

## SEGMENT FOUR, STUDY GUIDE

**Note: this is a very general list of topics for which you are responsible for Exam IV. Please also see the topics listed on the syllabus. There may be some differences between the emphasis of topics on the exam and this study guide. You are encouraged to obtain specific information from the lecture outlines and the readings in the text.**

**Behavior** includes every action of an animal, and how that action is accomplished. Both genes (*fru* in male *Drosophila*) and experiences shape behaviors **Ethology** is the study of behavior. Examples:

Unlearned—Fixed Action Patterns (FAP) as in male three-spined stickleback fish.

Learned—Imprinting is an irreversible type of learning that is limited to the **sensitive period**.

**Altruism/Cooperation** - behavior that reduces one individual's fitness but increases another's fitness; **Inclusive Fitness** (William Hamilton) is the total contribution to the next generation.

**Hamilton's Rule:** selection favors altruism when  $rB > C$  where

$r$  = the coefficient of relatedness;  $B$  = extra offspring (benefit) produced by altruism, and

$C$  = the cost (number of fewer offspring) produced by the altruist.

**Kin selection** occurs when altruism towards close relatives increases inclusive fitness.

**Coefficient of relatedness** - The proportion of identical genes between two individuals.

Ecologists study at six different levels:

- organismal ecologists study animal behaviors, such as those above.
- population ecology;
- community ecology (a community refers to all the organisms in a region);
- ecosystem ecology – comprises both organisms and abiotic factors in a region;
- landscapes – areas where different types of ecosystems are adjacent;
- the biosphere is the global ecosystem.

Biotic Components (Organisms), which are classified by ecologists as

- Competitors (within and between species)
- Predators, parasites, pathogens and herbivores
- Prey & hosts
- Scavengers and Decomposers.

Abiotic (nonliving) Components

- 1) Mineral nutrients in rocks, soil or dissolved in water effect pH.
- 2) Climate Patterns - global (**macroclimate**) or restricted (**microclimate**):
  - a) Solar intensity and temperature; in aquatic environments, sunlight is limiting.
  - b) Ocean circulation (e.g., California current; Gulf Stream)
  - c) Mountains (Rain-shadow effect).

Aquatic biomes (coral reefs; temperate lakes; wetlands, etc.)

Terrestrial biomes (tropical forests; deserts; etc.)

**Climographs** can indicate the expected types of terrestrial biomes;

**Population ecologists** study how population size, density, distribution, and age structure are determined by biotic and abiotic factors. Growth can be described by growth curves (logistical, exponential).

**Carrying Capacity** is the maximum population size that available resources can support.

The **Ecological footprint** is the total of water and land areas required by each person, city, or nation to produce all the resources it consumes and to absorb all the wastes that it generates.

The history of human population mostly shows exponential growth.

A **demographic transition** has been observed when regional populations shift from relatively high birth and death rates (zero pop. growth) to relatively low birth and death rates (also zero pop. growth).

A **community** consists of all of the organisms in a particular area. Organisms occupy ecological **niches**—the sum of the biotic and abiotic resources

Interspecific interactions are defined in terms of the affect on fitness: + indicates an increase in fitness; 0 indicates no affect on fitness; - indicates a decrease in fitness.

**Interspecific Competition** (- / -) occurs when similar resources are utilized by two different species. Two species with identical niches cannot coexist because of **competitive exclusion**.

Outcomes of interspecific competition: **Resource partitioning** and **Character Displacement**.

**Predation** (+ / -) or (- / +) is an interaction in which one organism eats another and includes herbivory, parasitism, and pathogenicity. Adaptive outcomes of predation include: **Cryptic** coloration; **Aposematic** (Warning) coloration; **Müllerian mimicry** (Fritz Müller proposed this in 1879) and **Deceptive** Coloration (or Batesian mimicry) (Henry Walter Bates proposed this).

**Mutualism** (+ / +) is an interaction causing the fitness of both interacting species to increase due to **coevolution**.

**Commensalism** (+ / 0) or (0 / +) is somewhat difficult to confirm.

Species that shape communities include: **dominant** species, **keystone** species, and **foundation (facilitator)** species.

**Ecological succession** refers to transitions in community composition over time and may be:

- Primary—in a relatively lifeless area without soil after glacial retreat etc. or
- Secondary—in a recently disturbed area with intact soil.

Human activities cause ecosystem disturbances: disruption of nutrient cycling, acid precipitation, biological magnification, global warming, ozone depletion, introduced species, & cultural eutrophication.

Specific conservation strategies:

1. Preserve biodiversity hot spots;
2. Target invasive species for eradication.
3. Maintain minimum viable population size (MVP)
4. Preserve ecological landscapes with natural gradations from one type of ecosystem to another.

**Edges**, are boundaries between ecosystems.

Movement **corridors** allow organisms to travel between fragments of habitat.

5. Pay for natural resources.

Broad conservation activities

1. Establish nature preserves
2. Restore degraded habitats
  - a. **Restoration Ecologists** return degraded ecosystems to their natural states.
  - b. **Bioremediation** is the use of organisms to detoxify polluted ecosystems.