MODULE 6 – Wildlife Conservation
LECTURE NOTES

Key Topics

- Fundamentals of Wildlife Conservation
- Animal Behavior
- Benefits of Wildlife
- Population Ecology
- Human Threats to Wildlife
- Diseases and Zoonosis
- Wildlife Conservation Strategies
- Wildlife Management in Liberia
- The Role of Local Communities

Fundamentals of Wildlife Conservation: Definitions

Wildlife includes all free-ranging vertebrates in their naturally associated environments.

Wildlife Conservation is the practice of protecting plant and animal species and their habitats. As part of the world's ecosystems, wildlife provides balance and stability to the world's ecosystems and so are a critical part of human survival.

Wildlife Conservation has 4 interrelated components:

1. Research - using science to better understand the needs and requirements of wildlife and its habitat.
2. Education - learning and sharing the best means to conserve wildlife and the broader environment.
3. Law Enforcement - ensuring that all laws related to wildlife are followed.
4. Wildlife Management - manipulating wildlife populations to achieve policy goals.

What is the difference between wildlife and domestic animals?

Taming: Elimination of tendencies to flee from man. Wild animals may be tamed whereas most domesticated animals do not require taming.

Feral animals: Domestic animals can REVERT to a wild state.

Animal Behavior: Definitions

Animal Behavior is the scientific study of the many ways animals interact with each other, with other living beings, and with the environment. This scientific discipline explores topics such as how animals find and defend resources, avoid predators, choose mates, reproduce, and care for their young.

To fully understand a behavior, we need to know: what causes it, how it develops in an individual, how it benefits an organism, and how it evolved. Some behaviors are **innate**, or genetically hardwired, while others are **learned**, or developed through experience. In many cases, behaviors have both an innate component and a learned component. Animal behavior is shaped by natural selection: many behaviors directly increase an organism's fitness, that is, they help it survive and reproduce.

What Influences Animal Behavior?

Natural Selection

Animal behavior is shaped by natural selection: many behaviors directly increase an organism's fitness, that is, they help it survive and reproduce. What ultimately drives animal behavior is survival. Nature tends to reward the behaviors that best ensure an individual can escape predators or find food, i.e., survival of the fittest.

Reproductive Fitness

What drives animal behavior ultimately boils down to a pretty simple factor: survival. Evolution rewards behaviors that help an individual escape predators or find food. 'Survival of the fittest,' right? This is true to an extent, but there is an even more powerful influence: the drive to reproduce. In evolutionary terms, living a long life only matters insofar as the individual reproduces and passes along their genes. Really, we should be saying, 'Reproduction of the fittest.' So, **reproductive success** is a powerful force in nature, and is the most important driver of animal behaviors.

Innate vs. Learned Behaviors

Some animal behaviors are innate (genetically hardwired), while others are learned, or developed through experience. In many cases, behaviors have both an innate component and a learned component.

Territoriality occurs when individuals (usually males) establish dominance over a particular region and, oftentimes, the females of that region. They defend their territories from other males, violently when necessary, to ensure that they have exclusive access to resources and mating rights. A common example of this is male bighorn sheep clashing heads in battle over harems of females. Bird species, like peacocks and birds of paradise, are known for their incredible displays.

A **home range** is the area in which an animal lives on a regular basis. Home ranges can stretch for many miles or only a few feet. The size of a home range often depends on the size of an animal. Home range size is related to **habitat quality**. In higher-quality habitat, home ranges tend to be smaller than in poor habitat. To estimates the size of home ranges, researchers must collect data on habitat, resources, and other attributes of the landscape, so that they can understand basic behaviors of animals and their environment.

A **seasonal home range** is the area an animal uses in a particular season of the year. A seasonal movement, or migration, is made when an animal moves from one seasonal home range to another. Migration may represent movements to and from wintering and nesting areas, such as waterfowl and songbirds.

Migration is the seasonal movement of animals from one habitat to another in search of food, better conditions, or reproductive needs. The more widely a species moves (i.e., the larger its home range), the more likely it is to move beyond areas where it is protected.

Concentration is a kind of animal behavior, in which some species have aggregation behaviors that make them vulnerable to disturbance or hunting. For example, bats may congregate in large numbers in particular caves to have their young, making significant portions of their total population especially susceptible when their habitat is disturbed by human visitation or damaged by the cave's commercialization or flooding.

Various species of groupers (fish species) often come together to spawn on a few nights of each year tied to phases of the moon and at traditional mating sites. Fishermen who know these sites and the timing of spawning can devastate large populations of these species by concentrating their efforts during this most vulnerable time in the fish's life cycle.

PRACTICUM: ANIMAL BEHAVIOUR

Benefits of wildlife

- All elements of living resources and their ecosystems are interdependent, and deterioration or extinction of one element leads to damaging ecosystems as a whole.
- Wildlife is an essential component of various food chains, food webs, biogeochemical cycles and energy flow through various trophic levels.
- Seed dispersal and predation are two of the most studied roles of mammals and birds in tropical rain forests.
- Many mammals and birds exhibit trophic foraging strategies that include the consumption of fruits or their constituent parts.
- A great number of plants rely upon vertebrates as seed dispersers or pollinators. Such services by vertebrates can regulate the recruitment of trees by selectively predating and/or dispersing seeds.
- From a forest use perspective there are also numerous reasons to protect wildlife. Many species directly influence the processes of forest regeneration that are required for long-term sustainability of timber production.
- Commercial crops such as coffee (*Coffea canephora*) can benefit from a species-rich and abundant bee assemblage, which in turn depends on the preservation of natural forests and forest fragments in the vicinity of those coffee agroforestry systems
- At least 450 economic products including timber, fruits, fuelwood, fiber, medicines, tannins and dyes, are derived from plants for which fruit bats are pollinators or dispersal agents.

- These services are rarely well recognized but their loss has major long-term implications for all forest derived products and services.

Habitat Assessment

All wildlife need appropriate habitat. Habitat must provide the basic needs of wildlife: food, water, shelter, space, air. All habitat components must exist in sufficient quantity, quality, and arrangement to support a species. The specific habitat needs vary by species. Forest habitat components can be identified and compared to species needs to determine if the forest can provide habitat for that species. There are a number of scales and components to identifying appropriate habitat. These include:

- Species distribution/range – whether the species occurs in the geographic area of the forest
- Composition – the variety of plant species in an area
- Structure – the horizontal and vertical distribution of layers in a forest, including height, diameter, and species present.
- Interspersion of habitats – wildlife species often have different requirements during different seasons of the year. Interspersion is the relationship between the different habitats a species needs.
- Minimum area – the minimum area of contiguous habitat that is required before an area will be occupied by a species. Many wildlife species have minimum area preferences, that is, regardless of the quality of habitat, size may be a limiting factor.
- Availability of food – often the availability of food is a key determinant of habitat suitability. Carnivorous species, especially, are most often limited by food availability rather than other habitat components.

PRACTICUM: HABITAT ASSESSMENT

Population Ecology: Definitions

Population is the number of individuals in a given area.

Population Ecology is the study of populations in relation to their environment and its influences on density, distribution, age structure, and population site.

Density is the number of individuals (populations) divided by the size of the focal area.

Immigration is the influx (coming in) of individuals from another area

Emigration is the movement of individuals out of a population

What factors stop a population from growing indefinitely?

Births and **Immigration** cause populations to increase while **Deaths** and **Emigration** cause populations to decrease.

A **life table** is a summary of the survival pattern of a cohort (group of individuals in a population born at the same time), in order to understand the survival pattern of a population. A **survivorship curve** is a graphic representation of a life table.

Exponential growth of a population of any species is not sustainable for long, and this growth progression ends when a population reaches the **carrying capacity** for the environment they are in. Carrying capacity refers to the maximum population size for a species that an ecosystem can support.

Different species grow differently because of their **life history traits**. This refers to a combination of characteristics in a species, which affect its reproduction and survival.

Some changes in population are **density dependent** and affect populations that have higher numbers more than populations that have low numbers e.g. disease. Other changes in populations are **density independent** and affect populations no matter the size, such as natural disasters.

Populations of different species also exhibit different patterns of **concentration**:

- some are **aggregated** around resources (e.g. picathartes/bats need rocky cliffs for nesting)
- some are **scattered** widely because of home range needs (e.g. predators need a large area to hunt enough food away from other predators)
- Some are **random** in concentrated due to dispersal method (e.g. plant species are dispersed by animals randomly)

<u>Population regulation</u>

Predation can affect the population of a prey species that is growing a lot, as the species becomes easier to encounter for the predator.
Territoriality can also limit populations from becoming too dense in an area, despite availability of resources, as individuals drive away others from their ***home range.***
Dispersal of individuals means that there are often individuals moving constantly between populations. For some populations which are low in size and in danger of becoming unstable, the arrival of new individuals can increase the chances of persistence.
Disease can spread more rapidly in areas where populations are denser, and populations are controlled this way from growing too much.

Why do some populations show radical fluctuations in size over time, while others remain stable?
Contrary to the view that populations are mostly stable, studies have shown that populations fluctuate greatly over time in different seasons or periods, based on factors such as weather, predation. The effect of these on different populations depends on the species and the habitat they exist in. The **population cycle** refers to the regular increases (**boom**) and decreases (**bust**) of populations depending on the resource/s that most strongly affects them.

<u>Fundamentals of Wildlife</u>

How to we learn about and monitor wildlife?

Estimation is necessary to efficiently monitor wildlife populations because it is nearly impossible to count every individual in a population. Population size can be estimated using:

***Mark-recapture method** can be used by capturing a random sample of individuals and marking them. These individuals are released back into the population, and given time to mix. Another random sample is taken of the entire population (marked and unmarked). The size of the population can then be estimated based on how many of the second group contained marked individuals.

***Index of population size** refers to any item or feature which is closely associated with the population, e.g. chimpanzee nests. The number of nests is counted along transects or in randomly selected plots, and the number of individuals which each nest represents is calculated. This can then be used to extrapolate the number of individuals in population.

***Sampling** refers to the counting of a small section of the population based on a random method, and using this number to estimate the population size. It is the most often used method because it is the most efficient and convenient, and flexible across many different taxa. Sampling can make use of direct or indirect signs (dung, feathers, hair, feeding marks, etc…).

PRACTICUM: Camera Trapping

Table of sampling techniques by taxa

	Transects	Point Counts	Traps (incl. Mist Netting)	Camera traps	Nest counts	Genetic sampling	Plots	Active search
Birds	■	■	■	■				
Large mammals	■			■				
Great apes	■			■	■	■		
Small mammals			■				■	
Amphibians and reptiles	■		■				■	■
Fish		*Visual counts*	■					

Other information besides population size can be obtained through sampling, such as location, habitat preference, behavior, and more.

PRACTICUM: Working with Wildlife Data

Species can be conserved in the wild (**IN SITU**) or in enclosed controlled areas (**EX SITU**) such as zoos. There are conflicting views on the long-term effectiveness of zoos for conservation, considering challenges such as disease, habituation, inbreeding depression, and unforeseen differences between simulated habitat and real habitat (at re-release). In situ conservation is

also faced with serious challenges, such as poaching, illegal extraction, invasion of alien species, and degraded environment. Wildlife conservationists try to manage wildlife population levels through **habitat improvements** and **elimination of threats**. Some of the most severe threats to species are those caused by humans.

Human Threats to Wildlife

Wildlife everywhere is under threat of extinction and struggling for survival. Some of the most severe threats to wildlife are:

Habitat loss: the growth of the human population, industrialization, urbanization, increased need for resources have contributed to the large-scale destruction of habitats of plants and animals. Habitat loss is an umbrella term which also applied to the degradation and fragmentation of species habitat. These can affect species nearly as strongly as the loss of their habitat. Habitat loss/degradation, and fragmentation are caused by assorted human activities, most notably **logging**, **agricultural expansion**, and **mining**. Logging for the harvest of timber or other forest product and for the clearing of areas for use by humans for building of new areas to live, agricultural expansion, or extraction of minerals (mining), lead to the same outcome—loss of species habitat. In addition, roads built to support these activities often cause further problems for wildlife in nearby remaining habitat. Unlike other threats which affect certain wildlife groups more severely than others, habitat loss affects species across the board.

Pollution: The release of harmful or abundant materials into wild environments can result in degradation of the quality of water, soil, and air, and increase the amount of noise. Noise is a problem for countless species which use sound to communicate the presence of danger, breeding availability, presence of food, and generally to maintain contact with the rest of the population. The damage to air, water, and soil can lead to the accumulation of unhealthy materials in individuals which results in their death.

Hunting: the killing or capturing of wildlife for food or trading most strongly affects large forest fauna, e.g. large mammals, reptiles, and birds, and charismatic species (colorful birds and primates). Overhunting alters the balance of wildlife in habitats and causes subtle shifts in the habitat. Traditionally, hunting is non-selective, meaning that individuals are targeted regardless of their condition (this is a problem especially when hunters kill pregnant females, thus decreasing the productiveness of the whole population in the next generation).

Invasive species: the introduction of alien or exotic species to a habitat can be caused by accidental transfer of plant matter, increased access due to the existence of roads or removal of previously buffering habitat. This can lead to competition for resources as a new species which is not historically accounted for in the ecosystem suddenly appears and begins to use the resources already needed by the existing population. The increased proximity of a new species (or feral individuals of the same species) can lead to an increase in diseases as the resident population is not used to dealing with the same diseases as the invasive one.)

Diseases and Zoonosis

Pathogens are tiny organisms that can cause diseases (bacteria, viruses, fungi, and parasites). Many infectious diseases in humans are historically caused be pathogens introduced from animals. This is due to human practices which cause change and disturbance in ecosystems we interact with, resulting in rapid increase and transmission of pathogens. Some of these

practices are the **hunting**, **consumption, keeping, and selling of wildlife**, **intrusion of humans into wildlife areas**, e.g. for tourism activities, and **destruction of wildlife habitat** which may cause some species to flee to new areas.
Wildlife, forestry, and conservation experts have an important role to play in keeping people, animals and ecosystems healthy. Practical strategies can help avoid or reduce disease risks. Protected area managers can **consider disease risk** in their site management practices, to inform decisions concerning site uses, animal reintroduction protocols, and community awareness.
Rangers can report unusual disease events and signs of ecosystem degradation that that threaten humans, animals and the environment.

Wildlife Conservation Strategies

Habitat Conservation: the preservation of a habitat to the benefit of a species or species.
Sustainable Land Use Practices: the careful use of converted land with wildlife-friendly practices which enable wildlife species to exist in or near the converted area.
Research and Monitoring: the continuous recording and counting of wildlife to maintain a clear view of populations, in order to respond to threats before they become too severe to change.
Recycling: the repurposing or re-use of products in order to decrease the demand for new products and therefore decrease materials harvested from wildlife habitats.
Public Education and Awareness: the engagement with the public to ensure issues surrounding wildlife survival are widely known, which can lead to kinder use of habitats and more care for at risk species.
Creating Wildlife Areas: the deliberate alteration to converted (sometimes even urban) areas to include resources which wildlife species can benefit from.
Planting Trees: the propagation of trees that can be used to increase the ground cover of an area, or aid in reforestation projects to the benefit of wildlife species which require shelter from tree species.

Wildlife Management in Liberia

Wildlife management is at present, mostly **custodial**, rather than manipulative. This means that wildlife management staff is mostly **dedicated to protection of wildlife species and habitats**, as the main way of maintaining wildlife populations. This is focused on the **formation and management of protected areas**, and **elimination of wildlife crime**.
Liberia's protected area and proposed protected area network is the focus of the FDA, with rangers and other PA staff spread across the country and supported by diverse non-governmental organizations (NGOs), private partners, and local communities.
The Wildlife Crime Unit is responsible for responding to instances of captured wildlife or encounters with wildlife products such as bush meat, scales (of pangolins), feathers, or duiker horns. Presently all bushmeat is prohibited in Liberia, as curing practices make it nearly impossible to distinguish endangered species from other species. Any products confiscated are publicly burned to remove incentive for success from all involved parties.
Human Wildlife Conflict is inevitable when protected areas without boundaries exist close to human settlements. Farming is a source of income for many of the communities. Additionally, there are some large species which can potentially cause a lot of damage. This occurrence is

accounted for under Liberia's Wildlife management scenario through monitoring to enable management to respond to incidents in time.

The Role of Local Communities

In recent years, conservation has shifted away from the practice of protecting wildlife habitats without consideration for local communities. This shift was brought about by the recognition of some simple facts:

- Poverty is the leading cause of environmental disturbance.
- Social factors play a critical role in almost every conservation problem.

As a result, **conservationists have to develop an understanding of social problems in order to effectively protect wildlife populations**. This led to the realizations that conservation is most effective when is it combined with community development goals, and that active participation of communities can lead to more effective removal of threats, awareness raising, and preservation of habitat.

Participatory management strategies are best practice, as they encourage community representation in protected area management. **Integrated Conservation-development projects** (including alternative livelihood projects) are also more commonly included in protected are support strategies.