

Ecology - Advanced

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Introduces basic concepts of ecology.

Ecology - Advanced



[Figure1]

What is ecology?

Does it have to do with the environment? Does it have to do with all sorts of plants? And animals? Does it have to do with how all organisms interact? And does it have to do with the role of non-living factors in the environment? The answer to all these questions is a resounding YES.

Ecology

Ecology is the scientific study of the interactions of living things with each other and their relationships with their environments. Ecology is usually considered to be a major branch of biology. However, ecology has a broader scope because it includes both organisms and their environments. Examining the interactions between organisms and

their environments can provide a basic understanding of the richness of life on Earth and can help us understand how to protect that richness, which is increasingly threatened by human activity. Regardless of the challenges associated with conducting research in natural environments, ecologists often carry out field experiments to test their hypotheses.

Organisms and the Environment

Ecology is guided by a number of basic principles. One principle is that each living organism has a continual relationship with every other element in its environment. In this context, the environment includes both living and nonliving components.

Organisms

An **organism** is a life form consisting of one or more cells. All organisms have properties of life, including the ability to grow and reproduce. These properties of life require energy and materials from the environment. Therefore, an organism is not a closed system. Individual organisms depend on and are influenced by their environments.

The Environment

To an ecologist, the **environment** of an organism includes both physical aspects and other organisms. These two components of the environment are called abiotic and biotic components respectively.

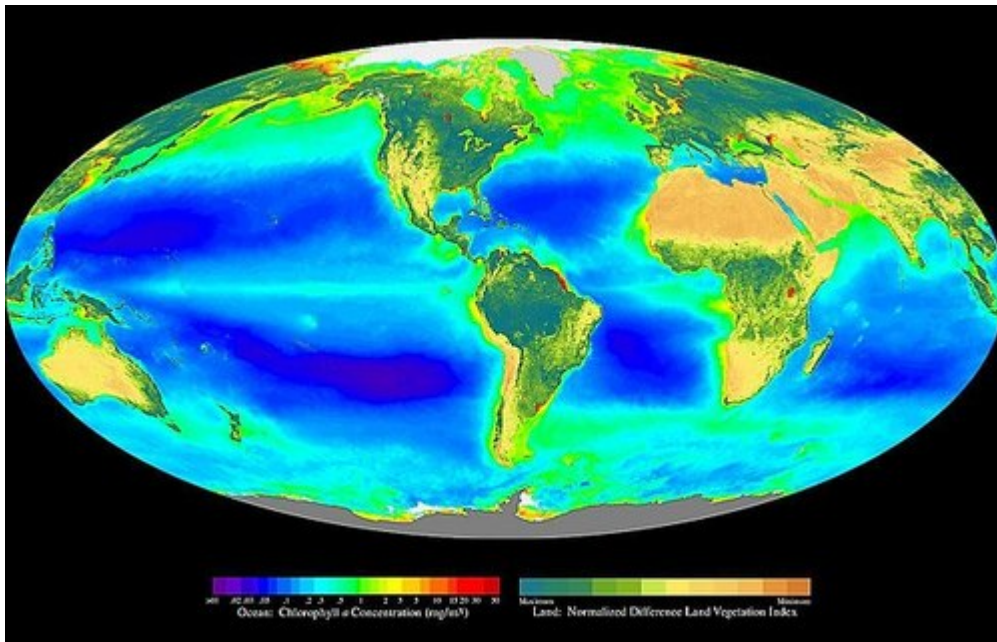
- **Abiotic components**, or abiotic factors, are the non-living, physical aspects of the environment. Examples include sunlight, soil, temperature, wind, water, and air.
- **Biotic components**, or biotic factors, are the living organisms in the environment. They include organisms of the same and different species.

Together, these components comprise an **ecosystem**. Biotic components can be very important environmental influences on organisms. For example, the first photosynthetic life forms on Earth produced oxygen, which led to the development of an oxygen-rich atmosphere. This change in Earth's atmosphere caused the extinction of many life forms for which oxygen was toxic and the evolution of many other life forms for which oxygen was necessary.

Levels of Organization

Ecologists study organisms and their environments at different levels. The most inclusive level is the biosphere. The **biosphere** consists of all the organisms on Earth and the areas where they live. It occurs in a very thin layer of the planet, extending from about 11,000 meters below sea level to 15,000 meters above sea level. An image of the

biosphere is shown in the **Figure below**. Different colors on the map indicate the numbers of food-producing organisms in different parts of the biosphere. Ecological issues that might be investigated at the biosphere level include ocean pollution, air pollution, and global climate change.



[Figure2]

This image of Earth's surface shows the density of the chief life forms that produce food for other organisms in the biosphere. Plants are the chief food producers on land, and phytoplankton are the chief food producers in the oceans. The map shows the density of plants with a measure called the normalized difference vegetation index and the density of phytoplankton with the chlorophyll concentration.

Ecologists also study organisms and their environments at the population level. A **population** consists of organisms of the same species that live in the same area and interact with one another. Important ecological issues at the population level include the following:

- Rapid growth of the human population, which has led to overpopulation and environmental damage.
- Rapid decline in populations of many nonhuman species, which has led to the extinction of numerous species.

Another level at which ecologists study organisms and their environments is the community level. A **community** consists of populations of different species that live in the same area and interact with one another. For example, populations of coyotes and rabbits might interact in a grassland community. Coyotes hunt down and eat rabbits for

food, so the two species have a predator-prey relationship. Ecological issues at the community level include how changes in the size of one population affect other populations.

Summary

- Ecology is the scientific study of living things and their relationships with their environments.
 - Levels of organization in ecology include the biosphere, populations, communities, and ecosystems.
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Review

1. What is ecology?
 2. Define abiotic and biotic components of the environment.
 3. What does the biosphere consist of?
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1.0 REFERENCES

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