

## ECOSYSTEMS, FOOD CHAINS AND FOOD WEBS

### Food Chains and Food Webs

Understanding food chains and food webs requires understanding the flow of energy and food sources among living things on Earth. Let's review.

The ability to produce energy from sunlight gives plants the name **producers**. Producers do not need to eat other living things since they produce their own food.

Organisms that obtain their food by eating another living organism are called **consumers**. They must consume another living thing to get the energy they need to sustain life.

Energy enters an ecosystem as sunlight and is turned into energy by plants. That energy is transferred to organisms that eat producers—plants, and consumer. ecosystem

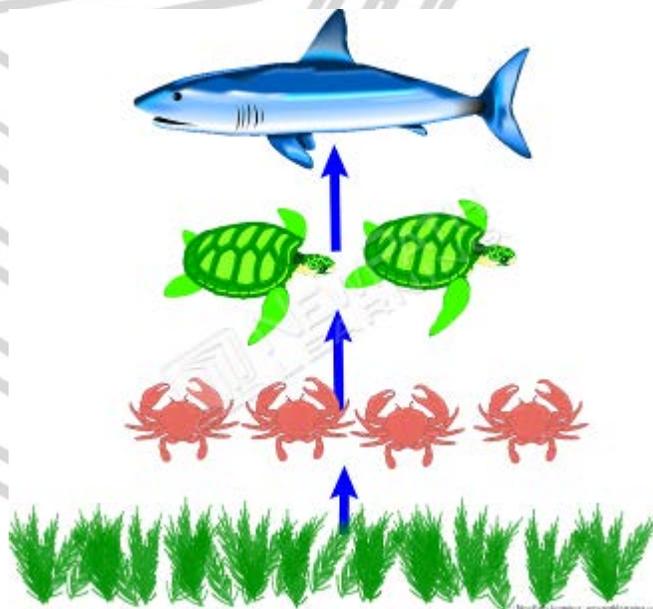
A **food chain** they obtain in the food organisms



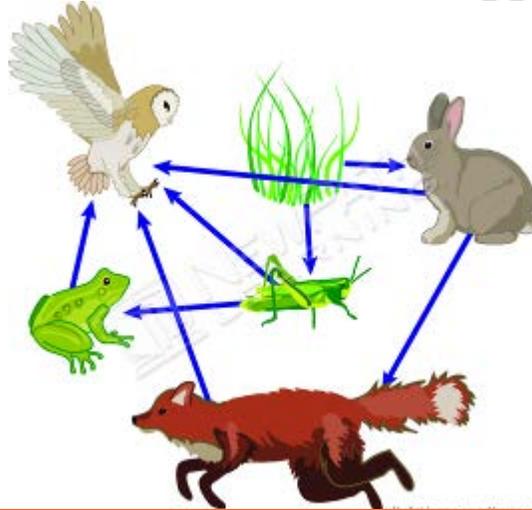
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A **food web** is made up of many different food chains in an ecosystem. A food web helps us understand how organisms are interrelated within an ecosystem. For example, foxes are part of several food chains, since they will eat a variety of types and species of animals, including rabbits, mice, and birds. A food web makes this clear.



## Energy Flow

An energy pyramid shows how energy moves through an ecosystem.

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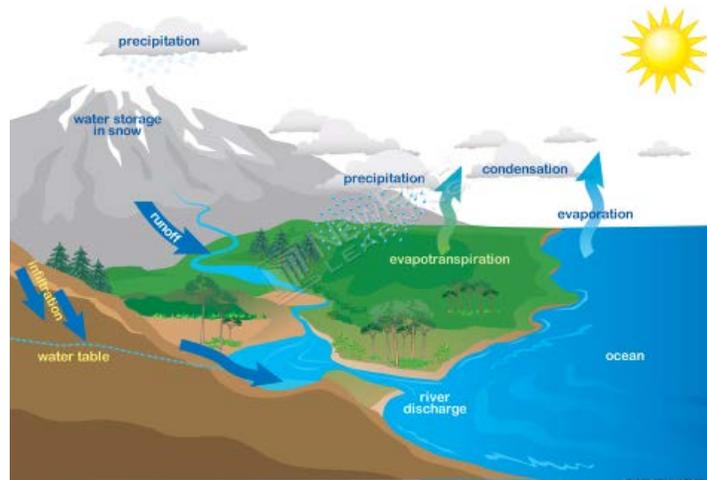
Organisms use energy to grow, move, and complete other daily activities.

Energy is greatest at the producer level. As you go up the pyramid, the available energy decreases. Approximately 10% of the energy at each level goes on to the next level.

### **Lesson Checkpoint:** **What does an energy pyramid tell us?**

## The Water Cycle

Water is the most abundant substance in our bodies. Water is constantly recycled on earth in a process known as the water cycle. The water cycle is a constant process of water movement from the ground through the atmosphere and back to the ground. There are three stages of the water cycle which occur over and over again: evaporation, condensation, and precipitation.



- **Evaporation** is the process of water molecules in liquid form building up energy to change to a gas state. The energy that water uses for evaporation comes from sunlight. Living organisms also give off water through evaporation. Once the water changes into a gas, it rises.
- **Condensation** occurs when the temperature of the air decreases and water molecules in the air condense into liquid droplets within the clouds.
- **Precipitation** occurs when the water droplets in the clouds become heavy enough to fall to the earth's surface.



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## The Carbon Dioxide Cycle

Carbon and oxygen are the substances that are necessary for life. The **carbon dioxide cycle** is a process of recycling carbon and oxygen gases.

- Carbon makes up living organisms and is present in our atmosphere as carbon dioxide gas. Plants take in carbon dioxide from the atmosphere to gain energy from the process of photosynthesis. The carbon is used to make energy and the waste that is produced is oxygen.
- The oxygen that is produced by plants is used by heterotrophs to break down food and release the energy within the food. The waste created by the heterotrophs is carbon dioxide.

### Lesson Checkpoint:

**How does a mammal participate in the carbon dioxide cycle?**

## The Nitrogen Cycle

As we learned in Topic 22, 78% of our Earth's atmosphere is made up of nitrogen gas. Nitrogen makes up the matter of living organisms, but we are not able to obtain nitrogen from the atmosphere directly. The atmospheric nitrogen must be combined with other elements to be used by organisms.

**Nitrogen fixation** is the process used to change nitrogen in the atmosphere into usable nitrogen that is combined with other elements.

- Some bacteria are able to combine nitrogen molecules. These bacteria live in the roots of certain plants in structures called **nodules**. The plants and the bacteria have a mutually symbiotic relationship. The bacteria have a place to live and the plant is supplied with nitrogen that is usable. The fixed nitrogen is used to build proteins and other substances.
- When the plant dies, decomposers break the fixed nitrogen down and release it into the soil.
- Eventually, atmospheric nitrogen is released back into the atmosphere.



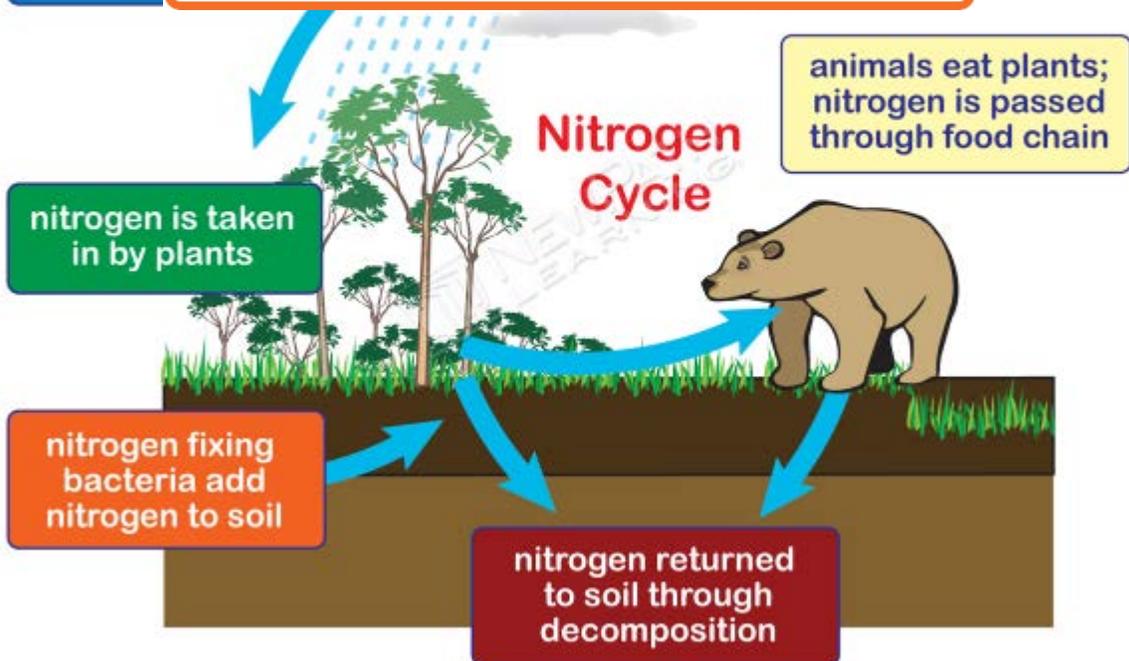
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## Rainforest Biome

A **biome** is an ecosystem that has a similar climate and similar organisms that live within the ecosystem. Biomes are generally determined by the climate conditions of the ecosystem. The rainforest biomes are usually located near the equator and the conditions are hot and humid year round. Plants are abundant in rain forests, as well as animal life. The rainforest is made up of different layers of trees.

## Rainforest Layers of Vegetation

At the very top is the **canopy**, which is made up of tall trees. The layer below the canopy is called the understory. The **understory** is made up of vines and smaller trees. Barely any light reaches the **ground** in a rainforest, but life is abundant at this level.

## Desert Biome

A desert is an ecosystem that receives less than 25 centimeters of rain per year. The amount of rain is less than the amount of evaporation.

During the day, the temperature is very hot. At night it is very cool. There is extreme temperature variation. There are usually only a few trees.

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## Grassland Biome

The grassland biome is an ecosystem that receives between **25 and 75 centimeters of rain** per year. This is not enough water necessary for a tree to grow, but it is enough water for the many species of grasses that the biome supports. Grasslands are able to support many different species of herbivores. Grasslands that are located close to the equator are called **savannas**.

## Lesson Checkpoint

### Why don't trees grow in the Grasslands?



### **Deciduous Forest Biome**

The deciduous forest biome is made up of trees that grow leaves and shed them during the year. Ecosystems in this biome receive at least **50 centimeters of rain** per year, allowing trees to grow within the biome. The temperatures of the deciduous forest vary through the seasons. There are many species of plants and animals that live within this biome. Some animals hibernate during the winter months, while others migrate south for the winter. Some animals hibernate below or just below the ground.



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### **Boreal Forest Biome**

The boreal forest biome is located in the northern hemisphere. It is characterized by **extremely cold temperatures during the winter months**. Precipitation is high in boreal forests, but not many trees have been able to adapt to the cold biome. Many of the animals of the boreal forest are herbivores that eat the seeds that are produced by the conifer trees. These herbivores support the existence of large predators like bears, wolves, and wolverines in this biome.



## Tundra Biome

The tundra biome is an ecosystem that is extremely cold and has as little precipitation as a desert biome. The soil of the tundra is frozen all year round. In the summer, the tundra is free of snow for a few weeks, but it takes a month or more to melt. The days are long and the nights are short.



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**Lesson Checkpoint:**  
**Where is the permafrost, and what is it?**

## Freshwater Ecosystems

Nearly three quarters of earth is covered with water. Plants that live in water are able to produce energy using photosynthesis just like the plants that live on land. Water absorbs light from the sun, so plants are only able to take in enough light for photosynthesis near the surface or in shallow water.

The freshwater biomes are made up of **water that does not contain salt** like the marine biome. The waters in lakes and ponds are still or standing. This means that the water does not move or does not move much. There are many plant and animal species that live within the lakes and ponds.

Stream and river freshwater biomes are different from lakes and ponds because the water is moving rapidly. Many plants are not able to survive in the current that is created by the moving water, so animals depend on materials that fall into the moving water for food.

## Marine Ecosystems

Surprisingly few organisms live in the deep ocean. The water in the deep ocean is very dark and cold. The water in the deep ocean is very dark and cold. The water in the deep ocean is very dark and cold.

- The habitat is called the deep ocean.
- The **intertidal zone** is the lowest part of the ocean that withstands both the air and water.

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### **Lesson Checkpoint: What is an estuary?**

- The **neritic zone** starts at the area of the lowest low tide and runs until it meets the continental shelf. The water in this zone is usually fairly shallow, allowing plants to survive. Coral reefs also usually form within this zone.
- The **surface zone** is the top portion of the ocean where light can penetrate the ocean waters.
- The **deep zone** is located directly below the surface zone. Light is not able to penetrate through to the waters of the deep zone. Most organisms are able to survive off of the remains of organisms that lived in the surface zone and sank down to the deep zone. Some of the most interesting animal species are within the deep zone.