

Ecosystems

I. What is an ecosystem?

An ecosystem is a community of living and non-living things that work together – it consists of abiotic (soil, water, air) and biotic parts (flora, fauna). Ecosystems have no particular size. An ecosystem can be as large as a desert or as small as a tree. The major parts of an ecosystem are: water, water temperature, plants, animals, air, light and soil. They all work together. If there isn't enough light or water or if the soil doesn't have the right nutrients, the plants will die. If the plants die, animals that depend on them will die. If the animals that depend on the plants die, any animals that depend on those animals will die. All the parts in an ecosystem work together to achieve balance. A healthy ecosystem has lots of species and is less likely to be damaged by human interaction, natural disasters and climate changes. Every species has a niche in its ecosystem that helps keep the system healthy.

1 Soil

Soil is a critical part of an ecosystem. It provides important nutrients for the plants. It helps anchor the plants to keep them in place. Soil absorbs and holds water for plants and animals to use and provides a home for lots of living organisms.



2 Air

The atmosphere provides oxygen and carbon dioxide for the plants and animals in an ecosystem. The atmosphere is also part of the water cycle. Without the complex interactions and elements in the atmosphere, there would be no life at all!



3 The sun

The heat and light from the sun are critical parts of an ecosystem. The sun's heat helps water evaporate and return to the atmosphere where it is cycled back into water. The heat also keeps plants and animals warm. The light from the sun is necessary for photosynthesis, so that plants have the energy they need to make food.



4 Water

Without water there would be no life. Water is a large percentage of the cells that make up all living organisms. Water is also used by plants to carry and distribute the nutrients they need to survive.



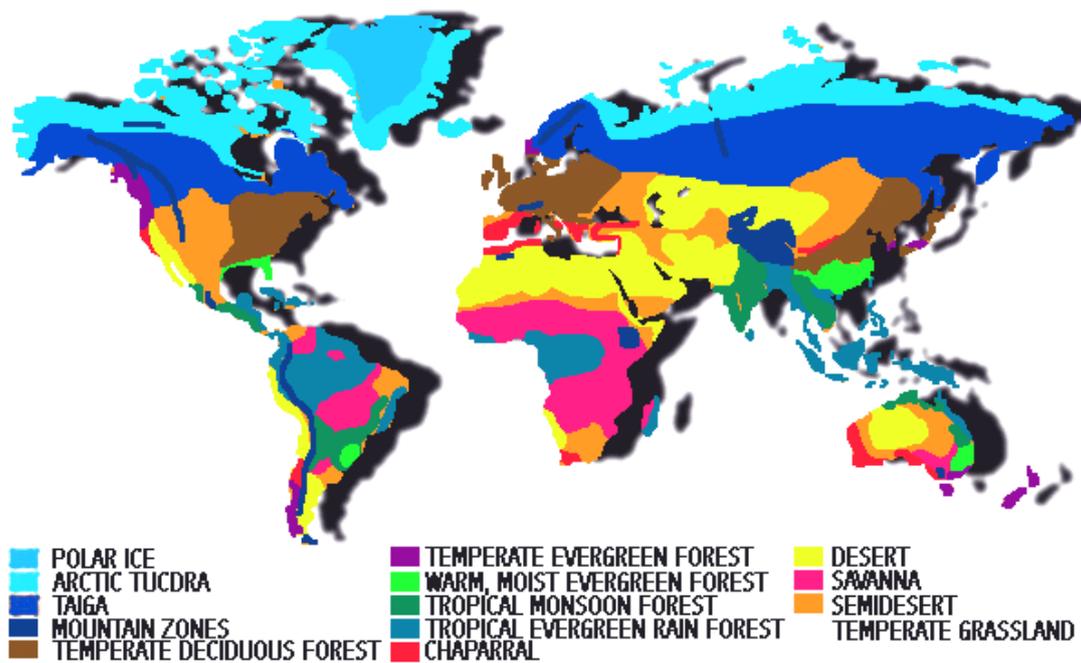
II. Examples of ecosystems

Examples of ecosystems are: agroecosystem, aquatic ecosystem, coral reef, desert, forest, human ecosystem, littoral zone, marine ecosystem, prairie, rainforest, savanna, steppe, taiga, tundra, urban ecosystem and others.



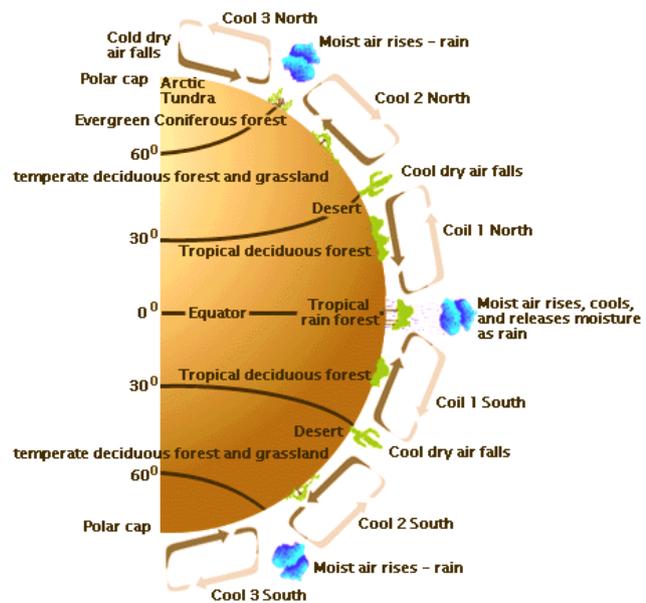
III. Biomes

Biomes are globally similar areas, including ecosystems, as regards combinations of plants, animals, soil organisms and climatic conditions. They have certain common factors, e.g. plant structures (trees, shrubs, grasses), leaf types (broadleaf, needles), plant spacing (forest, woodland, savanna) and climate. The basic types of biomes are: land, freshwater and marine biomes.



Map of land biomes

Certain plants grow in certain climates and thus create the biomes – vegetation types extending over a large geographic area. So climate affects the creation of biomes strongly. The following chart shows the relationship between the biome type and the climate.



IV. Habitats

Within each ecosystem there are habitats of various sizes. A habitat is a place with a population (a group of living organisms of the same kind). All the populations living in the same place at the same time interact, forming a community. Such community also interacts with the non-living world around it, thus forming an ecosystem. The habitat must provide the organisms with food, water, temperature, oxygen and other goods they need. Among populations in the same habitat different processes may occur, such as cooperation, symbiosis, but also competition and predation.

V. Ecosystem dynamics

When new biotic or abiotic elements enter into an ecosystem, they cause an interruption. This can also lead to death of certain species within the ecosystem. But often ecosystems can protect themselves from intruders, depending on the toxicity of the new element and the resiliency of the original ecosystem. Organisms have survived despite continuous changes, natural selection and intruders, but they had to adapt to new conditions. Changes are always gradual. Some species even disappear and new ones move in. Usually the population remains within limits of the food supply within an ecosystem. In general, ecosystems are more resilient to sudden or great changes than each species individually.

Arctic tundra in Russia is an example of an ecosystem which has remained relatively unchanged for a long period of time.

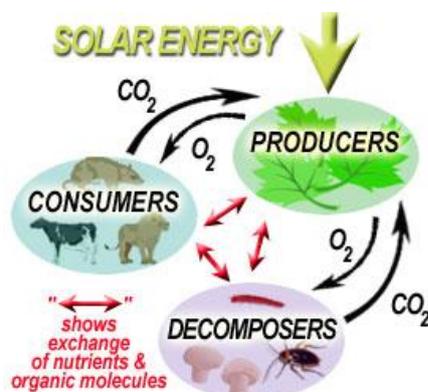


VI. The energy & water cycle

All living things need energy. In an ecosystem, the sun is the source of energy. Different species in an ecosystem have different functions: **producers**, **consumers** or **decomposers**, all of them being important parts of an ecosystem. **Producers** are green plants which make their own food. **Consumers** are animals which get their energy from the producers or organisms that eat producers. There are three types of consumers:

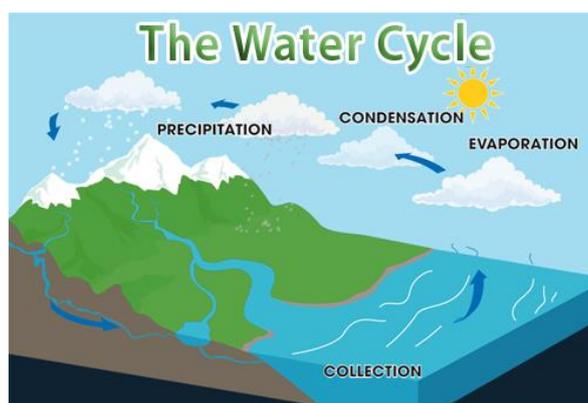
- herbivores: animals that eat plants;
- carnivores: animals that eat herbivores and sometimes other carnivores;
- omnivores: animals that eat plants and other animals.

Decomposers are plants and animals that break down dead plants and animals into organic materials which go back into the soil.



Source: <https://www.bigelow.org/archive/bacteria/>

Living beings also need water within their habitats. Their needs are met through the **water cycle**.

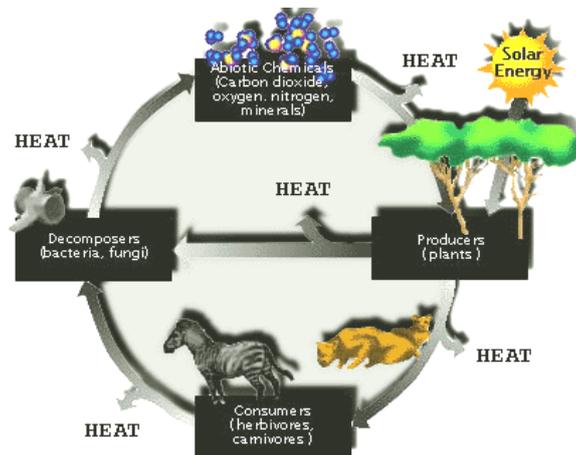


Source: <https://www.thinglink.com/scene/835601366037561346>

Energy and water are vital to the survival of an ecosystem, thus a system of **conservation** is necessary. The exchange of carbon dioxide and oxygen is a process of conservation. What one species discards, means food for another. When food is limited, the conservation processes and the need for recycling become more urgent. If it is not successful, species are endangered and may even become extinct.

VIII. Material flow

Living organisms also need certain nutrients. Plants obtain elements such as carbon, nitrogen or phosphorus from the atmosphere, water or soil. Animals can also obtain them directly from the environment, but mostly from food (eating other organisms). The nutrients are transformed within the bodies of organisms and later on returned to an inorganic state. Often bacteria are involved in such processes, e.g. decomposition. The elements in the environment are then again used by new organisms.



PRACTICE

Answer the following questions.

1. What is an ecosystem?
2. What are the major parts of an ecosystem? How do they interact?
3. What does the soil provide for the plants?
4. What is the meaning of the air for the plants and the animals?
5. What role does the water play in the living organisms?
6. Enumerate some kinds of ecosystems.
7. Define a biome.
8. What is a habitat?
9. What causes changes in ecosystems?
10. Describe the functions of certain species within an ecosystem (producers, consumers, decomposers).

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