Biology Key Terms

Ecology

**INTRODUCTION TO ECOLOGY**

**Ecology** - study of the interactions between organisms and the nonliving components of their environment.

**Biosphere** - the portion of the Earth (air, water and land) where living things exist.

**Biotic** - living things that shape or affect an ecosystem

**Abiotic** - non-living things or factors that shape or affect an ecosystem

**Ecosystem** - all organisms and the nonliving environment in a defined area.

**Population** - all the members of the same species that live in a defined area at one time.

**Organism** - the simplest level of organization in ecology; a living thing.

**Biome** - ecosystems that are identified by their climax communities within a large geographical area having similar plants & animals as well as consistent climate.

- Terrestrial Biomes - biomes that cover land masses.
- Aquatic Biomes - biomes that are based within fresh or salt water

**ECOSYSTEM ECOLOGY**

**Habitat** - a description of the physical location of a population or community of organisms

**Niche** - a role or profession of an organism in its community and in ecology; it’s habitat combined with it’s behavior in that environment (i.e., range of conditions tolerated, methods of obtaining resources, number of offspring, time of reproduction and all other environmental interactions for the organism.)
• Fundamental niche - the range of conditions that a species can potentially tolerate and the range of resources it can potentially use.
• Realized niche - a species is the range of resources it actually uses; this may vary based on competition or other interactions.

**Photoautotrophs** - producers; green plants, algae or cyanobacteria that convert light energy into food that can be consumed via photosynthesis.

**Chemoautotrophs** - organisms that get their energy by consuming inorganic molecules (example: bacteria in sulfur springs or on hydrothermal vents).

**Heterotrophs** - consumers; obtain energy from food that they take into their bodies.

**Food chain** - a simple model that scientists use to show how matter and energy move through an ecosystem; arrows in a food chain move in the direction of energy flow.

**Herbivores** - consumers that feed directly on producers.

**Carnivores** - consumers that feed on herbivores or other carnivores.

**Omnivores** - consumers that eat both plants and animals. (examples: include humans, bears, raccoons, robins).

**Decomposers** - saprotrophs; heterotroph consumers that get their energy by breaking down dead organisms without ingesting them.

**Trophic level** - the position that an organism occupies in a food chain. (example: primary consumers)

**Primary Consumers** - are producers that use light directly.

**Secondary Consumers** - are herbivores that feed directly on plants.

**Tertiary Consumers** - are carnivores that feed on herbivores or other carnivores.

**Food web** - a model that expresses all possible feeding relationships at each trophic level in a community.

**Biomass** - the amount of dried organic material in an organism/s.
Ecological Pyramids - (trophic pyramid, energy pyramid) - illustrate the flow of energy, biomass or numbers at each trophic level in an ecosystem; the highest level is the top of the food chain.
- Pyramid of Energy - illustrates the energy decrease at each trophic level.
- Pyramid of Numbers - illustrates the population size at each trophic level.
- Pyramid of Biomass - illustrates the biomass of living material at each trophic level

Primary productivity - refers to the total amount of matter made by producers within an ecosystem.

Water (Hydrologic) Cycle - The movement of water between different reservoirs on the earth, under ground and in the atmosphere is known as the water cycle.
- Evaporation - process of a liquid converting to the gaseous state
- Transpiration - loss of water through stomata underneath leaves
- Condensation - transition from a gas to a liquid as vapor condenses
- Precipitation - the falling to earth of any form of water (rain or snow or hail or sleet or mist)
- Runoff - precipitation that is not absorbed or used flows into lakes etc.
- Groundwater - water below the surface of the soil, between soil pores and in rock spaces.

Carbon Cycle - process by which carbon is cycled through the biotic and abiotic environment in various chemical forms.
- Photosynthesis - process of converting light energy, carbon dioxide and water into sugar and oxygen
- Cellular Respiration - process of using the stored energy in food such as sugar along with oxygen into carbon dioxide and water
- Decomposition - the slow breaking down of organic matter; usually assisted by microorganisms or fungi, releasing carbon dioxide into the atmosphere
• Deposition - Coal, petroleum, and calcium carbonate rock are deposited in sediment and underground. Calcium carbonate deposits are eroded by water to form carbon dioxide. Large amounts of carbon are tied up in wood, only returning to the atmosphere when wood is burned.

Nitrogen cycle - process by which nitrogen is cycled through the biotic and abiotic environment in various chemical forms.

• Nitrogen Fixation - is the conversion of nitrogen gas (N₂) to ammonia (NH₃) by specific bacteria or lightning strikes; Ammonia (NH₃) can be absorbed by plants from the soil, and used to make proteins. It then enters the food web for consumers.

• Assimilation - Consumers obtain nitrogen from the plants and animals they eat by digesting the food’s proteins and using it to make their own proteins; plants assimilate nitrogen by absorbing nitrate (NO₂⁻) or ammonium ions (NH₄⁺) in the soil.

• Ammonification - decomposers return the nitrogen from the remains of dead plants and animals back to the soil as ammonium (NH₄⁺)

• Denitrification - occurs when anaerobic bacteria (chemoautotrophs) break down nitrates (NO₃⁻) and release nitrogen gas (N₂) back into the atmosphere.

• Nitrification - Bacteria convert ammonia (NH₄⁺) into nitrates (NO₃⁻) that plants can utilize.

COMMUNITY ECOLOGY

Competition - when organisms in same or different species attempt to use an ecological resource in the same place at the same time.

Predation - an interaction in which one organism captures and feeds on another organism.

Mutualism - symbiotic relationship where both species benefit

Commensalism - symbiotic relationship in which one member benefits and the other member is unaffected
Parasitism - symbiotic relationship in which one member benefits and the other member is harmed
Succession - a series of predictable changes in an ecosystem over time
Sere - each intermediate community that arises through succession
Primary Succession - occurs where there has never before been an ecosystem; for example, a volcano erupts spreading lava
Secondary Succession - the re-population of an area after its destruction due natural or man-made causes
Pioneer species - the first species to colonize a new habitat; usually a lichen
Climax community - the community that will remain stable in a given area
Biodiversity - the number of different species in an ecosystem and how common each species is

POPULATION ECOLOGY
Geographic distribution (or range) - is a term that describes the area inhabited by a population and can vary from a few cubic centimeters to millions of square kilometers.
Population density - number of individuals in a population in a given area at a given time.
Exponential Growth - growth when individuals of a population reproduce at a constant rate without limiting factors.; it is characterized by a J-curve (slow start then rapid and continuing increases)
Logistic Growth - is known as a realistic, slow growth curve that most populations exhibit because resources are limited; it is characterized by a S-curve (showing a lagging phase, an exponential phase and then a slowing, logistic phase before settling down into its carrying capacity)
Carrying capacity - the maximum number of individuals that an ecosystem is capable of supporting; often represented by the symbol, K.
Limiting factors - conditions or events that may reduce the birth rate and/or increase the mortality rate.
• Density-dependent limiting factor - a limiting factor that depends on population size.
• Density-independent limiting factor - a limiting factor that does not depend on population size and is usually related to a natural event or disaster.

*r*-strategist species - exploit less-crowded and unstable ecological niches, and produce many offspring, each of which has a relatively low probability of surviving to adulthood
*K*-strategist species - strong competitors in crowded but stable niches, and invest more heavily in fewer offspring, each of which has a relatively high probability of surviving to adulthood

**HUMAN IMPACT/ISSUES**

**Renewable resources** - replaced or recycled by natural processes. (examples: plants, animals, crops, soil, water (if carefully managed), wind, solar, geothermal power)

**Nonrenewable Resources** - are those that are available only in limited amounts and not replaceable (example: metals, such as tin, silver, gold, uranium, and copper)

**Greenhouse effect** - Natural process that traps heat in atmosphere; Atmospheric gases (CO₂) act as an insulating blanket to trap heat and keep the earth from getting too cool at night; excess CO₂ may trap too much heat, resulting in global warming.

**Global Warming** - when the greenhouse effect is amplified by excess CO₂ in the atmosphere.

**Pollution** - the contamination of soil, water, or air and is a result of human activity.

**Eutrophication** - the addition of excess nutrients to a body of water, in many cases due to fertilizer runoff, that causes an bloom of producers. This results in less oxygen, destroying other life in the body of water.
Acid Rain - air pollution containing sulfur oxides reacts with water vapor in the atmosphere to produce sulfuric acid. This sulfuric acid falls to the ground, which damages crops, kills organisms in aquatic ecosystems, and erodes buildings and monuments. Acid precipitation leaches calcium, potassium and other valuable nutrients from the soil, making the soil less fertile.

Biodegradable - wastes/object can be broken down naturally by bacteria or other decomposers

Non-biodegradable - object/waste that stays in environment for 100's to 1000's of years

Biological Magnification (biomagnification, bioaccumulation) - the increase in concentration of a chemical as trophic levels increase.

Integrated Pest Management (IPM) - an approach to reducing pests that considers all possible pest control techniques to minimize environmental impact and it’s effect upon human health.

Ozone layer - high in stratosphere; protects Earth from U.V. radiation; $O_2$ molecules are converted into $O_3$ molecules to create ozone. Some air pollutants can break down the ozone layer.

Threatened - when population declines rapidly.

Endangered - when numbers are so low that extinction is possible in near future

Extinction - marks the end of the living members of any species.

Invasive species (alien, introduced or non-native species) - plant or animal species that is non-native to an area, yet has colonized and spread to the new location, causing damage ecologically, economically or to human health. They typically have no natural control in the newer environment.