



APES in a BOX: The Review Sessions

Ecology

Ecology is the study of relationships formed between the **biotic** (living) and **abiotic** (non-living) factors found in nature. Environmental Science studies these relationships and interactions at several different levels. Environmental scientists also studies man's place in nature.

Community Interactions

A **community** is all of the different populations of an area.

An **ecosystem** is the community and the non-living factors of an area.

The **biosphere** consists of the **lithosphere** (land), **hydrosphere** (water), and **atmosphere** (air) that contain life.

Life on earth is very diverse. Natural selection is the driving force behind this diversity. Understanding that organisms respond to their environment is critical for ecologists and environmental scientists. It allows them insight into ecology, environmental health, and agriculture problems which includes **pesticide resistance**.

The **niche** of a species is defined by its exploitation of resources and its interaction with the community. The **fundamental niche** is the full niche that a species can occupy. However, due to **interspecific competition** (between different species) and **intraspecific** competition (between same species), the **realized niche** is the part of the niche that the organism actually fills.

Resource partitioning occurs when species use resources at different times in different ways. This occurs in many ecosystems, but the tropical rainforests take it to the extreme.

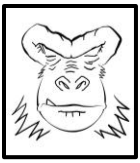
In addition to competition, close interspecific relationships form in a community. These **symbiotic** relationships can be defined in four ways:

Parasitism is when one species benefits while harming the other (host). Ex. Tick and coyote

Mutualism occurs when both species benefit. Ex. Honey bee and flower

Commensalism is when one species benefits, but the other is neither helped nor harmed. Ex. Cattle egret and cow

Amensalism occurs when one species is harmed and the other is unaffected. Ex. Cattle creating trails in grass



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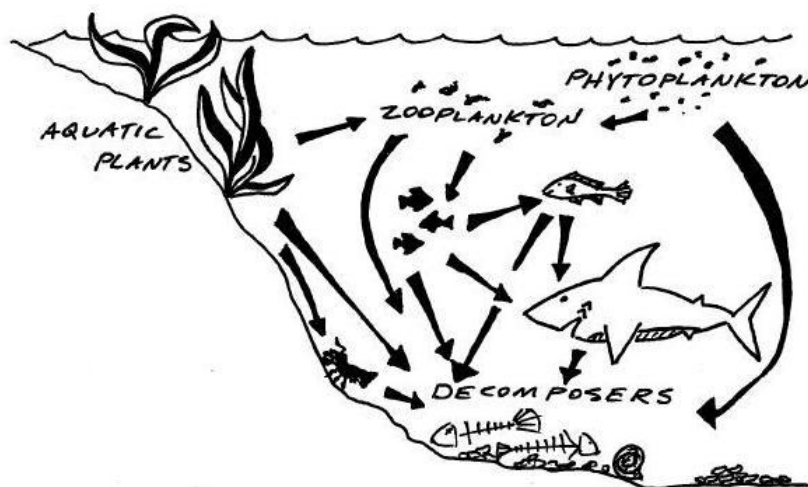
Predator-prey relationships also form between members of a community. The populations of the species involved in this relationship are controlled in two ways. **Top-down control** is when the predator controls the population of the prey species. **Bottom-up control** states that the prey item directly controls the population of the predator. In reality, both have an effect on the size of each other's population.

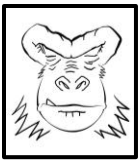
In an ecosystem, all members of the community have a role in which they play. However, some species have a greater impact on an ecosystem than their biomass would suggest. These species are known as **keystone species**. Examples of keystone species are the sea otters of the Pacific and their maintenance of the sea urchin population. Ecosystems are often defined by the presence of unique species. These species are known as **indicator species**. Indicator species also provide insight into the health of an ecosystem.

The one way flow of energy from the sun maintains life on Earth.

Autotrophs or **producers** convert solar energy into chemical energy through photosynthesis. This energy then flows to **heterotrophs** when they consume the plants. Organisms that eat only producers are known as **primary consumers** or **herbivores**. **Secondary** and **tertiary consumers** obtain their energy from consuming other heterotrophs. Organisms that only eat heterotrophs are **carnivores**. Organisms that eat both producers and consumers are **omnivores**. **Detritivores** consume dead organisms. **Decomposers** further breakdown the **detritus** and convert it into inorganic nutrients that plants can readily use.

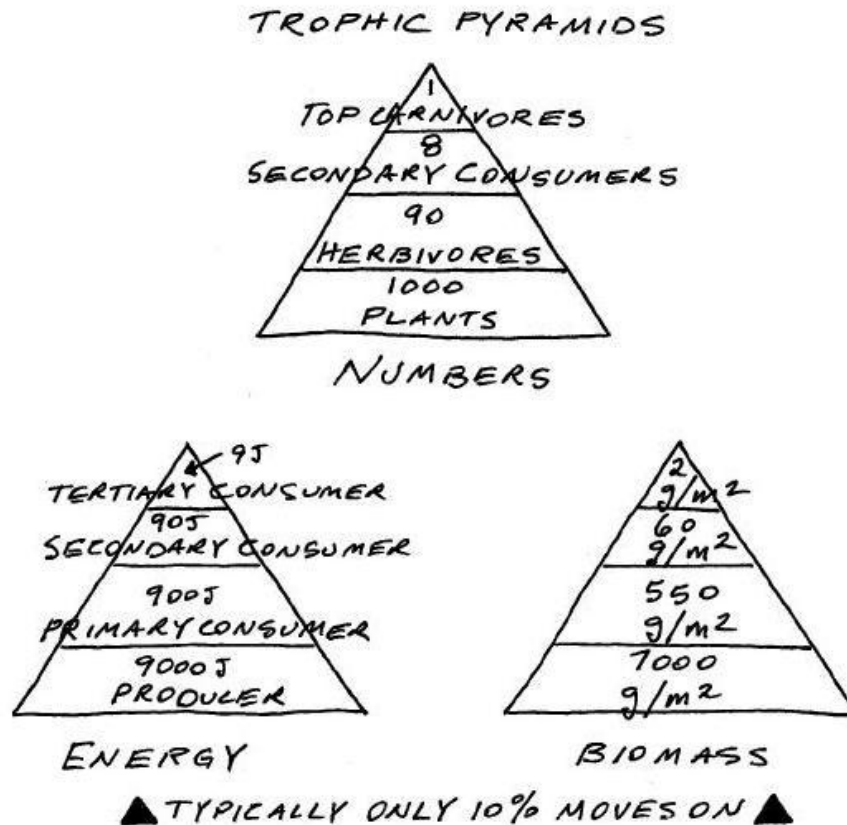
The feeding relationships of an ecosystem are often presented in **food chains** and food webs .





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The transfer of energy in an ecosystem can also be illustrated with **ecological pyramids**. These ecological pyramids can be used to represent energy efficiency, biomass, and numbers in each feeding level or **trophic** level. All of these ecological pyramids point out the fact that energy, biomass and numbers (generally) decrease in higher trophic levels.



When new communities are established or existing communities are disturbed, a process called **ecological succession** will take place. This process describes the steps in which the new communities are formed. Each step is made by an organism changing its surroundings. These changes allow subsequent species to survive and further alter the environment.

Primary succession is the establishment of a community in a soil-less environment. This could be in an area of a lava flow or the retreat of a glacier. **Pioneer species** like mosses and lichens (symbiotic relationships of fungi and algae) are the first inhabitants. As they grow, they release acids that break down rock into smaller sediments. They further add to the creation of soil when they die and decompose. Small plants and insects arrive next, providing even more



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nutrients and mass to the soil. Over time, if precipitation is sufficient, larger plants and trees will become established.

Secondary succession occurs in ecosystems that have been disturbed by fire or other natural disasters. It also takes place in land disturbed by man that is allowed to return to its native state.



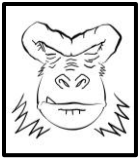
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Ecology Review Questions

1. Which of the following is an abiotic factor in an ecosystem?
 - A) Dissolved oxygen
 - B) Soil pH
 - C) Predators
 - D) Flora and Fauna
 - E) A and B only

2. Which of the following refers to a species that may be monitored to determine the health of an ecosystem?
 - A) Keystone species
 - B) Indicator species
 - C) Decomposers
 - D) Primary consumers
 - E) Threatened species

3. An autotroph
 - A) Is a top level predator.
 - B) Consumes dead organisms on the ocean floor.
 - C) Is an organism that eats plants.
 - D) Is an organism that is capable of making its own food.
 - E) is often the decomposer in a food chain.



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4. Which of the following terms describes an organism that eats both plants and animals.

- A) Omnivore
- B) Producer
- C) Carnivore
- D) Autotroph
- E) Herbivore

5. Which organism is responsible for breaking down dead organisms and returning nutrients to the ecosystem?

- A) Decomposers
- B) Herbivores
- C) Carnivores
- D) Primary Consumers
- E) Secondary Consumers

6. Approximately what percentage of energy is lost in between each trophic level?

- A) 10%
- B) 30%
- C) 50 %
- D) 90%
- E) Energy transformations between trophic levels is 100% efficient.



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Multiple Choice Scoring Guidelines

1. E	3. D	5. A
2. B	4. A	6. D

Multiple choice points earned/6 * 100 = Quiz average

(_____) / 6 * 100 = _____ Quiz Grade