ECOLOGY
Science Review

When studying for this portion of the test, be sure to review the following:

1. Analyze dependence of organisms on each other and the flow of energy and matter in an ecosystem.
   A. Evaluate relationships between organisms, populations, communities, ecosystems, and biomes.
   B. Describe the flow of matter and energy through an ecosystem by organizing the components of food chains and webs.

Assessment will focus on the following:

1. Understanding the identifying characteristics of major biomes of the world on a conceptual level, rather than identifying them on maps.
2. Describing predator-prey, producer-consumer, parasite-host, scavenging, or decomposing relationships among organisms.
3. Understanding and analyzing the physical conditions (food, space, water, air, and shelter) necessary for organisms to survive in an environment.
4. Understanding that the amount of matter remains constant as it flows through an ecosystem.
5. Explaining the flow of energy through an ecosystem and that energy may change from one form to another.
6. Using diagrams to interpret the interactions of organisms within food chains and webs.
7. Determining the role of different organisms in food chains and webs.

Become Familiar with the following terms:

Heterotroph
Autotroph
Adaptation
Habitat
Niche
Food Chain
Food Web
Predator
Prey
Parasite
Decomposer
Host
Producer
Consumer
Population
Community
Ecosystem
Symbiosis
Parasitism
Herbivore
Carnivore
Omnivore
Biome
Tundra
Taiga
Temperate Deciduous forest
Desert
Grassland
Tropical rain forest
Arid

ECOLOGY

ECOSYSTEMS

Life on earth extends from the ocean depths to a few kilometers above the earth's surface. The area where life exists is called the biosphere. The biosphere can be more easily understood by breaking it into smaller components called ecosystems.

An **ECOSYSTEM** is a physically distinct, self-supporting unit of interacting organisms and their surrounding environment. It is made up of biotic and abiotic interactions. The **BIOTIC** factors of an ecosystem are the living organisms in the area. The **ABIOTIC** factors are the non-living, or physical, components of the area like light, soil, water, temperature, wind, and nutrients. The essential factors that make an ecosystem successful are a source of energy, a storage of water, and the ability to recycle water, oxygen, carbon, and nitrogen.

Ecosystems must maintain an ecological balance. This can be helpful or harmful to the members that make up the community depending upon whether they are predators or prey. A **PREDATOR** is an animal that feeds on other living things. The animal it feeds upon is the **PREY**. Lions (predator) hunt down and kill antelope (prey). Recently several state parks have allowed hunting for deer. The deer no longer have a predator to keep their numbers down and so the parks are using man to do that. When there are too many deer, too much of the forest and undergrowth are eaten and there is not enough food for all deer to live a healthy life.

Each of the biotic organisms in an ecosystem interrelate with the others. A **SYMBIOTIC** relationship between two members of a community is one in which one or both parties benefit. **PARASITISM** is a relationship that involves a **HOST** organism which is harmed by the presence of the other organism (fleas on dogs and cats). A parasite/host relationship is usually associated with diseases. HIV is a virus that is a parasite living in the human body. A successful parasite learns to live in its host, harming it but not killing it.

Natural resources are necessary for human survival and the making of necessary products. The natural resources are water, air, soil, wildlife, and forests. Problems that are now being faced are related to erosion, soil depletion, species extinction, deforestation, desertification, and water shortages. Efforts to reverse these problems and their environmental damages are found in the planned programs of reforestation, captive breeding, and planned farming through efficient plowing and planting procedures.

Disruptive changes can easily upset the stability of an ecosystem. Destructive acts of nature can occur. A forest fire can destroy all plant and animal life in a forest, along a river, and around the shore of a pond. It can also pollute a pond with ash.

Humans are unique in our ability to modify our ecosystem. Pollution from human acts can also affect an ecosystem. A chemical spill or pesticides sprayed overhead can kill all plant and animal life with which it comes in contact with. A housing development along the bank of a river or on the shore of a pond can bring both garbage and noise pollution, in addition to direct physical destruction of these habitats.

COMMUNITIES

An ecosystem's biotic factors interact with each other and compose a **COMMUNITY** of living things that coexist. Each community is composed of populations. A **POPULATION** is a group of small individuals of a single species that occupy a common area and share common resources. The number of populations within a community varies. A tropical rain forest community may have thousands of populations while a desert community may have very few.

Just like communities are made up of populations, each population is composed of interacting individuals. Each individual organism lives in a specific environment and pursues a particular way of life. The surroundings in which a particular species can be found is called its habitat. An organism can inhabit an entire ecosystem like a woodpecker might occupy the whole oak forest. But the spider may only inhabit the trunk of one of the oak trees.

The way of life that a species pursues within its habitat is called its ecological niche. An organism's niche is composed of biotic and abiotic factors. Some niches can be very broad (rats) while others can be very limited (panda).

POPULATIONS IN ECOSYSTEMS

The population of an area is affected by the new offspring produced in the area. New plants and animals moving in from other places increase the size of the population. The death of organisms and animals moving out of the area decrease the size of the population. There is a direct relationship between the number of plants and animals in an area which is in ecological balance. If the number of one of them is increased or decreased, it will affect the

numbers of the other. During deer season, the number of deer is reduced by man. The plants that the deer eats will increase during this season.

A change in population may be helpful or harmful to the community. If insects are killed by insecticide, the animals that depend on them for food must move elsewhere. Even the human population changes as the seasons change. In the summertime, the coastal area is more widely populated by vacationing people. In the wintertime, the snowy, mountainous areas are more populated by snow skiers.

THE FLOW OF MATERIALS

Each ecosystem has its producers, consumers, and decomposers. Plants are called **PRODUCERS** because they are able to use light energy from the sun to produce food (sugar) from carbon dioxide and water. Animals cannot make their own food so they must eat plants and/or other animals. They are called **CONSUMERS** and there are several types. **HERBIVORES** are animals that eat only plants. **CARNIVORES** are animals that each only other animals. **OMNIVORES** are animals that eat both plants and animals. **DECOMPOSERS** (bacteria and fungi) feed on decaying matter. Decomposers speed up the decaying process that releases mineral salts back into the food chain for absorption by plants as nutrients.

All living things need energy to grow, energy to reproduce, energy to survive. All ecosystems, therefore, need energy. Their energy begins with the sun. Plants trap the solar energy and, through photosynthesis, convert it into the sugars that are their food. Animals eat the plants, taking some of that sun-harvested energy into themselves. Other animals eat those animals.

Eventually, the animals die. Their bodies are cleaned off by **SCAVENGERS** and dismantled by decomposers. A **SAPROPHYTE** is an organism that feeds on dead organisms (a **DECOMPOSER)**. For example, fungi use the nutrients in dead leaves and other items on the forest floor for food. The remaining minerals are returned to the soil, which is enriched by them so that it is once again fertile and can support new plants. Around and around it goes.

These relationships—which organisms eat which other organisms, and how the energy is passed from one to another—can be thought of in terms of an imaginary chain. In this chain, each organism forms a single link: the chain stretches from the blackberries to the mouse that eats one to the owl that catches the mouse. Such an imaginary chain is known as a food chain. **FOOD CHAINS** describe the flow of energy, in the form of food, from one organism to another. Each organism forms a link in the chain.

Almost all food chains begin with producers harvesting energy from the sun. From there the energy is passed from producers to consumers: herbivores, carnivores, and omnivores. When these die the energy passes to scavengers and decomposers, and back into the soil. Decomposers, as the last step to replenishing the soil, are both the end and the beginning of any food chain.

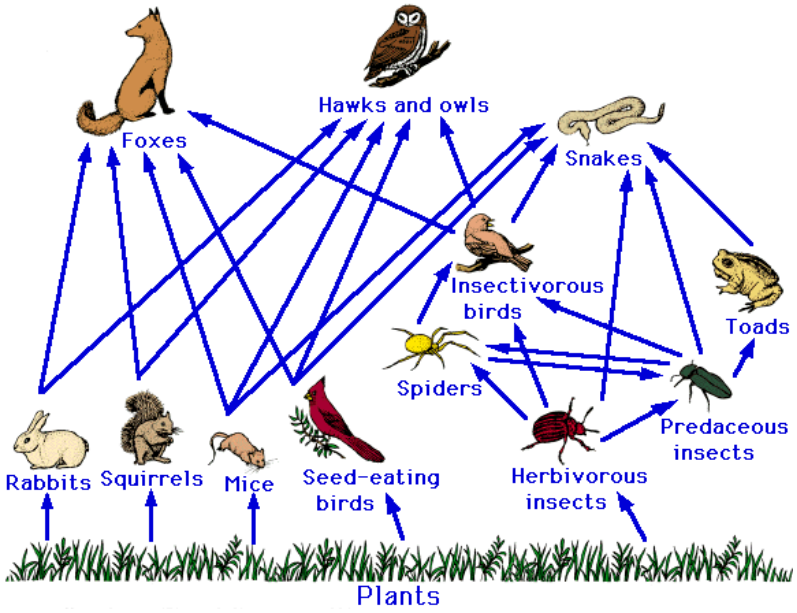
We can see that, as with a real chain, removing any link causes the entire chain to collapse. If the plants were removed, for example, it would not simply affect herbivores—for carnivores eat the herbivores. If the decomposers were removed, the soil would not become replenished with minerals; new plants would not grow; herbivores would not feed on them. And if the sun were removed from the chain—perhaps by pollution blocking its light—nothing else on the chain would remain. The last living recipient of energy in a food chain is called the “top consumer.” It will not be consumed itself until it dies.

Food chains are a helpful way to think about how energy moves through an ecosystem. In any real situation, though, there are many different food chains, all connected to each other. A food web is a diagram that combines food chains to show these connections. Food webs are made of interconnected food chains.

These relationships can also be imagined as a pyramid, with plants on the bottom, then herbivores, and then carnivores. This kind of diagram is known as an energy pyramid.

Energy is lost between every feeding level of an energy pyramid. Only about one-tenth of the energy in plants flows to herbivores. One tenth of the energy in herbivores flows to carnivores. The rest is used up in the process of staying alive or lost as heat.

The most abundant organisms in any ecosystem, aside from decomposers, will be the producers. Plants have the most energy available to them because they trap it directly from the sun. There will be fewer carnivores and will be even fewer top carnivores. Small populations of top carnivores depend on much larger populations of other animals to survive



FOOD WEB

All organisms need certain chemicals in order to live. The most important ones are water, oxygen, carbon, and nitrogen. The continuous movement of chemicals throughout an ecosystem is called recycling. The amount of water or carbon in an ecosystem does not change, but the form of the water or carbon may change. The water may be locked in ice or in a rain cloud and not in a lake or in the ground.

BIOMES

Communities are members of a larger ecological unit called a biome. A biome is an extensive area of similar climate and vegetation. A biome's abiotic (non-living) factors determine what plants and animals live there. The major influences are temperature, light intensity, and patterns of rainfall which determine the availability of water. There are six basic biomes on earth: tundra, taiga, grassland, deciduous forest, desert, and tropical rain forest. You need to be able to understand these biomes and not just locate them on a map.

Biomes that are closest to the poles experience the coldest weather conditions for they are furthest away from the sun due to the tilting of the earth.

Biome	Characteristics	Temperature	Rainfall	Location
TUNDRA	the coldest biome	very cold (32°F)	light rainfall	high altitudes, high latitudes
TAIGA	the biome that sustains Evergreen trees, but is Pretty cold	cold (50°F)	medium rainfall	occurs in northern climates or high up mountains
DECIDUOUS FOREST	Forest where trees lose their leaves;	more temperate (75°F)	medium rainfall	located in middle latitudes
GRASSLAND	grasses and shrubs, Few trees	more temperate (68°F)	low rainfall	middle of continents, away from large water sources
DESERT	very little vegetation	hot during the day (86°F) colder at night	very little rainfall	near the equator or near mountain ranges
RAIN FOREST	lots of plants and Trees; very diverse	temperate (77°F)	heavy rainfall	usually occurs near the equator