ecology, management and legislation affecting wildlife in Maryland. The guide has been divided into three main sections and includes a glossary.

Green treefrog Northern goshawk chicks

Wildlife Ecology

Wildlife ecology is a branch of science dealing with the interrelationships of wildlife with their own species, with other species and with their nonliving environment. This section of the study guide has been designed as an introduction to Wildlife Ecology for the Maryland State Envirothon. The following concepts are covered within this portion of the guide:

1. Habitat
2. Communities and Ecosystems
3. Species Richness and Diversity
4. Food Chains and Food Webs
5. Wildlife Population Dynamics
6. Natural Selection and Adaptations
7. Biodiversity
8. Plant Succession and Its Effect on Wildlife
9. Vertical Structure
10. Arrangement and Interspersion
11. Edges and Contrast
12. Home Range, Movements and Migration

River otters

Habitat

Habitat refers to resources required by wildlife to survive and reproduce. These requirements include both physical and biological resources. The four basic habitat requirements are food, water, cover (shelter) and space. These requirements fit together like pieces in a puzzle.

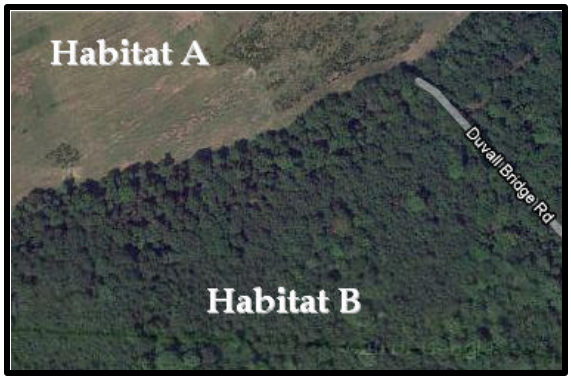
Space is often a forgotten element in habitat. However, every species has a minimum "space" requirement. Space is needed to obtain life's necessities. A large predator, such a coyote, needs more space to meet its needs than a green frog. It should be noted that each species has its own set of specific habitat requirements. For example, the gray squirrel uses acorns for food while the woodpecker eats insects. Mallards use thick grass and forb cover for nesting, while brown thrashers nest in shrubs.


Short-eared owl

Habitat requirements for wildlife change during the seasons of the year. The food wildlife eat in the winter may be much different than what is consumed in the summer. For example, white-tailed deer eat leafy, herbaceous plants in the summer and switch to woody stems, buds, and acorns in winter. The cover wildlife need for nesting also may be much different than the cover needed to survive a winter storm.

Sometimes, groups of species tend to occur in similar types of habitats. These are known as habitat guilds. An example of a habitat guild would be grassland species which might include short-eared owls, grasshopper sparrows and meadow voles. Other types of habitat guilds can include forest, wetland, urban/farmstead, edge/generalist guilds and others.

Many times, aerial photos are used to determine suitable wildlife habitat in an area. Aerial photos show general landscape composition as well as the interspersion and arrangement of vegetation types and successional stages. By understanding what habitat types certain species of wildlife prefer, you can infer which areas may be suitable for which species. For example, if you know that meadow voles prefer high grassland habitat, then a heavily forested landscape like Habitat B pictured to the right would not be suitable for them.



Communities and Ecosystems


A tidal marsh community

A community is defined as all of the plants and animal populations living in a defined area. The composition of the community changes over time due to climate and plant succession (see Plant Succession and Its Effect on Wildlife). Communities interact with abiotic (non-living) resources such as soil, air, water and sunlight. A tidal marsh is an example of a community. Tidal marshes are made up of wetland plants such as cattails, Spadderdock, rushes and grasses in addition to animals such as wading birds, muskrats and turtles. These marshes are regularly flooded by the tides and have thick, organic soils. The size of various communities can vary greatly. For example, a decaying log can contain a community of mosses, invertebrates, fungi and bacteria. However, the decaying log community is much smaller than a tidal marsh community.

The interactions of communities and abiotic conditions form an ecosystem. Ecosystems have no particular size. An ecosystem can be as big as a rainforest or a lake or as little as a tree or a puddle.

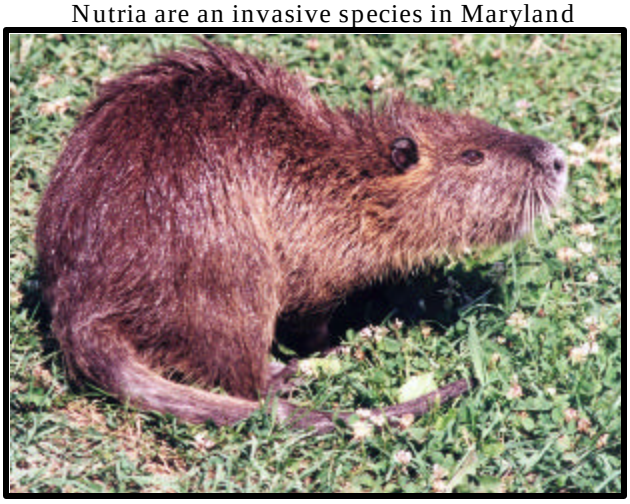
Species Richness and Diversity

A species is a type of organism whose members can interbreed and produce viable (reproductive) offspring. The number of different wildlife species found in an area is known as species richness. The combination of species richness and species abundance is known as species diversity. Many times, species diversity can be used to determine the health of an ecosystem. If an ecosystem has poor species diversity, then it may not be functioning properly. In general, the productivity of an ecosystem is greater when species diversity is higher.

Some species help maintain species diversity within an ecosystem. Species that play a critical role in maintaining structure of an ecological community are known as keystone species. Beavers are a keystone species in Maryland. Beavers create wetland habitat which is used for food and cover for a variety of other species.

Other species have been introduced into areas and can sometimes limit diversity. Introduced species are known as non-native or exotic species. When exotic species pose biological, economic or human-health related harm, then they are considered to be invasive species. One invasive species in Maryland is nutria, a large semi-aquatic rodent from South America. Nutria consume the roots of wetland vegetation, and thousands of

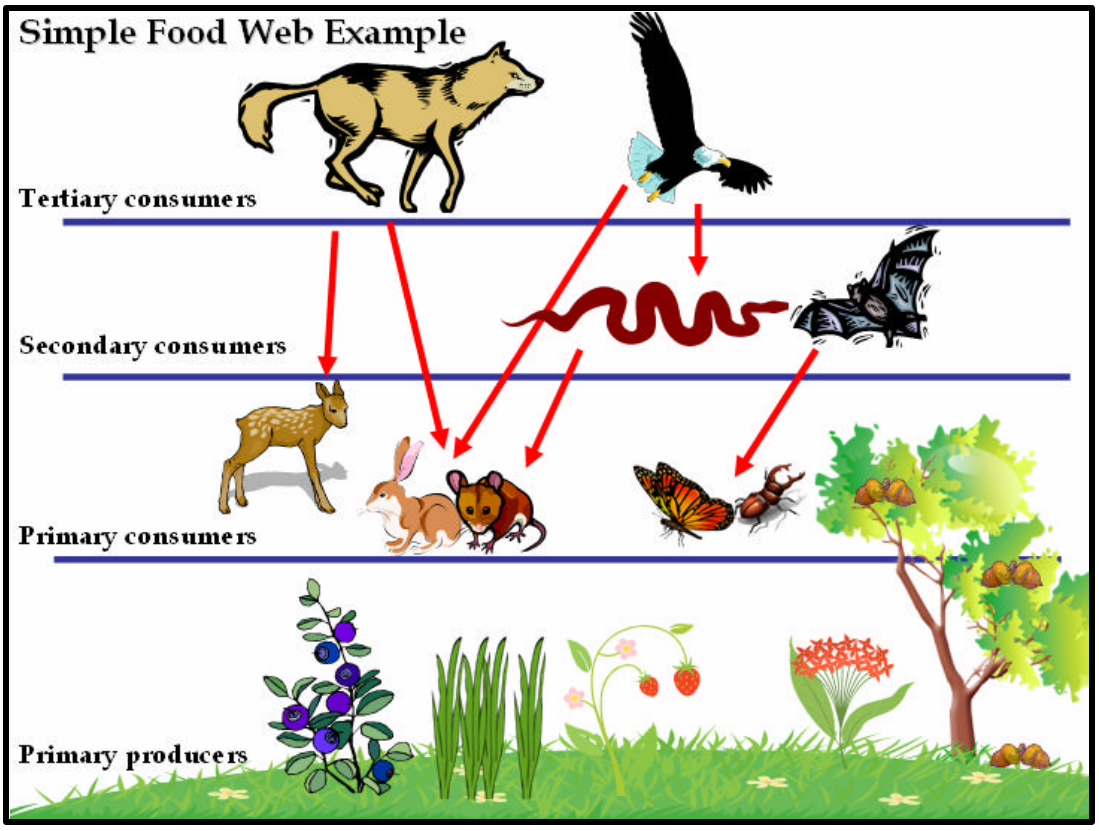
Nutria are an invasive species in Maryland



acres of wetlands have been lost on the Eastern shore due to this animal's ravenous eating habits.

Food Chains and Food Webs

A food chain is a model that shows how energy is passed, in the form of food, from one organism to another. A series of connected food chains make up a food web. Food chains and webs are organized by trophic levels which are feeding positions in the web. The lowest trophic level contains the producers (autotrophs) which manufacture their own food and the decomposers which break down existing organic material. Plants generally fall into producer category while fungi are typically decomposers. The organisms which feed on plants and other producers are then considered to be primary consumers. Anything that eats a primary consumer is then considered to be a secondary consumer. Animals that eat secondary consumers are known as tertiary consumers. Food chains and food webs are, therefore, comprised of multiple predator and prey relationships.



Within the food chain, some organisms only consume plant material. These organisms are considered to be herbivores. Typically, herbivores are classified as primary

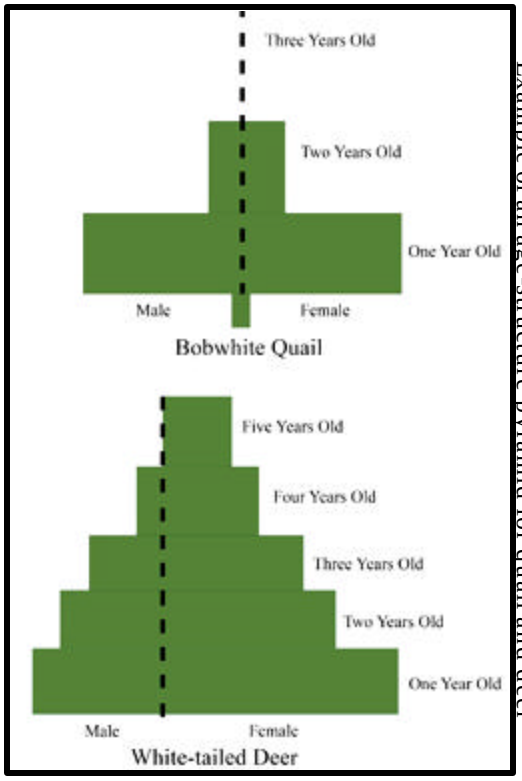
consumers. This category includes species such as rabbits and white-tailed deer. Organisms that consume both plants and animals are defined as omnivores, while organisms which only eat other organisms are considered to be carnivores. Foxes, raccoons and opossums are omnivores while bobcats and cougars are carnivores. Some species, like the short-tailed shrew, only eat insects and invertebrates. These species are considered to be insectivores. Species that feed almost exclusively on seeds are considered to be granivores.

Wildlife Population Dynamics

Populations are a group of organisms that occupy a certain area at a certain time. The factors and their interactions that control or influence a system or process are known as dynamics. Therefore, wildlife population dynamics are the study of factors and their interactions that control or influence the growth, stability, and decline of wildlife.

Wildlife population dynamics are affected by factors such as births, deaths, immigration and emigration. The balance of births and immigrations with deaths and emigrations will result in zero population growth. However, if more individuals are added to a population, then the population will grow.

Natality is the production of new individuals in a population through birth. Conversely, mortality deals with the level of death within a population. These terms are usually expressed as rates that reflect pressures to increase and decrease population size. The size of a population is impacted by many factors which vary over time. At a particular point in time, natality factors or mortality factors may dominate, causing a population to increase or decrease. Natality can be affected by breeding age, mating habits and population density. For example, rabbits have a higher natality than black bears because they can breed at a much younger age and more often than bears. Factors that cause mortality in wildlife populations include predation, disease and parasites, weather, starvation, pollution, hunting and accidents. Factors which cause natality and mortality can be predictable or unpredictable.



Example of an age-structure pyramid for quail and deer

The proportion of young and old age classes reveals a lot about population dynamics. Generally, there should be a balance among the age classes, and the "proper" balance will vary by species and season. Normally, the age structure can be depicted by a triangle, with the numerous young on the bottom and the very few old

animals at the top. "Age" might be measured in years, weeks, or days, depending upon the species considered. At the end of the food-rich season, the youngest age classes are usually at their highest density. The winter will kill many individuals, but usually the young and very old age classes experience the highest mortality rates. Humans sometimes have a strong impact on the age structure of a population. For example, hunting restrictions can be placed on antler sizes of bucks in an effort to increase the number of older, trophy bucks. In wildlife management, it is important to be able to age and sex species to understand population dynamics.

Natural Selection and Adaptations

Natural selection is the process whereby organisms better adapted to their environment tend to survive and produce more offspring. It is important to keep in mind that natural selection ***does not*** act on individuals; it acts on populations. Adaptations help organisms survive and reproduce in their ecological niche or habitat. Adaptations occur over many years. Adaptations can be physical, behavioral or physiological.

Long-tailed weasels have well-developed carnassials

A physical (anatomical) adaptation is one that entails a physical feature like the shape or color of an animal. Camouflage is an excellent example of a physical adaptation. Other example of physical adaptations include the well developed carnassial teeth on mustelids (weasels) that help them shear flesh or the clear eyelids that beavers have to be able to see underwater.

Behavioral adaptations are adaptations that have been learned or inherited. Language, swarming and use of tools are all examples of behavioral adaptations.

Physiological adaptations permit the organism to perform special functions. An example of this would be the production of venom by timber rattlesnakes. Another physiological adaptation is the process of estivation or when some animals enter a state of inactivity during prolonged periods of drought or high temperatures.

Biodiversity

Biodiversity is simply the variety of life on Earth. Biodiversity encompasses the numbers of plants, animals, fungi, microorganisms and their associated habitats. Biodiversity is important because it increases ecosystem productivity. Diverse

ecosystems can also recover from disturbances easier and can provide more resources for people and wildlife.

Biodiversity can be broken into three main categories: genetic, species and ecosystem diversity. Genetic biodiversity refers to the total number of genetic characteristics in the genetic makeup of a species. A species with a higher genetic biodiversity is more likely to be able to adapt to changing environments. Species biodiversity is the combination of species richness and species abundance in a given area. Ecosystem biodiversity is all the different habitats, biological communities and ecological processes, as well as variation within individual ecosystems.

Two of the greatest threats to biodiversity today are habitat destruction and invasive species.

Plant Succession and Its Effect on Wildlife

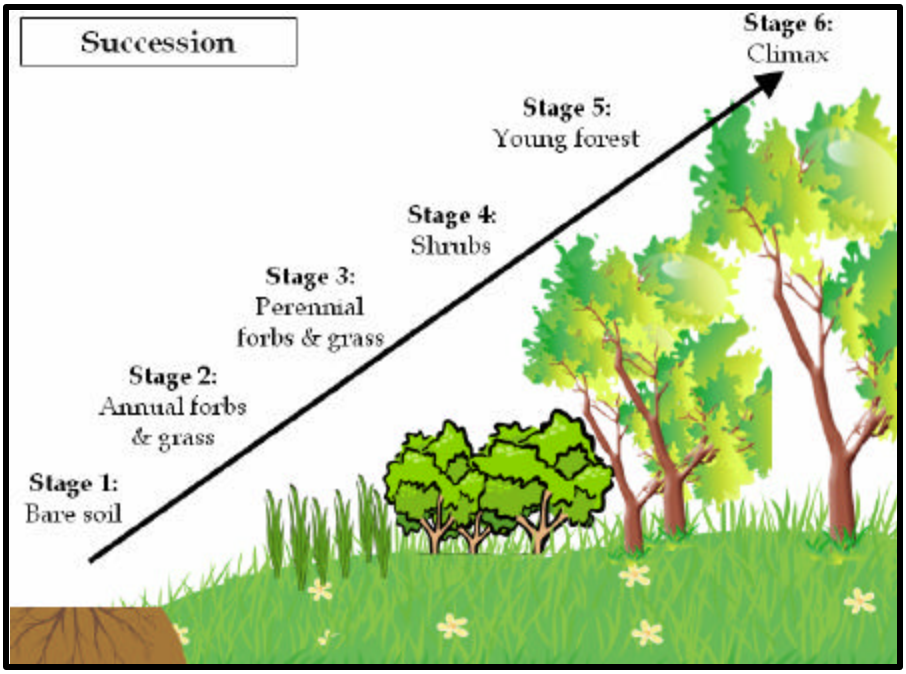
Plant succession is the gradual change in plant species in a given area over time. Succession generally occurs in steps or stages until a stable or climax community is reached. Disturbance events such as fire, flooding, wind storms and grazing continually set back succession and the cycle will continue forward from the new starting point. Disturbance events can be natural or caused by humans (anthropogenic). In some cases, anthropogenic disturbance can mimic natural disturbance. In other cases, natural disturbances such as fires and floods are prevented from occurring by humans.

The rate succession occurs is dependent on factors such as climate, level of disturbance and species involved. Succession typically occurs rapidly in areas with warm temperatures and abundant rainfall such as deciduous forests in the eastern United States. Large-scale disturbances such as volcanoes can also cause succession to occur at a much slower rate than smaller disturbances like windfalls in a wooded area. In addition, some plant species grow much more rapidly than others which can alter the rate of succession.

Succession is very important in wildlife management as wildlife species typically depend on one or several successional stages to meet their various life requirements. Species such as scarlet tanagers and fishers are typically found in one or two successional stages while others like wild turkey and white-tailed deer require multiple successional stages.

Succession in terrestrial environments is generally broken into six different stages beginning with bare ground and ending with a climax community. These stages are:

1.) Bare ground
2.) Annual forbs and grasses
3.) Perennial forbs and grasses
4.) Shrubland
5.) Young forest
6.) Mature forest (climax)



In some regions, natural factors such as the soil or climate will prevent succession from proceeding past a certain stage. For instance, in the short-grass prairie region, lack of precipitation often prevents succession from proceeding past stage 3 (perennial forbs and grasses). In this case, stage 3 would be considered the climax community

Nature never gives up. Even abandoned concrete parking lots are eventually taken over by plants. Plants first grow in the cracks and around the edges, then, if left alone, a concrete parking lot will eventually become "habitat" for some wildlife species.

Vertical Structure

Typically, vegetation is grouped by its vertical height. These groupings are known as strata. Grasses, ferns and forbs generally grow close to the ground and make up the ground layer or understory. The next highest level is usually comprised of shrubs and young trees under 4.5m in height. This layer is known as the shrub layer. The tallest vegetation layer contains trees over 4.5m in height and is known as the canopy or overstory.

The arrangement of vegetation in different layers is important to many wildlife species. For instance, some species may require an herbaceous layer for food but also need a well developed tree canopy for cover. Not all areas in a single stage of succession are alike. One tulip poplar-oak forest in stage 6 of succession may have a variety of layers comprised of grasses, forbs, shrubs, small trees and large trees, while another stage 6 tulip poplar-oak forest may have only one distinct layer of tall trees. Although these two forests are both the same type, they would not necessarily provide suitable habitat

for the same species. The vertical structure of any site can be manipulated depending on the management objectives.

Arrangement and Interspersion

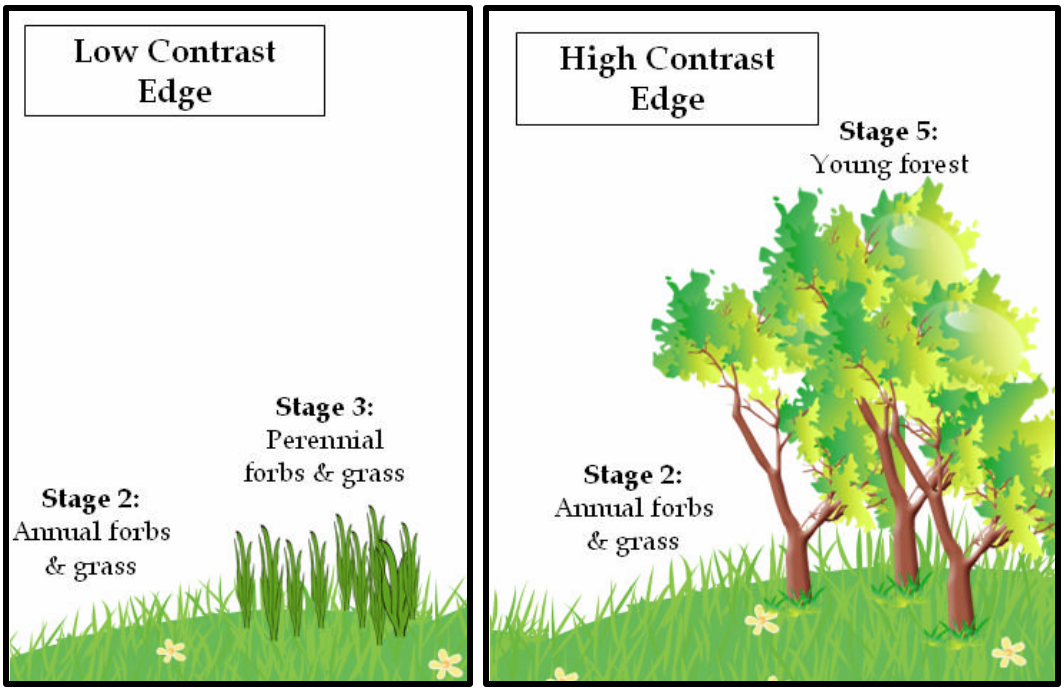
An important concept in wildlife habitat management is how areas in different successional stages or vegetation types are arranged in relation to each other. This type of relationship is often referred to as horizontal arrangement or juxtaposition.

Many wildlife species need areas in different successional stages to provide all of their habitat requirements. To be of value, the different areas need to be within a distance of each other that can be traveled safely by wildlife. While some species can have all of their habitat requirements provided by only one successional stage, many other species require several successional stages throughout their life. The mixing of areas with different successional stages is called interspersion. Usually areas with high interspersion support a wide variety of wildlife. It should be noted that increased interspersion is not necessarily beneficial to all species of wildlife.

Edges and Contrast:

The boundary where two or more different types of vegetation or successional stages meet is called an edge or an ecotone. An example would be the area where a forest and a field meet. The transition between different vegetation types can be gradual or abrupt. In places where a gradual change occurs, an edge looks a little like both successional stages or vegetation types. Where abrupt changes occur, the edge is narrow.

Edges produced by successional stages that have extremely different types of vegetation are defined as having high contrast or a hard edge. An area where a young forest (Stage 5) meets an annual grass field (Stage 2) would be an example of high contrast. Many times, areas with high contrast edges have high species richness. However, the edge between an annual forb and grass field (Stage 2) and a perennial forb and grass field (State 3) would be a low contrast (or a soft edge) due to its gradual transition.



Edges attract many different wildlife species because the variety of food, cover, and other habitat requirements are arranged close together. This is due to the increased interspersion of vegetation along the edges. White-tailed deer benefit from increased edge habitat.

While some species benefit from edges, others do not. Thus, examining an aerial photo and counting the number of edges is not necessarily a good indicator of habitat quality. Like other areas of wildlife management, it is best to research the needs of the focal species before altering the habitat. A balance of edge with blocks of vegetation in one successional stage is desirable. Areas with unbroken blocks that are 50 to 100 acres in size are considered to have a good balance of edge and unbroken blocks.

Home Range, Movements and Migration

The home range of an animal is the area where an animal lives. For every species, home range size is related to habitat quality. In higher quality habitats, home ranges tend to be smaller as animals don't have to travel far to obtain necessary habitat components. Some species naturally have large home ranges, like cougars while others like shrews have relatively small home ranges.

Corridors are areas of continuous habitat that permit animals to travel securely from one habitat to another. As environments become more broken up (fragmented) from construction or roads, parking lots, urban areas, harvest of timber, clearing for agriculture, etc., small islands of vegetation remain.

Corridors allow animals to find and use the islands of suitable habitat. For example, in an urban area, relatively unbroken corridors found along riparian areas and ravines allow wildlife to move into parks, and other suitable habitats. Preservation, maintenance, and creation of un-broken corridors are very important in wildlife habitat management.

For many animals, corridors are essential for migration. Migration is the periodic movement of an animal from the place where it has been living to a new area and its subsequent return journey. When animals migrate, it is usually to find food, water and / or a good place to breed.

The movement of migratory animals usually corresponds with seasonal changes, though some species may migrate for shorter periods of time. Many animals migrate to northern regions during summer months. The long summer days in the northernmost portions of the world ensure a good food supply. As fall and colder weather approaches, many animals migrate south to find warm winter weather and available food. Here are three examples:

1. Ducks that nest in the northern United States must fly south to warmer climates to find food sources and wetlands that are not frozen during winter. The migration routes for birds are known as flyways.
2. Marbled salamanders spend most of their lives underground. However, in the fall, Marbled salamanders will migrate to seasonal wetlands known as vernal pools. Marbled salamanders will lay their eggs in the dry wetlands which hatch after spring rains fill the pools.
3. Many colorful songbirds such as Baltimore orioles and the scarlet tanager nest in U.S. forests but migrate to Central and South America and the Caribbean to spend the winter. These species are known as Neotropical migrants.

Marbled salamander

Wildlife Management Concepts

Before an individual can evaluate wildlife habitat and make management recommendations, some basic concepts about habitat and its relation to different wildlife species should be understood. Wildlife management is both an art and a science that deals with complex interactions within the environment. Wildlife biologists are tasked with balancing the needs of a diverse public with the needs for many species of wildlife and their habitats.

This section was designed as an introduction to wildlife management for Maryland State Envirothon participants. Many of the concepts have been simplified to give a broad overview of wildlife management. The following concepts are covered within this section:

1.) Focal Species
2.) Habitat Management
3.) Carrying Capacity
4.) Wildlife Population Management
5.) Wildlife and Heritage Mission and Funding

A biologist conducts a controlled burn to manage for rare species

Focal Species

There are two basic goals in wildlife habitat management:

- to provide the best habitat possible for specific (focal) wildlife species
- to provide habitat for as many different wildlife species as possible in an area

To evaluate habitat, you must determine focal species. Landowners may have certain objectives for specific species, or, the general public may have concerns about particular game or endangered species. Once the species are selected, identify the habitat requirements for the focal species and evaluate the capability of the environment to provide the requirements. If the area is unable to supply the necessary habitat requirements, then management practices may be used to improve the area's ability in supplying needed requirements.

It is usually best to select management practices that provide the requirements that are in the shortest supply. 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, then a management practice that supplies water will improve the habitat more effectively than planting additional trees.

When determining which management practices to apply, be aware that management practices that improve habitat for some wildlife species may be detrimental to other species. It is impossible to manage habitat for any one species without influencing other species in some manner. For example, if you clearcut a forest to benefit American woodcock, then forest species such as wood thrushes, ovenbirds and gray squirrels will move to another area that contains forested land.

American woodcock use field habitats and young woods for courtship and nesting

Habitat Management

Habitat is essential for wildlife, and sometimes to maximize the amount of wildlife using an area or to increase focal species, habitat management is necessary. Habitat

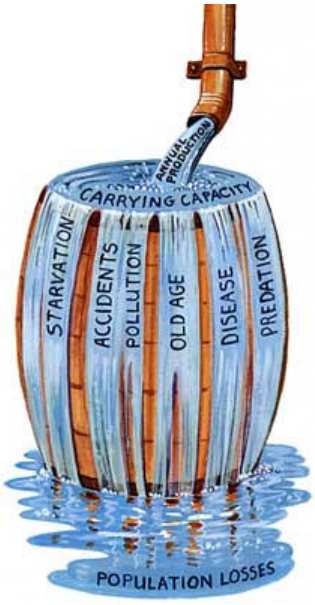
management is any alteration to the focal area. A simple habitat management process would be to plant native grasses and forbs for cover and nesting for grassland species. Another habitat management action would be to plant shrubs to increase cover and to increase soft mast that will benefit many wildlife species.

Other ways to manage habitat include manipulating plant succession. One way to manipulate plant succession is through the use of controlled burns. This practice helps reduce leaf litter, release nutrients in the soil and kill or set back the growth of woody species. In areas where controlled burns are not feasible, frequent mowing may simulate some of the benefits of controlled burns. Habitat managers can also harvest timber to alter plant succession.

Habitats can also be managed by planting food plots, creating snags for cover, creating ponds or other water sources, controlling invasive species, etc. The possibilities are endless on how habitat can be managed. However, be sure to have a specific goal in mind before putting management practices in place.

Carrying Capacity

There is a limit to how many animals the habitat can support regardless of habitat management practices. That limit is called the habitat's "carrying capacity." The quantity and quality food, water, cover, and space determines the carrying capacity. If one basic requirement is in short supply, then the carrying capacity is lowered. Factors that prevent a population from growing any larger are known as limiting factors. By addressing limiting factors, a manager can increase the habitat's carrying capacity.



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

More animals are produced each year than will survive to the next. When this happens, all extra or surplus animals will be lost in an existing habitat. Young wildlife and animals in poor health experience the highest death rates. Higher populations may also lead to greater chance of disease spreading through the populations. 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,

then these efforts will fail. A long-term increase in population can only be accomplished by increasing the habitat's carrying capacity.

Many times, carrying capacity refers to biological carrying capacity. However, sometimes the environment can support more animals than people can deal with. Cultural carrying capacity depends on the attitudes of people. To give an example, the biological carrying capacity of white-tailed deer in an ideal habitat can be as high as 200 deer per square mile. However, humans in that area may not appreciate such as large herd of deer as the number of human-deer conflicts will increase.

Wildlife Population Management

Wildlife populations are dynamic in nature and may vary naturally in distribution over time. Occasionally, due to a combination of factors, populations may increase beyond levels that the environment can sustain. Factors contributing to overabundant populations include isolated landscapes, absence of fire, altered predation regimes and increased access to food and water. Overabundant populations can degrade habitat, put pressure on other species, spread diseases, become nuisances to humans and occasionally may face mass starvation.

To ensure wildlife populations do not become overpopulated, wildlife managers must carefully monitor population levels. One way to control wildlife population levels is through the use of regulated hunting and trapping. If populations of a particular species are too low, then managers may utilize habitat management practices to increase habitat. One goal of wildlife management is to manage for a sustained yield. A sustained yield is the continuing yield of a biological resource, such as bear, by controlled periodic harvesting. Once managers have figured out approximately how many animals (like bear) can be harvested each year while maintaining a constant population size, figuring out how many permits can be sold can be calculated relatively easily from harvest results from previous years.

Wildlife and Heritage Mission and Program Funding

The **mission** of the Maryland Wildlife and Heritage Service is to conserve Maryland's diverse native wildlife, plants and natural communities that support them, using scientific expertise and informed public input. Along with this the Service is charged with:

- ensuring the long term conservation of the full array of native ecosystems, natural communities and species (both animals and plants) that comprise the biological integrity of Maryland.

- helping to educate the residents of Maryland about the laws that protect our natural resources and our citizens, as well as to help educate teachers and students and all Marylanders who are interested in the conservation of our state's natural and hunting heritage.
- Striking the necessary balance between the ecological needs of Maryland's wildlife and heritage resources, and the societal needs and desires of Maryland's citizens.

The majority of funding for Maryland's state wildlife programs comes from hunting licenses and fees and from a special, federal excise tax on sport hunting devices and ammunition. About 70% of Maryland's state budget for wildlife programs comes from these two sources. The federal aid funds are derived from an 11% excise tax on sport hunting devices and ammunition through the Pittman-Robertson Fund. For the past 60 years, sportsmen and women have been contributing to this fund through this excise tax mechanism.

Each state receives a share of the funds, which is administered by the U.S. Fish and Wildlife Service. Hunters' dollars are used for hunter education programs, enforcement of wildlife regulations, wildlife-related education programs and conservation programs. Other sources of funds include federal grants and the Chesapeake Bay and Endangered Species Fund, to which donations are made through the Maryland Income Tax Form.

Wildlife Legislation

Laws can be federal or state laws. Federal laws are either outlined in the Constitution or written and passed by Congress. In contrast, State laws are written and passed by State legislatures. Wildlife laws may address individual species, a suite of species, habitats and/or broad areas. Laws are created by statutes that originate from legislative bills. Once laws are enacted, regulations are put in place to implement, interpret or make specific the law enforced. This section was designed as an introduction to wildlife legislation for Maryland State Envirothon participants. Many of the concepts have been simplified to give a broad overview of wildlife management. The following concepts are covered within this section of the guide:

1. Lacey Act of 1900
2. Migratory Bird Treaty Act of 1918
3. Federal Aid in Wildlife Restoration Act of 1937
4. Marine Mammal Protection Act of 1972
5. Endangered Species Act of 1973
6. MD Endangered Species

Lacey Act of 1900*

When the Lacey Act, named for Representative John Lacey of Iowa, was passed in 1900 it became the nation's first far-reaching federal wildlife protection law. The act was prompted by growing concern about interstate profiteering in illegally taken game. It was amended in the 1930s and 40s, and again in 1981.
Under the Lacey Act today, it is illegal to import, export, sell, acquire, or purchase fish, wildlife or plants taken, possessed, transported, or sold:

- in violation of U.S. or Indian law, or
- in interstate or foreign commerce involving any fish, wildlife, or plants taken possessed or sold in violation of State or foreign law.

The law covers all fish and wildlife and their parts or products, and plants protected by the Convention on International Trade in Endangered Species or State law. Commercial guiding and outfitting are considered "sales" under the Lacey Act.

The Lacey Act was amended in 1949 to prohibit import of wild vertebrates and other animals listed in the Act or declared by the Secretary of the Interior to be injurious, except under certain regulated conditions, such as for research or museum display. Declaring a species injurious involves a five-step process: Petition, Notice for Information, Record of Compliance, Proposed Rule, and Final Rule. The Service may initiate a proposed rule without a petition or notice for information if the scientific data

support a listing. The Lacey Act does not set a time frame for making "injurious" determinations. It typically takes 12 to 18 months complete the evaluation and publish a Final Rule. Currently, 16 species, or groups of species, are listed as "injurious" under the provisions of the Lacey Act.

The Act sets fines for violations involving imports or exports, or commercial violations in which the value of the wildlife exceeds $350. Fines for misdemeanor violations are currently set at a maximum of $100,000 for individuals and $200,000 for organizations. Maximum fines for felonies are presently $250,000 for individuals and $500,000 for organizations.

Officers enforcing the Lacey Act may carry firearms; make arrests; search and seize; issue subpoenas and warrants; and inspect vessels, vehicles, aircraft, packages, crates, and containers on arrival or departure from the United States. The law authorizes rewards for information leading to arrests, criminal convictions, civil penalties, or forfeiture of property, and for payment of costs of temporary care for fish, wildlife, or plants needed for court proceedings.

*excerpts from USFWS website, 2011

Migratory Bird Treaty Act*

The MBTA was born in an era when people adorned their hats with egret feathers, and signed their letters with pelican-quill pens. At the same time, sport hunters were pushing for a law that would unify state hunting regulations.

Through a far seeing coalition of hunters and conservationists, this Act assures the protection of a healthy environment for people, fish and wildlife, and helps Americans conserve and enjoy our living treasures.

Cerulean warblers are migratory birds

The Migratory Bird Treaty Act (MBTA) of 1918 implemented the 1916 convention between the United States and Great Britain for the protection of birds migrating between the U.S. and Canada. Similar conventions between the United States and Mexico (1936), Japan (1972) and the Union of Soviet Socialists Republics (1976) further expanded the scope of international protection of migratory birds. Each new treaty has been incorporated into the MBTA as an amendment and the provisions of the new treaty are implemented domestically. These four treaties and their enabling legislation (the MBTA) established Federal responsibilities for the protection of nearly all species of birds, their eggs and nests.

The MBTA made it illegal for people to "take" migratory birds, their eggs, feathers or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. The Bald and Golden Eagle Protection Act affords additional protection to all bald and golden eagles.

Migratory Birds and Habitat Programs primarily operate under the auspices of the MBTA. In total, 836 bird species are protected by the MBTA, 58 of which are currently legally hunted as game birds. A migratory bird is any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle.

*excerpts from USFWS website, 2011

Federal Aid in Wildlife Restoration Act*

The Federal Aid in Wildlife Restoration Act of September 2, 1937, is commonly called the "Pittman-Robertson Act." It has been amended several times, and provides Federal aid to States for management and restoration of wildlife.

The Federal Aid in Wildlife Restoration Act requires an 11 % excise tax on sporting arms and ammunition. These funds go to the Secretary of the Interior and are allocated to States on a formula basis to pay up to 75% of cost approved projects. Project activities include acquisition and improvement of wildlife habitat, introduction of wildlife into suitable habitat, research into wildlife problems, surveys and inventories of wildlife problems, acquisition and development of access facilities for public use and hunter education programs, including construction and operation of public target ranges.

One amendment approved in 1970, added provisions for the deposit of the 10 % tax on pistols and revolvers, one-half of which may be used by the States for hunter safety programs. This amendment also provided for development of comprehensive fish and wildlife management plans.

In 1972, the Act was further amended to add provisions for the deposit of the 11% excise tax on bows, arrows, and their parts and accessories for use in wildlife projects or hunter safety programs.

An amendment in 1984 contained a provision that expanded the tax on arrows to include those used in crossbows.

In 1989 the Act was amended to require the Secretary of Treasury to invest funds held in interest-bearing obligations. This provided that the interest be used to fund the North

American Wetlands Conservation Act through fiscal year 2005, and then to be available for the wildlife restoration fund beginning fiscal year 2006.

*excerpts from USFWS website, 2011

Marine Mammal Protection Act of 1972*

The Marine Mammal Protection Act (MMPA) was enacted on October 21, 1972. All marine mammals are protected under the MMPA.

The MMPA established a moratorium on the taking of marine mammals in U.S. waters. It defines “take” to mean “to hunt harass, capture, or kill” any marine mammal or attempt to do so. The inclusion of harassment in the definition was a groundbreaking action by Congress. Exceptions to the moratorium can be made through permitting actions for take incidental to commercial fishing and other nonfishing activities; for scientific research; and for public display at licensed institutions such as aquaria and science centers. The moratorium generally does not apply to Alaska natives who live on the Alaskan coast. The MMPA contains provisions allowing for take for subsistence use or to create and sell “authentic articles of handicrafts and clothing” without permits or authorizations. The taking must not be “accomplished in a wasteful manner,” and the Secretaries of Commerce and the Interior may regulate the taking of a depleted species or stock, regardless of the purpose for which it is taken.

Congress passed the Marine Mammal Protection Act of 1972 based on the following findings and policies:

- Some marine mammal species or stocks may be in danger of extinction or depletion as a result of human activities;
- These species or stocks must not be permitted to fall below their optimum sustainable population level ("depleted");
- Measures should be taken to replenish these species or stocks;
- There is inadequate knowledge of the ecology and population dynamics; and
- Marine mammals have proven to be resources of great international significance.

The MMPA was amended substantially in 1994 to provide for:

- Certain exceptions to the take prohibitions, including for small takes incidental to specified activities, when access by Alaska Natives to marine mammal subsistence resources can be preserved, and permits and authorizations for scientific research;
- A program to authorize and control the taking of marine mammals incidental to commercial fishing operations;
- Preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; and
- Studies of pinniped-fishery interactions.

*excerpts from NOAA website, 2011

Endangered Species Act of 1973*

The Endangered Species Act of 1973 (ESA) was signed on December 28, 1973, and provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. The ESA replaced the Endangered Species Conservation Act of 1969; it has been amended several times.

A "species" is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future.

The listing of a species as endangered makes it illegal to "take" (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to do these things) that species. Similar prohibitions usually extend to threatened species. Federal agencies may be allowed limited take of species through interagency consultations with NMFS or USFWS. Non-federal individuals, agencies, or organizations may have limited take through special permits with conservation plans. Effects to the listed species must be minimized and in some cases conservation efforts are required to offset the take. NMFS' Office of Law Enforcement works with the U.S. Coast Guard and other partners to enforce and prosecute ESA violations.

There are approximately 1,970 total species listed under the ESA. Of these species, approximately 1,370 are found in part or entirely in the U.S. and its waters; the remainder are foreign species.

*excerpts from NOAA website, 2011

Maryland Endangered Species

The Wildlife and Heritage Service Natural Heritage Program tracks the status of over 1,100 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements of our State's natural diversity. Of these species, the Maryland Department of Natural Resources officially recognizes 607 species and subspecies as endangered, threatened, in need of conservation, or endangered extirpated. Only 37 (or 3% of the total tracked species) are listed by the U.S. Fish and Wildlife Service as nationally endangered or threatened.

The primary State law that allows and governs the listing of endangered species is the

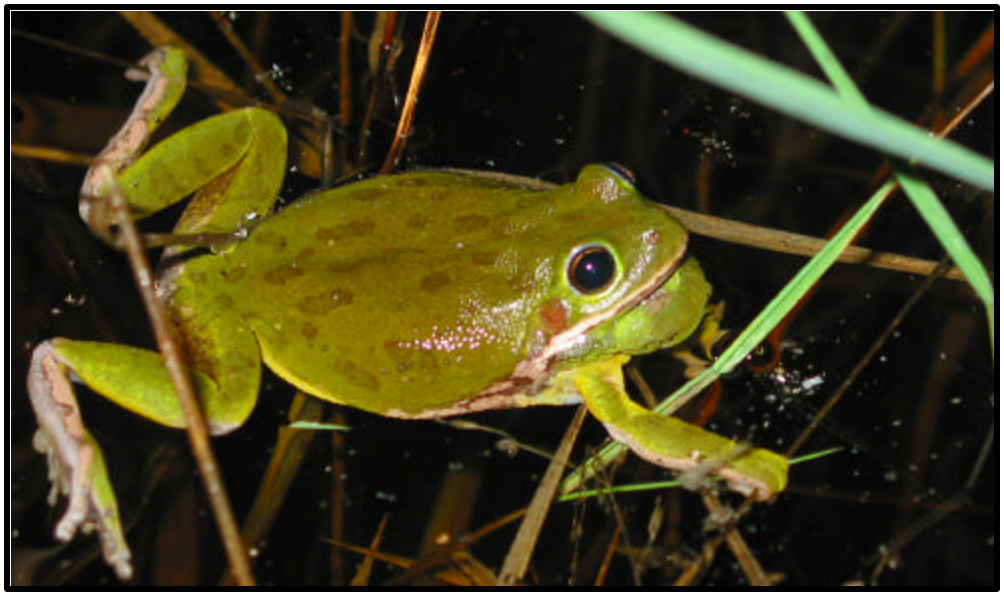
Nongame and Endangered Species Conservation Act. This Act is supported by regulations that contains the official State Threatened and Endangered Species list.

Secondarily, DNR's Fisheries Service maintains an official list of game and commercial fish species that are designated as threatened or endangered in Maryland.

Complete listings of the Rare, Threatened & Endangered Plants of Maryland and the Rare, Threatened, & Endangered Animals of Maryland include all species tracked by the Wildlife and Heritage Service Natural Heritage Program and indicate which species are federally listed and which are officially State listed. Compiled by Natural Heritage Program staff, these lists are the result of 20 years of data gathering from numerous sources, such as herbaria and museums, private collections, scientific literature, unpublished documents, reports from biologists and amateur naturalists, and from field work conducted by regional ecologists.

Since the time of European colonization in the 1600's, more than 500 species and subspecies of native animals and plants have become extinct in North America. Some of these had been abundant in the Chesapeake Bay region. Passenger pigeons blackened the sky during migration, Carolina parakeets roosted in coastal swamp forests, and heath hens boomed on rolling grassland hilltops.

Although Maryland harbors a rich variety of plant and animal life, the populations of many species have declined since colonization and many have been extirpated, including small whorled pogonia, chaffseed, gray wolf, and American bison.



Barking treefrogs are considered to be Endangered in Maryland

MD Envirothon Wildlife Glossary

Abiotic – a non-living factor in an environment ie. light, water, temperature

Accipiter – A hawk of the genus *Accipiter*, characterized by short wings and a long tail

Accidental species- species found far outside its expected breeding, wintering or migrating range; for example, sometimes manatees will accidentally show up in the Chesapeake Bay or a Tropical kingbird will be blown off course and end up in Maryland

Adaptation- traits or behaviors that help organisms survive and reproduce in their ecological niche or habitat

Aestivation – dormancy, generally seasonally

Aquatic – growing, living in or frequenting water

Arboreal – tree dweller

Autotroph – an organism capable of manufacturing its own food by synthesis of inorganic materials, as in photosynthesis; also known as a producer

Behavioral adaptation- learned or inherited adaptations that increase an organism's ability to survive and reproduce; ex: use of tools by primates

Bergman's rule – among forms of a particular species, body size tends to be larger in the cooler regions of its range and smaller in the warmer regions

Biodiversity- variety of life on Earth from plants, animals, microorganisms, fungi and their habitats

Brood – the offspring of a bird just hatched

Browse – (v) to eat the twigs and leaves of woody plants; (n) commonly used in wildlife management to signify brushy plants utilized by deer

Buteo – Any of the various hawks of the genus *Buteo*, characterized by broad wings and broad, rounded tails

Carapace – the upper or dorsal surface of a turtle's shell

Carnivore – An animal belonging to the order Carnivora, including predominantly meat-eating mammals

Carrion – the bodies of dead animals usually found in nature in a decaying state

Carrying capacity – the number of wildlife species that a given unit of habitat will support without damage to the habitat (aka biological carrying capacity)

Cast – to regurgitate indigestible prey remains

Circadian – designating a biological period of about 24 hours

Climax community – the final community structure in plant succession

Clutch – eggs laid and incubated by a female bird per nesting

Community- all plant and animal populations living in a defined area

Consumptive use – any use that involves activity resulting in the loss of wildlife i.e. hunting

Contiguous forests – Forests that share an edge or boundary, touching

Corridors- areas of continuous habitat that permit animals to travel securely from one area to another

Coverts – One or more of a group of feathers covering the bases of the longer main feathers of a bird's wings or tail

Covey – a small group or flock, often a family group, of birds such as quail

Crepuscular – appearing or becoming active at twilight or dawn

Dabbling ducks – duck species that principally feed in shallow water by "tipping up" or dabbling on the surface

Decomposers- organisms that break down existing organic material; ex: fungi

Depredation – the act of preying upon. Mostly wildlife damage to farmer's crops

Diurnal – A term used to describe an animal that is most active by day

Diving ducks – duck species that feed principally by diving below the surface

Dorsal – of or pertaining to the upper surface

Dump nest – eggs deposited by more than one female in a single nest

Ecosystem- formed by interactions of communities and abiotic conditions

Ecosystem diversity- total number of habitats, biological communities, ecological processes and variation in an ecosystem

Ecotone- the place where two or more different plant communities, successional stages or vegetative stages come together or meet (aka edge)

Edge – the place where two or more different plant communities, successional stages or vegetative stages come together or meet (aka ecotone)

Endemic – confined to a certain area or region

Estivation – a state of inactivity during prolonged periods of drought or high temperatures

Exotic – non-native species that has been either introduced or escaped

Flyway – fly routes established by migratory birds.

Focal species- a species primarily benefited by a project / contract action; Focal species may be a group of species, such as wildlife, or a subset of a species

Food chain or food web – the relationship between autotrophs, herbivores, and carnivores

Forest Game – Game species that are managed by the DNR whose habitat needs are found mainly in forests. These species in Maryland include wild turkey, ruffed grouse, gray and red foxes and squirrels.

Furbearers – Various animals that have a thick coat of soft hair covering their bodies. The Maryland DNR regulates the harvesting of 14 furbearing species: beaver, bobcat (closed season), coyote, fisher, gray fox, long-tailed weasel, mink, muskrat, nutria, opossum, otter, raccoon, red fox and skunk.

Genetic biodiversity- total number of genetic characteristics in the genetic makeup of a species

Granivore- species that feed almost exclusively on seeds are considered to be

Guard hairs – Long, coarse hairs that forms a protective coating over an animal's under fur

Habitat- resources required by wildlife to survive and reproduce; includes food, water, shelter and space

Harriers – Any of the various slender, narrow-winged hawks of the genus *Circus* which prey on small animals

Harvest – proportion or number of a wildlife population brought to bag by hunters; in wildlife management, killing an animal

Herbivore – An animal that eats plants

Herpetology – The scientific study of reptiles and amphibians as a branch of Zoology.

Hibernation – passing the winter or a portion of it in a state of sleep

High contrast edge- edges between extremely different successional stages; also known as a hard edge

Home range- the area where an animal lives and travels in

Horizontal arrangement- see juxtaposition

Indigenous – a naturally occurring species

Insectivore – a mammal or organism that feeds on insects

Interspersion- mixing of areas with different successional stages

Invasive species- non-native (exotic) species which causes biological, economic or human-health related harm

Inventory – the process of counting or identifying animals

Juxtaposition- how areas in different successional stages or vegetation types are arranged in relation to each other (aka horizontal arrangement)

Keel – a ridge down the back or along the plastron of a turtle or a longitudinal ridge On a dorsal scale in certain snakes

Keystone species- a species that plays a critical role in maintaining the structure of an ecological community

Lateral – pertaining to the side

Limiting factor – Anything that affects a species population. It could result from causes in nature as well as human activities. Examples include food, water, shelter, space, disease, predation, climatic conditions, pollution, hunting, poaching and accidents

Litter – the number of young born with each birthing

Low contrast edge- edges between similar successional stages; also known as soft edge

Mandibles – either the upper or lower part of the beak in birds

Marsupial – A mammal of the order Marsupialia that includes kangaroos, opossums, bandicoots and wombats. These females have pouches that contain mammary glands and that shelter the young until fully developed

Melanistic – Abnormally dark pigmentation of the skin or other tissues. Black pigmented

Migration- periodic movement of an animal from the place where it has been living to a new area and its subsequent return journey

Molt – the process of shedding or replacing feathers

Monogamous – term used when one male breeds with one female

Mortality (death rate) – the number of animals that die each year

Natality (birth rate) – ability of a population to increase; reproductive rate

Natural selection- process whereby organisms better adapted to their environment tend to survive and produce more offspring

Neotropical migrant- a species that breeds in North America but migrates to central and South America for the non-breeding season

Niche – that part of a habitat particularly suited to the requirements of a given species.

Nocturnal – active by night; the opposite of diurnal

Non-consumptive use – any use that does not directly kill wildlife, i.e. bird watching, hiking, photography

Non-native species- a species which is not native to a given area or region; also known as exotic

Omnivore – An animal or organism that feeds on both animal and plant matter

Ornithology – The scientific study of birds as a branch of zoology

Parasite – an organism that lives by deriving benefit (usually doing harm) from another organism.

Passerine – Birds of the order Passeriformes, which include perching birds and songbirds such as the jays, blackbirds, finches, warblers and sparrows

Pelage – The coat of a mammal, consisting of hair, fur, wool or other soft covering, as distinct from bare skin

Philopatry – annual homing to the same nesting area and often the same nest site

Physical adaptation- anatomical feature that increases organism's ability to survive and reproduce; ex: camouflage coloring in a prey species

Physiological adaptation- adaptations that allow organisms to perform special functions to increase ability to survive and reproduce; ex: venom production

Plant succession- gradual change in plant species over time

Plastron – The ventral surface of the shell of a turtle or tortoise

Polygamy or polygyny – term used when a male animal breeds with many females.

Population – the number of a particular species in a defined area

Population dynamics – factors regulating population levels including natality, productivity and mortality

Primary consumer- organisms which feed on plants and/or other producers

Recruitment – addition of a number of young to an adult population of breeders

Riparian area – the area of influence between upland habitats and aquatic habitats

SAV (submerged aquatic vegetation) – vascular plants that live and grow completely underwater

Scat – The excrement droppings of an animal

Secondary consumer- organisms that eat primary consumers

Species – populations of animals that possess common characteristics that freely interbreed in nature and produce fertile offspring

Species diversity- the combination of species richness and species abundance in a given area

Species richness – the number of wildlife species found in a given area

Strata- groupings of vegetation based on height of plants

Sustained yield- the continuing yield of a biological resource, such as timber, by controlled periodic harvesting

Taxonomy – the science of the classification of animals or plants

Torpor – temporary loss of all or part of the power of motion

Trophic level – a feeding level in the food chain of an ecosystem characterized by organisms that occupy a similar functional position in the ecosystem

Upland game – Game species that are managed by the DNR whose habitat needs are usually found in upland areas. These species in Maryland include Eastern cottontail rabbit, snowshoe hare (closed season), bobwhite quail, ring neck pheasant, woodchuck and crow

Ventral – of or pertaining to the lower surface

Waterfowl – water birds, usually referring to ducks, geese and swans

Wildlife- all non-domesticated plants, animals and other organisms

Wildlife population dynamics- study of factors and their interactions that control or influence the growth, stability and decline of wildlife

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- Page 4– Short-eared owl by George Jett; habitat puzzle and aerial by Kerry Wixted
- Page 5– Tidal marsh by Jason Harrison
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