

Ecosystems

An ecosystem is the interaction of a community with its environment

All organisms need energy to carry out essential functions, such as growth, movement, maintenance and repair, and reproduction. In an ecosystem, energy flows from the sun to autotrophs, then to organisms that eat the autotrophs, then to organisms that feed on other organisms. The amount of energy an ecosystem receives and the amount that is transferred from organism to organism has an important effect on the ecosystem's structure.

Producers

Autotrophs (plants, a few protists & bacteria) *make* their own food. They are also called producers.

Producers are organisms that can capture energy from the sun and use it to make organic molecules (food!)

Consumers

Heterotrophs (all animals, most protists, all fungi, and many bacteria) *cannot make* their own food.

Instead they get it by eating other organisms or organic wastes. They are also called consumers.

Consumers eat other organisms to get their nourishment.

Types of Consumers

Herbivores – eat producers.

Examples: antelope that eats grass
Zooplankton that feed on phytoplankton

Carnivores – eat other consumers

Examples: Lions, bald eagles, cobras, preying mantises

Omnivores – eat both producers and consumers

Example: grizzly bear

Detritivores – consumers that feed on the “garbage” of an ecosystem – organisms that have recently died, fallen leaves and branches, and animal wastes

Example: vulture

There is a class of detritivores called decomposers

Example: Many bacteria and all fungi

- ✪ Decomposers cause decay by breaking down dead tissue & waste into simpler molecules
- ✪ Some of these molecules are absorbed by the decomposers
- ✪ Some are returned to the soil or water and are then available to autotrophs
- ✪ Process of decomposition recycles chemical nutrients

Energy Flow

- ☺ Energy flows through an ecosystem, moving from producers to consumers
- ☺ We group organisms in an ecosystem based on how they obtain energy – their **trophic level**
- ☺ An organisms **trophic level** indicates its *position* in the sequence of energy transfers
 - ☑ All producers (plants) belong to the **1st trophic level**
 - ☑ Herbivores belong to the **2nd trophic level**
 - ✦ They are **first-order consumers** – feed directly on producers (plant eaters)
Examples: zebras, deer, antelope, mice
 - ☑ Predators of herbivores (carnivores) belong to the **3rd trophic level**
 - ✦ **Second-order consumers** feed on herbivores
Examples: snake (feeds on a mouse), lion (feeds on a zebra)
 - ✦ **Third-order consumers** feed on second-order consumers
Example: Hawk (feeds on a snake)

Energy Transfer Through Trophic Levels

Pyramid of energy – transfer of energy through trophic levels

- ☑ About 10% of total energy consumed in 1 trophic level is transferred to the next trophic level
- ☑ Top level is much smaller than bottom level – contains less energy – supports fewer individuals
- ☑ Organisms belonging to lowest level usually much more abundant than organisms belonging to highest level
- ☑ Lowest level has the greatest amount of **biomass**

Biomass – total amount of dried weight of organic matter

Food Chains and Food Webs

A **food chain** is a single pathway of feeding relationships among organisms in an ecosystem that results in *energy transfer*.

- * Feeding relationships in an ecosystem usually too complex to be represented by a single food chain
- * Many consumers eat more than one type of food
- * More than one species of consumer may feed on the same organism
- * Many food chains interlink

Interrelated food chains in an ecosystem are called a **food web**.

Disrupting the Balance of the Ecosystem

- * Natural Occurrences
 - Flood, earthquake, volcanic eruption (abiotic)
 - Cannot be prevented
- * Man-made Occurances
 - Lake Pollution
 - * Eutrophication – increase of nutrients in an environment-can lead to algal bloom
 - * Algal bloom – population explosion of algae
 - Decreased levels of oxygen
 - Reduction of cellular respiration
 - Death of many organisms
 - Disruption of the food web

Example: Let's look at a lake community

Phosphates are chemicals present in detergents.

Phosphates and nitrates are also present in fertilizers.

Phosphates enter a lake from sewage treatment plants.

Phosphates and nitrates enter a lake from soil runoff of fertilized crops.

Phosphates and nitrates are important nutrients for algae, so low levels of these chemicals are good.

But large amounts of these chemicals, along with warm temperatures can cause algae populations to thrive and grow very rapidly.

When this happens we call this an algal bloom.

The algal population may become so large that the algae uses up all of the nutrients and begin to die.

The dead algae settle to the bottom of the lake where it is decomposed.

Large amounts of oxygen are used up as decomposition occurs.

Less oxygen, then, is available for cellular respiration and organisms begin to die.

This death disrupts the food web