

# ECOLOGY



## INTRODUCTION

No **organism**, or individual living thing, exists in isolation from other organisms or its **environment**, the surroundings and conditions within which an organism lives. To understand what each organism needs, how to get along with it, and how to protect it requires knowledge of the organism within its environment. **Ecology** is the study of the relationships between living things and their environments.

Each organism exists within an **ecosystem**, a system of plant and animal communities

that depend on each other and on the non-living environment for survival. Each ecosystem functions as a coherent unit within the larger environment of the earth — generating oxygen, purifying the air and water, and providing food and shelter.

Within an ecosystem there are always many forms of life, a condition known as **biodiversity**, the variety of living things within an ecosystem and in the world. Biodiversity helps create balance in an ecosystem by ensuring there are many different types of organisms to fill any available places in the complex web of relationships.

The many forms of life in an ecosystem are connected in extremely complex ways, creating a system of interdependent relationships. And every ecosystem is related with every other ecosystem, through animal migrations, seed dispersal, and air and water circulation. Taken together, this creates the **web of life**, the complex web of interdependence and interrelationships of life on earth.

In fact, it is this interdependence of living things that creates balance and resilience in an ecosystem and in the web of life. If any type of organism tries to dominate an ecosystem, there is usually some limitation that controls it, such as lack of food or space, or the buildup of waste. Such limitations ensure a rich diversity of life in most ecosystems.

Some scientists estimate that the earth is home to between 10 and 13 million different **species**, groups of organisms made up of members that resemble each other sufficiently to be able to produce healthy offspring when they breed. These millions of species live in a broad range of environments, with conditions such as temperature, moisture, and landscape all varying tremendously. Still, organisms find ways to survive in almost all environments.

With the possible exception of bacteria, no organism has proved as adaptable as humans. The result is that humanity is an integral part of most ecosystems. Within an ecosystem, each person is dependent on the environment for everything needed for survival, including air, water, food, and shelter. Almost everything humans use in their everyday lives was grown or dug up from the ground.

## Note to the teacher

When presenting topics in ecology, guide students to link the subject with what they learned in the Five Great Lessons, especially in the Second Great Lesson, Life Comes to Earth, and the Third Great Lesson, Humans Come to Earth.

Humans also depend on the environment as a place to dispose of waste.

Unfortunately, humanity is destroying the environment. The earth is damaged from humans taking its raw materials, from their manufacturing industries that produce dangerous by-products, and from their consumer waste piling up in landfills and garbage dumps. Water and air carry dangerous residues into all ecosystems and into the food supply. Humanity is putting biodiversity and the web of life itself at risk. Consequently, as people have come to understand the scope and importance of biodiversity and the threats to it, people have made efforts to preserve and repair ecosystems.

## THE WEB OF LIFE

### Background Information

Life on earth is a unified whole. The **atmosphere**, the blanket of gases surrounding the earth, circulates constantly. Water also circulates constantly because of the **water cycle**, in which rain and snow fall from the atmosphere, moisture evaporates into the atmosphere and condenses to form clouds, and then falls again as rain and

snow. Each year birds fly thousands of miles through the atmosphere and fish swim thousands of miles through the oceans. There is no place on the earth that is truly isolated, allowing life on earth to be considered one large system — the web of life. The web of life is the complex web of interdependence and interrelationships of life on earth.



*A spider's web*

To understand the web of life, it is necessary to break the web down into smaller systems. Scientists focus on smaller systems in order to investigate, classify, and discuss the relationships of different organisms in their environments. A common system of classification breaks the web of life into three levels:

- **Biomes** are naturally occurring, relatively distinct areas on the earth defined by **vegetation**, the plant life in an area, and **climate**, an area's average weather pattern over a long period of time.
- Ecosystems are the relatively distinct plant and animal communities within a biome.

- A **niche** (pronounced “neesh”) is the local environment and ecological role of an organism within an ecosystem.

This breakdown allows a discussion of the many interconnections and interrelationships within the web of life.

Biomes are classified by their vegetation and their climate. There are several systems of classification, but one simple system has five major biomes: forest, tundra, desert, grassland, and aquatic. Of the five major biomes, the forest, tundra, desert, and grassland biomes are also known as **terrestrial biomes**, biomes that exist on land. The **aquatic biome** includes all areas covered by water, both seawater and freshwater. The following table summarizes the five biomes.



*forest*



*tundra*



## Biome characteristics

Biome	Characteristics
forest	<ul style="list-style-type: none"> <li>• considerable rainfall</li> <li>• hot or cold</li> <li>• extensive land area dominated by trees</li> <li>• includes the tropical rain forest and northern <b>coniferous</b>, or evergreen, forest</li> </ul>
tundra	<ul style="list-style-type: none"> <li>• moderate rainfall</li> <li>• cold</li> <li>• treeless, with small hardy plants growing close to the ground</li> <li>includes the Russian steppe and sub-arctic Canada</li> </ul>
desert	<ul style="list-style-type: none"> <li>• very dry</li> <li>• hot or cold</li> <li>• plants have water-conserving features</li> <li>• includes the Sahara Desert and Antarctica</li> </ul>
grassland	<ul style="list-style-type: none"> <li>• low rainfall</li> <li>• warm or cold</li> <li>• mostly grass, with some hardy shrubs and a few trees</li> <li>• includes the North American prairies</li> </ul>
aquatic	<ul style="list-style-type: none"> <li>• warm or cold</li> <li>• has plants and animals able to live with low to high salt content</li> <li>• includes all water-covered areas of the earth</li> </ul>



*desert*



*grassland*

## ACTIVITY 1

# Exploring the Biomes of the Earth

### Purpose

To understand the biomes of the earth.

### Material

Globe.

Table, Biome characteristics (see NAMC's CSM).

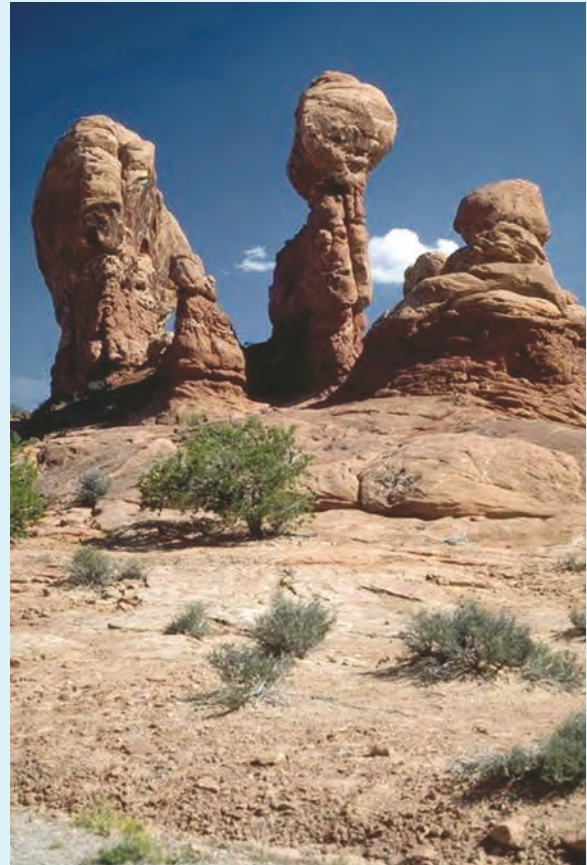
Illustrations of forest, tundra, desert, grassland, and aquatic biomes.

Illustration, Biomes created by latitude (see NAMC's CSM).

Natural Sciences journals and pencils.

### Presentation

- Most Montessori teachers introduce this concept in Year 4 and review it in Year 5.
- Announce to the students that they will be exploring a way to describe the earth in terms of biomes.
- Explain that a biome is an area of the earth that has similar plants and climate. The climate allows only certain types of vegetation to grow, whether because of the temperature or the amount of moisture. Add that the major biomes are forest, tundra, grassland, desert, and aquatic, or water.
- Present the illustration for each biome and invite the students to briefly describe each biome's obvious characteristics. Discuss and clarify each biome's characteristics with the students using the table, Biome characteristics.
- Present the globe and remind the students of the significance of lines of latitude. Explain that the same type of biome can be created at different latitudes because the climate changes with latitude.
- Add that the extremes of latitude combined with geographic location produce deserts. For example, there are hot deserts like the Sahara Desert that are caused by a combination of high temperatures and geographic location,



and cold deserts like Antarctica caused mostly by low temperatures. There are also deserts of moderate latitude and temperature that are caused by the rain



shadows of mountains, such as the desert in the Okanagan Valley in British Columbia, Canada.

- Invite the students to name different types or locations of each biome, such as rain forest and evergreen forest, freshwater and seawater, Canadian prairie and Russian steppe. Discuss and clarify that not all examples of a biome are the same and that the reasons for each occurrence must be examined.
- Point out that biomes overlap. For example, forest biomes often overlap with aquatic biomes, since there are rivers and lakes within most forests. Invite the students to say other places where biomes overlap, such as swamps and foothills.
- With the students, identify and discuss the local biome, its climate, and types of plant and animal life.

- Ask the students to use their journals to research and write a short report outlining the five biomes, and how climate and geographic location shapes each one.

## Extensions

- In a world atlas, find a map that indicates different climates. Try to identify and list the different biomes in the student's home country and on each continent.
- Determine what the local biome is. If possible, do so by walking around the local community and observing the surrounding plants, animals, and climate. What characteristics identify the local environment as that type of biome? Support conclusions with climate data on temperature and rainfall. How does the local climate compare to other examples of the same biome?
- Identify and list plants and animals characteristic to the local biome. Find an example of the same biome in another part of the world, and compare that biome's plant and animal life with local plant and animal life. Are the same types of plants and animals found in both locations?
- Research one example of each of the five main biomes and write about what characteristics make that area typical of its biome. Briefly describe how the plants and animals in that biome are similar to each other. For example, what is similar about all desert biome plants and animals?