



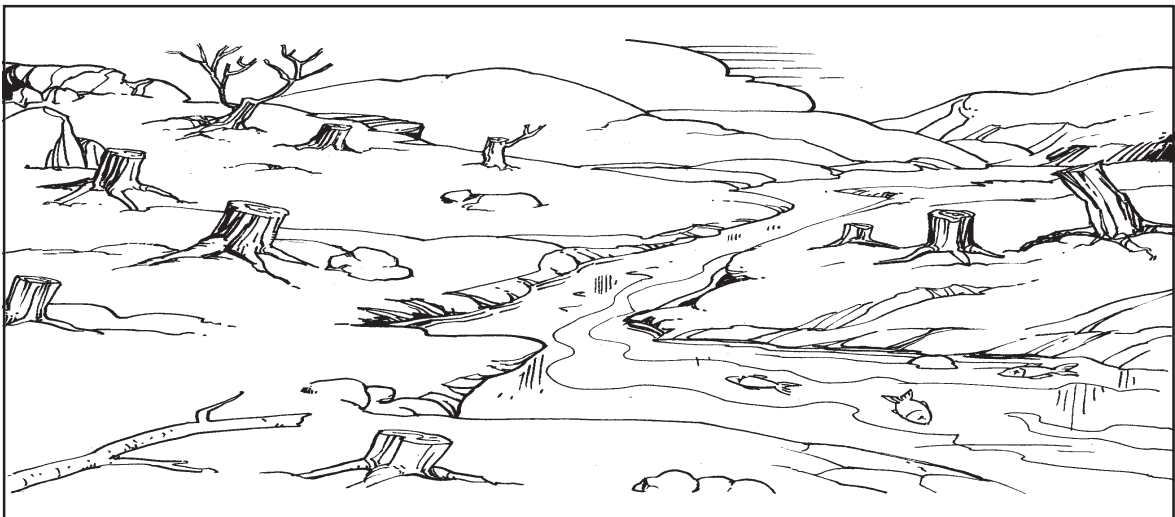
What Is This Module About?



Have you been to a place as beautiful as the one in the picture above?

How wonderful it is to see such beauty! Look closely at the picture. Do you often see this kind of environment around you?

Look at the picture below. Is this what you often see? The trees in the picture have been cut down. Cans, bottles, plastics, and even dead animals float in the river. Do you want to live in this kind of environment?



This module will make you more aware of the importance of the environment by providing you with the information about ecosystems.

This module is divided into two lessons. These are:

Lesson 1 – *Ecosystems and Their Components*

Lesson 2 – *Natural and Man-Made Ecosystems*



What Will You Learn From This Module?

After studying this module, you should be able to:

- ◆ explain what an ecosystem is;
- ◆ identify the components of an ecosystem;
- ◆ describe the role of the components of an ecosystem; and
- ◆ differentiate natural ecosystem from man-made ecosystem.



Let's See What You Already Know

Before you start studying this module, take the following test first to find out how much you already know about this topic. Encircle the letter of your choice.

1. Which is an example of an ecosystem?
 - a. river
 - b. flowerpot
 - c. dumpsite
 - d. all of the above

2. Which of the following is *not* an organism?
 - a. man
 - b. air
 - c. banana
 - d. cockroach

3. Orchids live and grow on tree trunks. This means that a tree trunk is the _____ of an orchid.
 - a. niche
 - b. community
 - c. ecosystem
 - d. habitat

4. Which of the following make up a community?
 - a. a group of people, plants, and animals in a house
 - b. a herd of horses
 - c. a plot of soil
 - d. a school of milkfish

5. Which of the following is an abiotic component of an ecosystem?
 - a. light
 - b. worm
 - c. tree
 - d. bird

6. What do you call the process of food making in plants?
- a. electrolysis
 - b. phytosynthesis
 - c. photosynthesis
 - d. thermosynthesis
7. When you eat both plants and animals, you are called a/an _____.
- a. autotroph
 - b. decomposer
 - c. herbivore
 - d. omnivore
8. Given the food chain below, which part of the chain is the primary consumer?
- kangkong* \longrightarrow insect \longrightarrow bird \longrightarrow human
 a b c d
9. _____ is a measure of stability in an ecosystem.
- a. Biodiversity
 - b. Evolution
 - c. Food chain
 - d. Energy flow
10. A _____ is a coastal ecosystem that is made up of layers of skeletons of a type of marine organism.
- a. coral reef
 - b. forest
 - c. bay
 - d. coastal zone

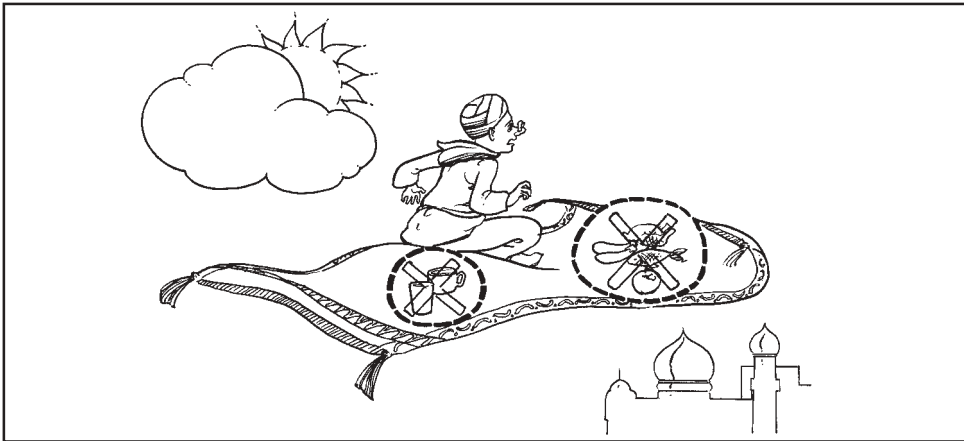
Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 28 to find out.

If all your answers are correct, very good! This shows that you already know much about the topic. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This means that this module is for you. It will help you understand some important concepts that you can apply in your daily life. If you study this module carefully you will learn the answers to all the items in the test and a lot more! Are you ready?

You may now go to the next page to begin Lesson 1.

Ecosystems and Their Components



There is a saying that no man is an island. It means nobody can live alone. Everyone needs people and other living and nonliving things in order to survive.

Look at the picture above. It shows a man who is alone on his flying carpet. He is isolated from other people and things on earth. He does not eat nor drink. His nose is even clipped to keep him from breathing the air. Will he survive under these conditions?

This lesson is about the interaction between living and nonliving things around you.

After studying this lesson, you should be able to:

- ◆ differentiate among population, community, and ecosystem;
- ◆ identify the components of an ecosystem; and
- ◆ differentiate biotic components from abiotic components of an ecosystem.



Let's Read

What Is an Ecosystem?

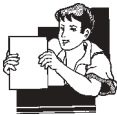
The word **ecosystem** is split into two parts: *ecological* and *system*. **Ecological** refers to the relationship between a living thing and where it lives. For example, a monkey lives on a tree for protection. It lives in the forest because the forest provides all the food that the monkey needs. A **system** is something that you do over and over. It is similar to your daily routine (waking up, going to work, going home, etc.). When you combine the two words you come up with **ecosystem**. This is what a living thing usually does with its surroundings, over and over again.



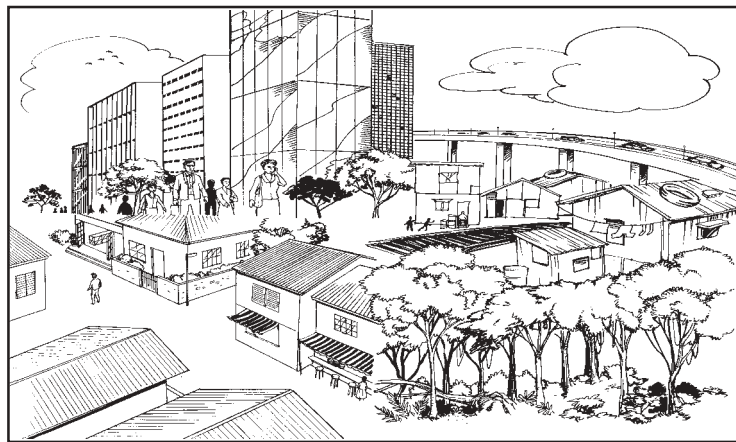
Let's Think About This

Based on what you read above, can you name some ecosystems?

You can compare your answers with some possible answers in the *Answer Key* on page 28.

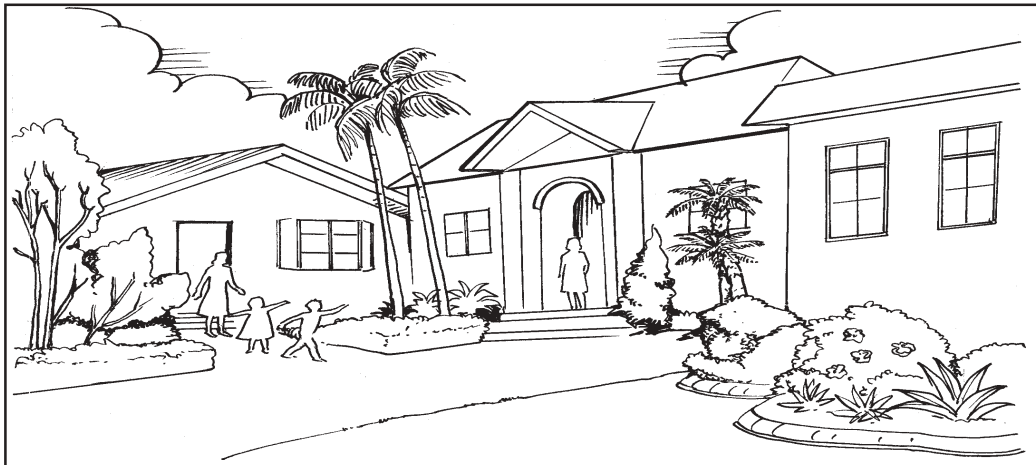


Let's Learn



Look at the picture above. They show different environments. What do you mean by **environment**?

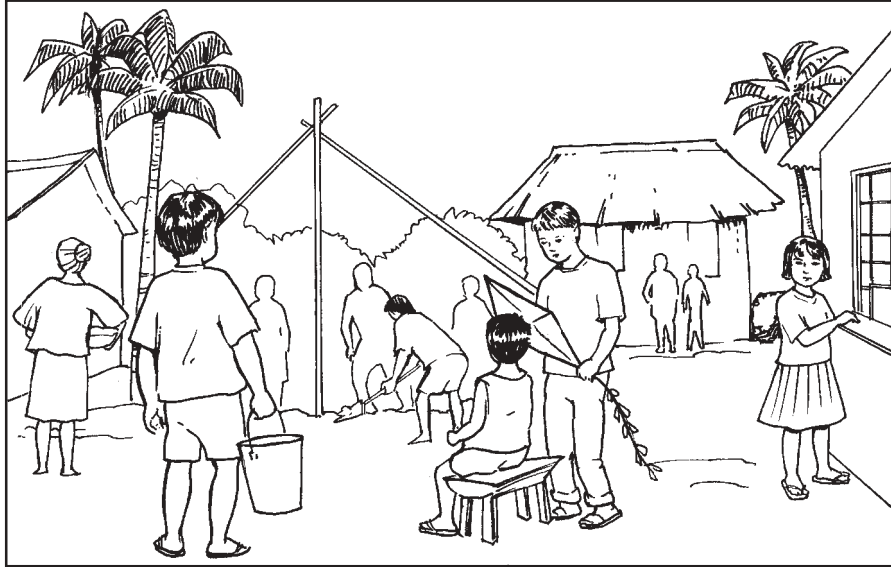
Everything around you makes up your environment. Your immediate surroundings is your environment. For example, in your home your parents, brothers, sisters, friends, and relatives are the people in your environment. Dogs, cats, lizards, ants, and plants are other living things in your environment. Buildings, parks, churches, roads, gardens, and the community center are also part of your environment.



Your environment is made up of all the people, things, plants, and animals around you.

What do you find in an environment?

From the time you wake up in the morning until you sleep at night you see many things. You see the things inside your house, the sun as it rises and sets, and some plants and animals. Your friends, family, and pets are living components of your environment. The living part of your environment also includes things that you do not see such as bacteria and fungi. All these living things are part of the **biotic environment**.



The living things in the biotic environment are also called **organisms**.

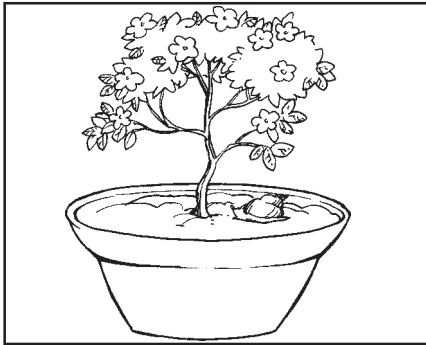
Other than living things, do you also see nonliving things in your environment? Can you name a few of these?

You probably see the water in a river, creek, or from the faucet. You see stones and rocks on the ground. You see the soil on the road you walk on. They are all nonliving things. They are called the **abiotic** components of the environment.

The biotic and abiotic components of the environment interact constantly with each other. A stable environment where the living and nonliving things interact with one another is called an **ecosystem**. The branch of science that studies the relationship between organisms and their environment is called **ecology**.

An ecosystem may be small such as a plant in a pot, an aquarium, an orchid on a tree, or even a drop of pond water. The plant in a pot interacts with ants, worms, and other organisms in the soil. It also interacts with the soil, water, and air which help it grow. A drop of pond water has very tiny organisms that interact with the water.

An ecosystem may be large such as a river, forest, rice field, lake, swamp, desert, island, or even a barrio or town.



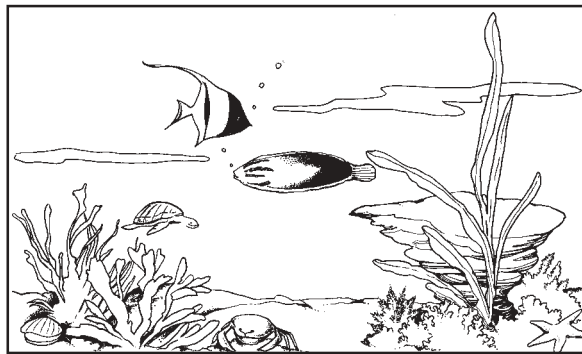
A small ecosystem: plant in a pot



A large ecosystem: a farm



Let's Try This



Look at the picture above. It shows an ecosystem. Can you identify the biotic and abiotic components of this ecosystem? List them under the appropriate headings.

Biotic Components

Abiotic Components

Compare your answers with those found in the *Answer Key* on page 28.

Organisms can be divided into smaller groups. The smallest group an organism belongs to is called **species**. Species is a group of organisms that can, and normally do, produce offsprings that are capable of reproducing. We humans belong to the species *Homo sapiens*. Each species occupies a specific area and plays a particular role in an ecosystem. The place where species live and grow is called its **habitat**. For example, the sea serves as the habitat of oysters.



Let's Try This

Do you know the answers to the following questions?

1. What is the habitat of orchids? _____
2. What is the habitat of birds? _____
3. What is the habitat of earthworms? _____
4. What is the habitat of water lilies? _____
5. What is your habitat? _____

Compare your answers with those in the *Answer Key* found on page 28.

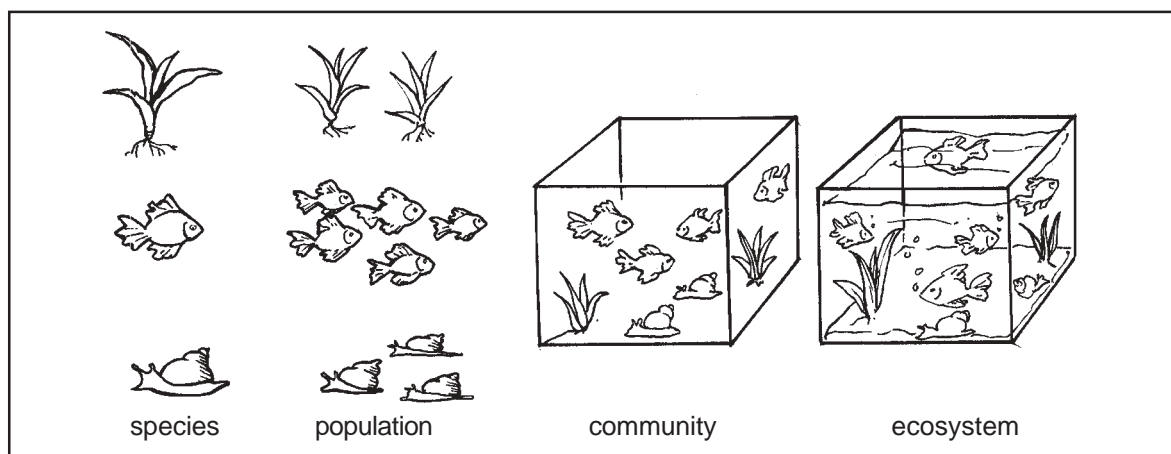


Let's Learn

Different species often share the same habitat. For example, a bird and a monkey may live in the same tree in a forest. Yet these animals have different roles within their habitats. The role or function of species in its habitat is called its **niche**. For example, the niche a snail occupies in an aquarium is eating the waste of the fish and hence, keeping its habitat clean.

Organisms of the same species that live together and reproduce in a particular area at a given time is referred to as **population**. Ants that live in crevices in the foot of a tree, a school of catfish in a pond, a group of banana trees in a plantations, and even a group of people living together in a barrio or city are all examples of population.

Groups of different populations that live together in the same area and depend on each other for food is called a **community**. For example, in an aquarium you will find a community of fish, snails, and plants.



Different levels in an ecosystem

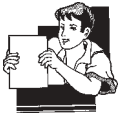
A community in an aquarium interacts with the water, air, and sunlight thus forming an ecosystem. Refer to the picture above to see how an ecosystem is formed from different levels of organization.

In an ecosystem, there is a relationship among different organisms. There is also interaction between the organisms and their environment. Look again at the ecosystem in the picture on page 8. Even if you do not feed the fish they will survive. They can eat the leaves of the plants. The snails eat the waste of the fish. The plants provide the oxygen needed by the fish. The fish give off carbon dioxide that is used up by the plants. The water provides the fish a place to swim and live. Oxygen is dissolved in water for the fish to breathe. The different processes and interactions that continuously take place render stability to the ecosystem.



Let's Try This

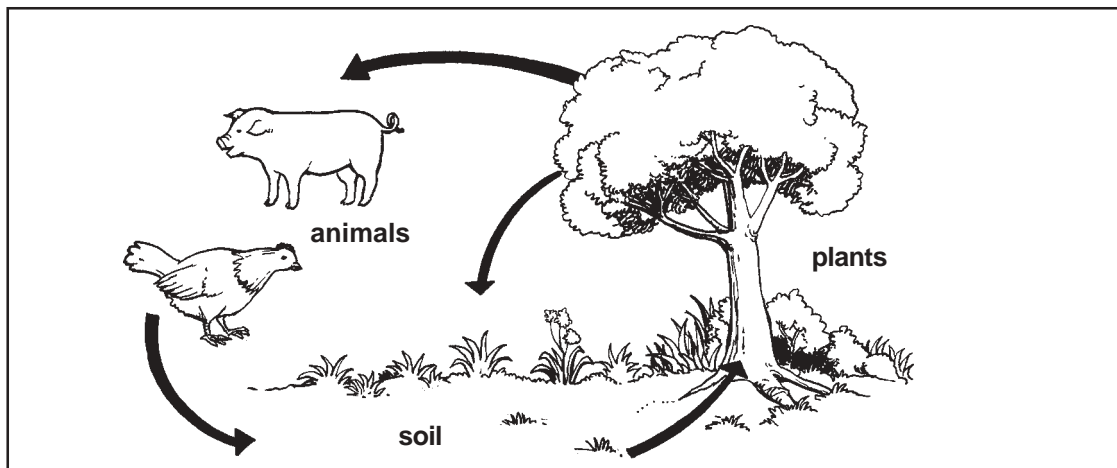
1. Visit a forest, farm, or subdivision.
2. On a sheet of paper, describe the interactions of the organisms and their environment. Compare your work with those provided in the *Answer Key* on page 29.



Let's Learn

The survival of an organism in an ecosystem depends on the delicate balance of energy, food, and other factors. For example, the production of food by green plants gives off oxygen as a by-product. Oxygen is a gas that is needed by animals to live. Another example is the role of water-dwelling decomposers or bacteria that break down dead plants and animals. They make rivers and lakes clean. Other processes that take place in the soil help in plant growth.

Each species depends on another in several ways. Animals depend on plants for food and oxygen. Plants depend on bacteria in soil. Bacteria depend on decaying bodies of plants and animals. The different interactions in an ecosystem are shown in the picture below.



Biotic and abiotic interactions



Let's Try This

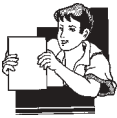
1. Examine the picture on page 9. Then interpret it by answering the questions below.
 - a. What does the soil do for the plants?

 - b. What do the plants give the animals?

 - c. How do plants and animals keep the soil fertile?

 - d. Can an organism survive without other organisms? Why?

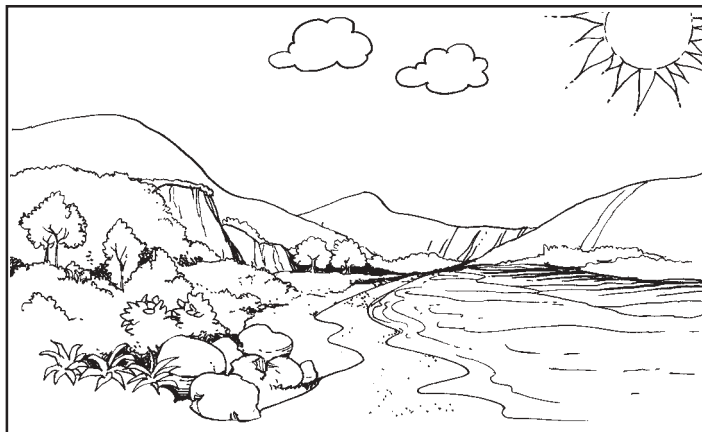
Check your answers with those found in the *Answer Key* on page 29.



Let's Learn

The Abiotic Components of an Ecosystem.

Abiotic or nonliving components include light, water, air, and temperature. These factors determine the growth and survival of organisms. They limit or control populations and stimulate organisms to adapt to their environment. Look closely at the abiotic factors in the ecosystem below.



Can you name the abiotic factors in this ecosystem?

Light or Solar Energy

Nearly all the energy on earth comes from the sun. The sun gives off solar or light energy. Solar energy warms the earth, evaporates water that falls as rain, and produces wind. The more important role of light energy from the sun is in the production of food by plants. The food-making process is called **photosynthesis**.

Plants containing **chlorophyll**, a green pigment, convert light or solar energy into chemical energy in the form of food. This process takes place in the presence of water and carbon dioxide. The reaction is represented in the equation below.



Water

Have you tried not drinking water for a day or two? You may survive without water for only a few days. Water is very important to all living things. Plants need it for making food. Animals need to drink water in order to survive. We humans use water for various activities.

The earth's surface is composed of 70% water. However, 97% of this is salt water and is therefore not suitable for drinking. Only a small part (about 0.1%) of the water on earth is freshwater which can be accessed in lakes, rivers, deep wells, and the atmosphere.



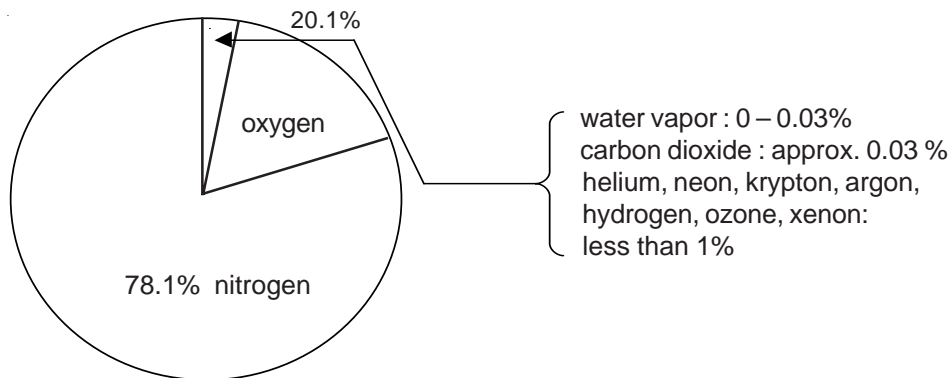
Let's Think About This

How is water used?

Compare your answer with that in the *Answer Key* on page 29.

Air

Air is a mixture of gases. The chart below shows the average composition of air:



Composition of Air

Nitrogen is the most abundant gas in the atmosphere. It is an important component of many organic molecules such as proteins. Oxygen is the second most abundant gas in the atmosphere. It plays a vital role in life processes — plants and animals need oxygen for respiration. Respiration is the process of combining oxygen with food molecules to produce energy for the organism to survive and grow. Another important gas is carbon dioxide. Can you recall the role of carbon dioxide in photosynthesis? The amount of water vapor in the air varies from place to place. This gas plays an important role in the water cycle.

Temperature

Would strawberry farms in Baguio grow well in Bulacan? Baguio has a cool temperature while Bulacan has a warm temperature. Temperature affects organisms. The activities of some organisms depend on changes in their environment's temperature. Each organism has a specific temperature requirement in order to survive. Strawberries, for instance, grow only in cool climates. Cacti, on the other hand, thrive in hot places. Each organism can only survive within a specific temperature range. If the temperature turns higher or lower than the required range, the organism will die.

Soil

Can trees grow without soil? Most organisms, except fishes, need a substrate (surface) on which to live. Soil provides the substrate for most of these organisms. It contains minerals, nutrients, and organic materials needed to support life.

The Biotic Components of an Ecosystem

The biotic components are classified as follows:

- ◆ **Producers** — also called **autotrophs**. They are mostly green plants that make food from simple substances like air, water, and light energy.

- ◆ **Consumers** — also called **heterotrophs**. They are the macroconsumers (large or big consumers) in an ecosystem. These are the animals that feed on plants and/or other animals.
 - a. **Herbivores** are consumers that eat only plants. Examples are horses, goats, and cows.
 - b. **Carnivores** are consumers that eat only other animals. Examples are lions, tigers, and eagles.
 - c. **Omnivores** are consumers that eat both plant and animals. Dogs, cats, and people are omnivores.
- ◆ **Decomposers** — also called **saprophytes**. They are microconsumers. These are bacteria and fungi such as molds. They break down the complex compounds in the tissues of dead plants and animals. They absorb some of the decomposition products and release simple substances which in turn are used by plants.



Let's See What You Have Learned

Match the items in Column A with those in Column B. Write the letters only.

A	B
_____ 1. The immediate surroundings of an individual	a. abiotic
_____ 2. A group of organisms of the same species living in a certain area at a given time	b. environment
_____ 3. Refers to all the populations occupying a given area	c. community
_____ 4. The interaction of a community and its nonliving environment	d. ecosystem
_____ 5. Component of an ecosystem that includes air, water, soil, and temperature	e. population
_____ 6. Component of an ecosystem that includes animals, plants, and microorganisms	f. consumers
_____ 7. Refers to all living things	g. biotic
	h. decomposers
	i. producers
	j. organisms

- _____ 8. Also known as autotrophs
- _____ 9. Organisms that depend on plants and other animals for food
- _____ 10. A group of organisms including bacteria and fungi

Compare your answers with those in the *Answer Key* on page 30. Did you get a perfect score? If you did, that's very good! Keep up the good work. If you missed some items, study the lesson again before moving on to the next lesson.



Let's Remember

- ◆ The environment refers to everything that surrounds an organism.
- ◆ The environment has both biotic and abiotic components. The biotic part of the environment is made up of all living things in the environment whereas the abiotic part is made up of all nonliving things in the environment.
- ◆ An ecosystem is made up of a community of organisms that are in constant interaction with their environment.
- ◆ Species is a group of organisms that can and normally reproduce offsprings that are themselves capable of reproduction.
- ◆ The place where species lives and grows is its habitat.
- ◆ The role that species play in its habitat is its niche.
- ◆ A group of organisms of the same species living together in a particular area make up a population.
- ◆ A community is made up of several populations that live together in the same area and depend on each other for food.
- ◆ The sun is the main source of energy in any ecosystem. It gives off light energy which is utilized by plants in the food-making process called photosynthesis.
- ◆ The abiotic components of an ecosystem includes water, soil, and air. The presence or absence, as well as quantity and quality of these components affect the living components of an ecosystem.
- ◆ The biotic components of an ecosystem can be grouped into producers, macroconsumers, and microconsumers.
- ◆ Macroconsumers are further grouped into herbivores, carnivores, and omnivores.

Natural and Man-Made Ecosystems



Do you often see the ecosystems shown in the upper pictures? They are natural ecosystems. Rivers, forests, and coastal areas have existed before you, your parents, or your great-grandparents were even born.

The lower pictures show ecosystems created by people for their convenience. These are what we call man-made ecosystems.

In this lesson you will find out about the different kinds of natural and man-made ecosystems.

After studying this lesson, you should be able to:

- ◆ differentiate the kinds of natural and man-made ecosystems;
- ◆ describe some natural ecosystems in the Philippines; and
- ◆ tell the ecological importance of each ecosystem.



Let's Read

Biodiversity

Biodiversity is used to define the variety of living things in an ecosystem. This includes plants, animals, and bacteria. Biodiversity is very important to humans and the overall health of the world for three reasons. First, different species of plants, animals, and other living things have very complex interactions which scientists are just beginning to understand. Second, many of the plants and animals of the world hold the cure to diseases. Third, the variety of plants and animals creates many diverse and unique places which are pleasing to the eyes, and offer an escape from our modernized world.

The amount of diversity of the world's mammal species is generally known. However, the exact numbers of other living creatures such as insects have yet to be discovered. It is this unknown which keeps scientists guessing at the total number of species that the world contains.

Some put the estimate at 10 million species; others as high as 100 million. One thing is certain though: Humans are changing the various natural ecosystems in many regions. As a result, humans are accelerating the extinction of species of plants, animals and, other living things at an alarming rate.



This accelerated extinction is occurring before we are even able to discover the potential and importance of these various and unknown species. Many plants and animals have been found to contain potential cures for cancer or new genes that can be used to modify and strengthen crops. Others are essential to the ecosystems in which they live. In many cases, an animal's extinction can create severe problems for other animals. In a rain forest, for example, things can be also difficult if a particular species of plant sprouts infrequently over a vast area.

It is our responsibility today to protect the biodiversity of the world for tomorrow. We will never know what species of plant holds the cure to our most chronic ailments.

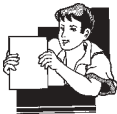


Let's Think About This

1. Why should we protect biodiversity?

2. In what way do humans change natural ecosystems? Cite some examples.

Compare your answers with those in the *Answer Key* on page 30.



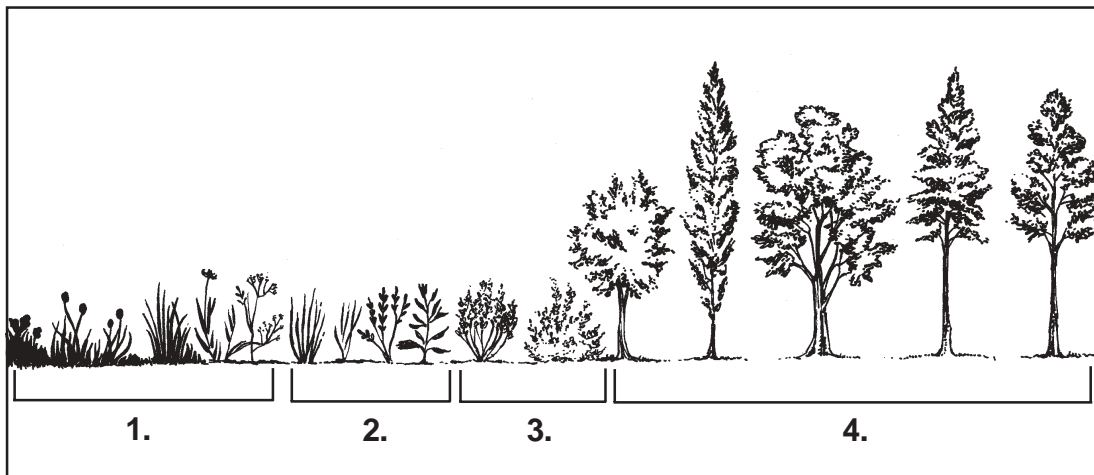
Let's Learn

We have mentioned before that ecosystems can be classified as natural and man-made. The variety of flora and fauna in an ecosystem is called **biodiversity**. The Philippines is one of the countries that boast of ecosystems with high biodiversity. Biodiversity in an ecosystem is a measure of that ecosystem's stability. The greater the variety of plants and animals found in the ecosystem, the more stable the ecosystem is.

However, we cannot expect that the numbers and kinds of organisms in an ecosystem will stay constant. Ecosystems are dynamic, meaning, they are ever changing. Changes in an ecosystem can either be brought about by natural processes or by human activities.

Natural changes, such as changes in the earth's structure (formation or breakdown of mountains and other landforms, formation of rocks and soil, etc.) and in the climate, take place slowly and occur in such a way that the ecosystem remains stable. These changes can lead to succession.

Look at the picture on the next page. It shows the stages in succession in an ecosystem. Succession takes place when a community replaces another community in an ecosystem. Succession takes place in a slow, natural, predictable, and orderly way.



Ecological succession in a forest

You can see in the picture that the first to grow in the exposed area were the lichens and mosses. Lichens are algae and fungi that live together and grow on bare rocks. They anchor the soil and add materials and chemicals that make the soil richer. As the rock surface changes, the lichens are less able to survive.

Other organisms then grow on the better soil. Larger, more complex plants begin to grow. These plants provide a thick cover over the ground and consumers begin to enter the area.

As communities die and decompose, more nutrients are added to the soil. This leads to an increase in the number and variety of organisms. Small shrubs and quick-growing trees begin to grow in the area. New habitats are created for more species of organisms and hence, new communities are created.

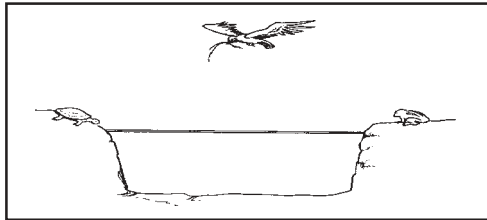
Soon the higher nutrient content of the soil enables larger trees to grow in the area. These larger trees provide so much shade that the smaller trees die out. When these larger trees die, trees belonging to the same species will replace them. These dominant species form the last community in this succession. They are called the **climax community**. A climax community does not change unless a major change occurs in the environment.

Natural occurrences bring about changes in an ecosystem. These changes take place slowly and in such a way that the stability of the ecosystem is not threatened. Human activities, on the other hand, tend to cause drastic changes in ecosystems. Various species of plants and animals often become extinct because they are not able to adapt to the drastic changes in their environment. These changes lead to unstable ecosystems (often seen as a decrease in biodiversity) and more often than not, many disasters that affect humans.

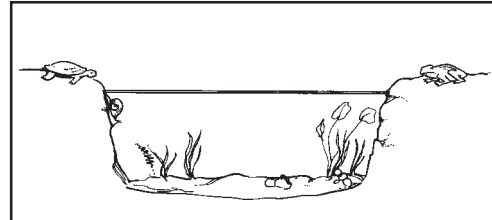


Let's Try This

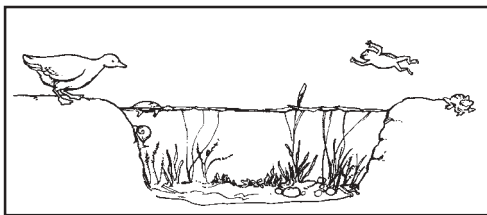
Based on the pictures below, can you describe the stages in succession in a pond ecosystem?



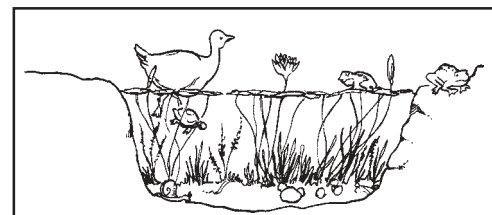
A



B



C



D

Compare your answers with those in the *Answer Key* on page 30.



Let's Learn

Let us now focus our attention on the natural ecosystems that we have here in our country. We will look at their characteristics as well as the benefits they provide us. We will also discuss our activities that are causing changes in these ecosystems.

There are three kinds of ecosystems that dominate in the Philippines. These are rain forests, freshwater ecosystems, and coastal ecosystems.

Tropical Rain Forests

Tropical rain forests are fascinating ecosystems that have evolved over millions of years. This means that the process of succession in this kind of ecosystem took millions of years to be completed. The Philippines is fortunate to have tropical rain forests. These forests are found only in the tropics, where rainfall does not go below 200 centimeters a year and humidity is constantly high. Rain forests all over the world shelter half of all plant and animal life of earth. In our country, the most common trees that grow in the forests are the dipterocarps. Dipterocarps are the main source of timber in our country.

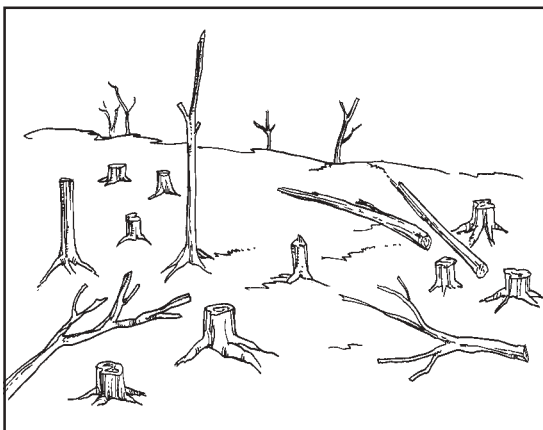
Forests supply us with timber, firewood, and charcoal for fuel. There are also plenty of plants and animals in the forests that are beneficial to us. Plenty of plants found in tropical rain forests have medicinal value. Even now, scientists are conducting studies on the healing properties of these plants. The animals in the forests serve to enhance the stability of the ecosystem by constantly interacting with the plants and the abiotic components of the ecosystem.



Tropical rain forest

Changes tend to occur in the forests because of natural occurrences such as typhoons. However, the most drastic changes that take place in forests are brought about by human activities. Among these are *kaingin* or the practice of cutting and burning trees in a forest in order to convert the area into an agricultural land. This practice lessens soil fertility and leads to soil erosion. The destruction of trees also leads to the death of smaller plants as well as other organisms that depend on these trees for food and protection.

Did you know that in 1903, there were more than 21 million hectares of forest land in the Philippines? Now there are less than 6 million hectares of forest left. Deforestation, or the act of cutting down trees without replacing them, results in soil erosion, sedimentation, and floods. A lot of disasters have occurred as a consequence. During typhoons, for instance, heavy floods cause the loss of lives and destruction of property.



Deforested area



Deforestation leads to disasters

Coastal Ecosystems

The three kinds of ecosystems are found within the marine waters from the coastline up to the point where light can penetrate the bottom. These ecosystems can only be found in tropical areas such as our country.

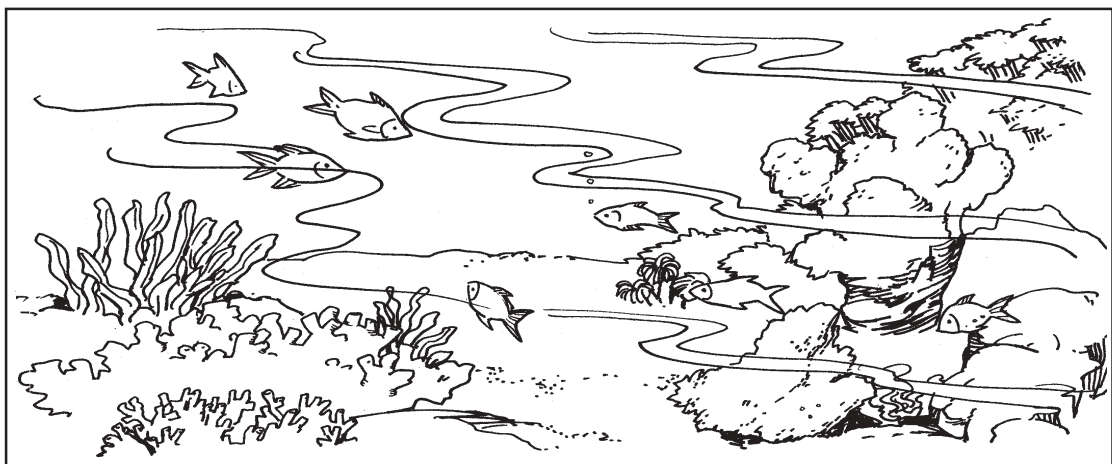
Mangrove ecosystems are located in brackish (salty and muddy) water. Their biotic components include the woody tree species and the plants and animals that interact with these trees. Mangroves provide food and shelter to various marine organisms. The root system of these trees is unique in that the roots are able to get oxygen from the air above the water. They form an umbrella-like structure that serves as shelter for aquatic life-forms. There are different mangrove species and these trees provide a natural barrier against storms, soil erosion, and pollution.



A Philippine mangrove

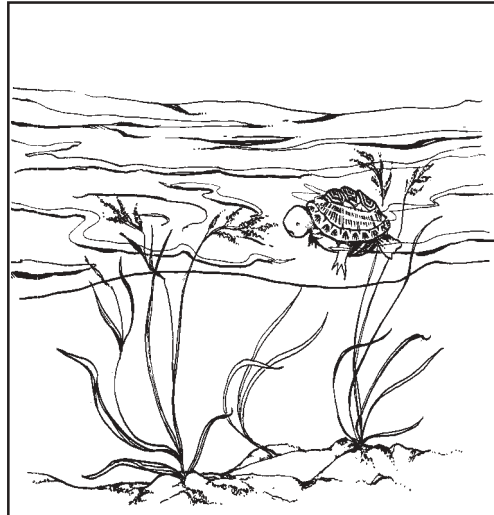
The Philippines has some of the most diverse coral reefs in the world. **Coral reefs** are natural structures that form from the layers of skeletons of corals, which are microscopic animals that secrete lime. The lime that corals secrete forms cavities within which they anchor themselves. When they die, they leave behind their lime skeletons and the layer piles up as more corals live and die. It takes about five years for a coral reef to grow an inch.

Coral reefs house a great number of marine species. Most fishes, seaweed, mollusks, and other organisms use coral reefs as their habitats.



A coral reef serves as habitat for many marine animals

Sea grass ecosystems serve as meadows in the sea. Sea grass serves as a primary food source for most plant-eating marine animals such as the dugong or sea cow, turtles, sea urchins, and some fishes.



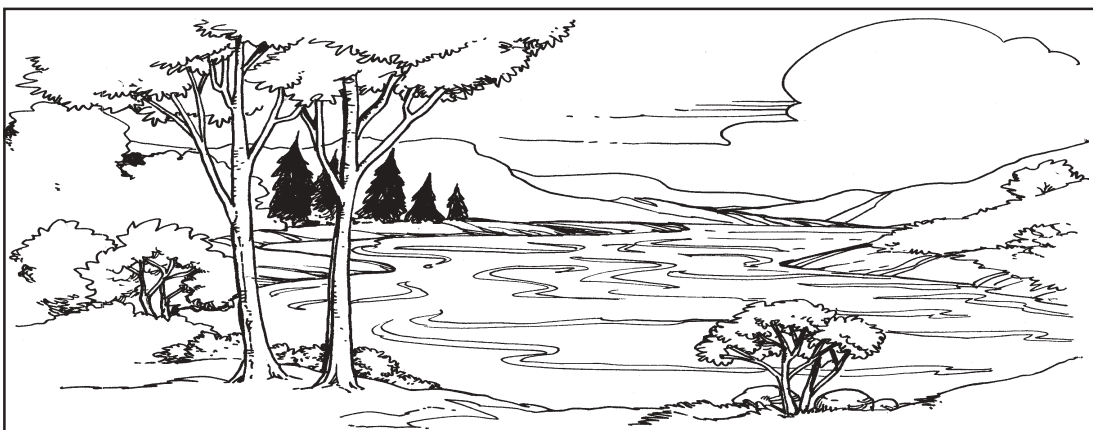
During low tides, the bed of sea grass serves as food for ducks and geese. The blades of the grass also serve as a surface for algae to grow on. When washed ashore the grass also serves as food for insects.

The leaves of the grass serve as a filter that shades organisms from the intense heat of the sun. This stabilizes the temperature and salinity (salt content) of the water. The grass also traps sediments and weakens the intensity of waves and currents.

All these ecosystems are threatened by human activities. Mangroves are cut down and made into charcoal. Coral reefs are destroyed through dynamite fishing. Sea grasses are destroyed through soil erosion, which deposits eroded soil into the water and thus cuts off the sunlight and oxygen supply of the grasses. Given the valuable roles these ecosystems play the damages that they sustain have drastic effects on humans as well.

Freshwater Ecosystems

Do you know where you can find freshwater? Freshwater is found in lakes, rivers, and ponds. In these bodies of water you will find many various organisms that depend on one another for their survival. In these bodies of water live tilapia, tawilis, catfish, and a great number of other fishes as well as plants and very tiny organisms.



We have 421 rivers and 60 lakes in our country. These bodies of water do not only provide water for people, plants, and animals, they also provide us with food. They also serve as means of transportation and their energy is used to provide us with electricity.

Rivers and lakes are the only readily accessible sources of freshwater that we have. However, many of our rivers and lakes are being contaminated with wastes from industrial plants, households, and mines. These wastes kill the organisms in the ecosystems. Species that are found only in a particular river or lake become extinct as a result. We also suffer a shortage in our water supply because of the contamination of rivers and lakes.



Let's Try This

Choose one from all the natural ecosystems that we discussed. Make a poster that will encourage other people to take care of this particular ecosystem. Post your creation in the NFE Learning Center. You may look at the sample poster on page 31.

Man-Made Ecosystems

The increasing number of people and their growing needs have led them to convert many land areas into residential areas. These converted areas are what we call man-made ecosystems. People make ecosystems where they put up their houses, businesses, places for leisure, schools, and community centers.

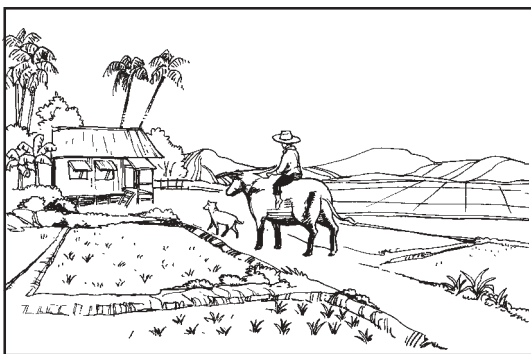
Land conversion has intensified over the years as the human population increase. Forests are continuously converted into rice fields and vegetable plantations. Some are also converted into grasslands on which livestock such as cattle graze.

Rice Field

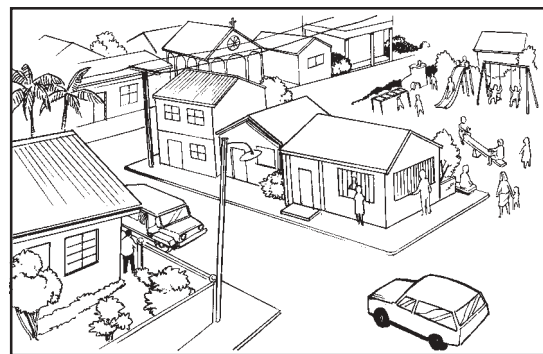
A rice field is man-made ecosystem. We develop rice fields to increase rice production. In a rice field we find plants like rice, weeds, shrubs, and a few trees. Insects, frogs, worms, snails, and even rats also live in rice fields.

Can you recall the interaction between the biotic and abiotic components of an ecosystem? Animals depend on plants and other animals. On the other hand, plants get the nutrients they need from animals. The trees provide fruits and shade for the farmers who work in the field. Water flows through the field in order for rice to grow.

Farmers prefer to live near rice fields. They depend on their produce for a living.



A rice field



An urban ecosystem

Urban Ecosystem

Another type of man-made ecosystem is the urban ecosystem. **Urban ecosystem** refers to the areas where people have settled and created communities. An urban ecosystem includes people's houses, schools, churches, stores, hospitals, business districts, and other establishments needed by people in order to meet their needs.

In an urban ecosystem, you can also find smaller ecosystems that are similar to natural ecosystems. A park, for instance, has trees and sometimes even a pond. Among these trees and pond, you will also find smaller plants and animals which interact with one another for survival.



Let's Try This

In an ecosystem, the biotic and abiotic components are in constant interaction with one another. Go around your neighborhood and observe people's activities. Based on your observation, can you say that your community is an ecosystem? Why?

Compare your answers with those in the *Answer Key* on page 31.



Let's See What You Have Learned

Match the items in Column A with those in Column B. Write the letters only.

- | A | | B | |
|-------|--|----|----------------------|
| _____ | 1. The type of forest found in the Philippines | a. | urban ecosystem |
| _____ | 2. Takes place when one community replaces another in an ecosystem | b. | biodiversity |
| _____ | 3. A type of man-made ecosystem | c. | succession |
| _____ | 4. A human activity done on forest ecosystems that can lead to disasters | d. | deforestation |
| _____ | 5. An ecosystem that serves as habitat for various marine animals | e. | coral reef |
| | | f. | freshwater |
| | | g. | mangrove |
| | | h. | dynamite fishing |
| | | i. | tropical rain forest |
| | | j. | coastal zone |

- _____ 6. A tree whose roots form an umbrella-like structure that serves as shelter for aquatic organisms
- _____ 7. A type of ecosystem that includes rivers and lakes
- _____ 8. A measure of stability in an ecosystem
- _____ 9. A practice that destroys coral reefs
- _____ 10. Land that surrounds a sea or an ocean

Compare your answers with the *Answer Key* found on page 31.



Let's Remember

- ◆ There are basically two kinds of ecosystems—natural and man-made ecosystems.
- ◆ Biodiversity is the variety of animals and plants found in an ecosystem. It is the measure of stability of an ecosystem.
- ◆ Changes in an ecosystem are brought about by natural events (changes in the earth's structure and climate) and human activities. Natural changes occur in a slow, orderly way and often lead to succession in an ecosystem. Human activities, on the other hand, often bring about drastic changes in an ecosystem, often leading to extinction of both plants and animals in the ecosystem.
- ◆ There are three kinds of natural ecosystems found in the Philippines: tropical rain forests, coastal ecosystems, and freshwater ecosystems.
- ◆ Tropical rain forest, are rich in biodiversity. Many of the plants and animals found in these forests are not found elsewhere. However, our rain forests are fast disappearing because of kaingin and logging.
- ◆ Coastal ecosystems are of three kinds: mangroves, coral reefs, and sea grasses. All these ecosystems serve as habitats for a great number of marine organisms. However, they are all threatened by destructive human activities such as dynamite fishing and logging.

- ◆ Freshwater ecosystems include rivers and lakes. These bodies of water provide water for plants, animals, and people. They also provide us with food and means of transportation.
- ◆ Rice fields are man-made ecosystems. They are usually converted from forest lands.
- ◆ Urban ecosystems are communities of people surrounded by institutions and other things that they need to carry out their daily activities.

You have now reached the end of the module. Congratulations! Did you enjoy reading this module? Did you learn a lot from it? The following is a summary of its main points to help you remember them better.



Let's Sum Up

- ◆ An ecosystem is made up of a community of organisms that constantly interact with one another and with the environment.
- ◆ An ecosystem is made up of biotic components and abiotic components.
- ◆ Abiotic components affect the number and variety of species in an ecosystem.
- ◆ Biotic components can be grouped into three: producers, consumers, and decomposers.
- ◆ There are two basic kinds of ecosystems: natural and man-made ecosystems. Natural ecosystems found in the Philippines are tropical rain forests, coastal ecosystems, and freshwater ecosystems. Man-made ecosystems include rice fields and urban ecosystems.



What Have You Learned?

A. Fill in the blanks.

1. _____ are also called autotrophs.
2. The role a species occupies in its habitat is its _____.
3. _____ is a measure of an ecosystem's stability.
4. _____ is the practice of cutting and burning trees in order to turn a forested area into an agricultural land.
5. Coral reefs are made from skeletons of _____.
6. _____ are the trees commonly found in our country's rain forests.
7. _____ serves as a primary food source for marine animals such as dugong and sea turtles.
8. _____ and _____ are examples of man-made ecosystems.
9. Air, water, and soil are examples of _____ components in an ecosystem.
10. _____ takes place when a community is replaced by another community in an ecosystem.

B. Answer the following questions.

1. Why are both biotic and abiotic components important in an ecosystem?

2. Why do we need to protect our natural ecosystems?

Compare your answers with the *Answer Key* on pages 31 and 32.



Answer Key

A. Let's See What You Already Know (pages 2–3)

1. d
2. b
3. d
4. a
5. a
6. c
7. d
8. b
9. a
10. a

B. Lesson 1

Let's Think About This (page 5)

Answers will vary. Some possible answers are: forests, rivers, lakes, ponds, grasslands, rice fields, seas, urban areas.

Let's Try This (page 7)

Biotic Components

plants
fishes
shellfish

Abiotic Components

water
stones
coral reefs

Let's Learn (page 8)

1. tree trunk or aerial pot
2. tree
3. under the soil
4. river or pond
5. house

Let's Try This (page 9)

Answers will vary depending on the learners' observations. The following are sample answers:

For a forest ecosystem:

The forest has all kinds of trees. The trees give shelter to animals. The roots of trees also control the flow of heavy rain by absorbing water. The large leaves of trees serve as shade to smaller plants.

For a farm ecosystem:

The farm has animals, plants, and people. Farmers take care of the animals and plant crops. Animals and plants serve as food for farmers. Farmers water plants to help in their growth. Organic waste is left in the field and serves as fertilizer.

For a subdivision:

Different families live in a subdivision. These families interact constantly with one another as they go about their daily activities. Schools, community or health centers, banks, stores, and other establishments that serve people's needs can also be found in a subdivision. Residents in the area help each other maintain peace, cleanliness, and security.

Let's Try This (page 10)

1. a. The soil provides a surface on which plants can anchor themselves. It also provides nutrients which the plants need.
- b. The plants give food and shelter to the animals.
- c. The decayed bodies of animals and plants are changed to organic nutrients that make the soil fertile.
- d. No organism can survive without others. All organisms depend on each other for food, shelter, and protection.

Let's Think About This (page 11)

Water is used for drinking, bathing, washing clothes, cooking, watering plants, cleaning, and manufacturing various products such as paper.

Let's See What You Have Learned (pages 13–14)

1. b
2. e
3. c
4. d
5. a
6. g
7. j
8. i
9. f
10. h

C. Lesson 2

Let's Think About This (page 17)

(Answers will vary depending on the learners' opinions. The following are the expected answers, however.)

1. We should protect biodiversity because there are many species of plants and animals in our natural ecosystems that we do not yet know. These species may have many benefits for us. In fact, scientists are now discovering the medical value of some plants that are found only in forests.
2. Humans are changing natural ecosystems by engaging in activities that tend to destroy these ecosystems. Some of these activities are illegal logging, *kaingin*, dynamite fishing and other methods of illegal fishing.

Let's Try This (page 19)

There are four stages in succession in a pond ecosystem. In the first stage (A), the pond has just begun to develop. Seeds are flown in by birds and land animals such as turtles begin to inhabit the pond. They are the pond pioneers.

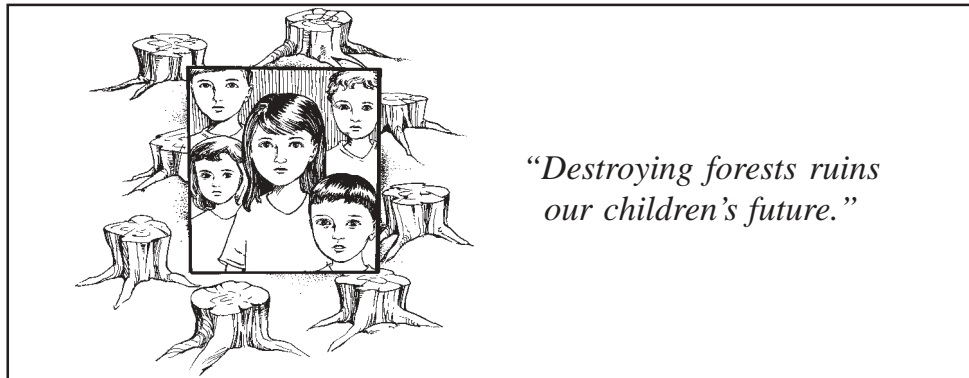
In the second stage (B), more creatures were found at the pond and the debris (products of decomposition) on the bottom increases. Plants begin to grow and multiply on the bottom of the pond.

In the third stage (C), the leaves of the deeply-rooted plants begin to surface in the pond. The layer of debris thickens and the pond floor rises.

In the last stage (D), the plants on the surface of the pond multiply and the debris thickens so much that the pond is now filled up. The pond has now become a marsh, which is another type of ecosystem.

Let's Try This (page 23)

Sample Poster



Let's Try This (page 24)

(Answers will vary depending on the learner's observations. The following is a sample answer.)

Yes, I can say that my community is an ecosystem. The people in our community are always interacting with one another. We also depend on such abiotic components as water and soil in order to meet our needs.

Let's See What You Have Learned (pages 24–25)

1. i
2. c
3. a
4. d
5. e
6. g
7. f
8. b
9. h
10. j

D. What Have You Learned? *(page 27)*

- A.
 1. Producers
 2. niche
 3. Biodiversity
 4. Kaingin
 5. corals
 6. Dipterocarps
 7. Sea grass
 8. Rice fields; urban ecosystems
 9. abiotic
 10. Succession

- B. 1. Both biotic and abiotic components are important in an ecosystem because biotic components depend not only on one another but also on abiotic components such as air, soil, and water in order to meet their need for food, shelter, and protection.
2. We need to protect our natural ecosystems because of the many benefits that we derive from them. These ecosystems are sources of organisms that provide us with food and shelter. Natural ecosystems also protect us from danger. For example, the trees in forests prevent soil erosion and thus protect us from floods. Any damage done to natural ecosystems will also have adverse effects on us humans.



Glossary

- Abiotic** The part of an ecosystem that is made up of all the nonliving things in the ecosystem.
- Autotrophs** The producers in an ecosystem; a group made up of green plants.
- Biodiversity** The variety of organisms in an ecosystem.
- Biotic** The part of an ecosystem that is made up of all the living things in the ecosystem.
- Carnivores** Meat-eating consumers.
- Chlorophyll** The green pigment in the leaves of plants that converts light energy into chemical energy.
- Climax community** The dominant species which appears in the last stage of succession.
- Community** A group of populations that live together in the same area and depend on each other for food.
- Coral reef** A lime structure made from layers of skeletons of corals.
- Deforestation** The practice of cutting down trees without giving them the chance to regenerate.
- Ecology** The study of the relationships between organisms and their environment.
- Ecosystem** A community of species and the nonliving things with which the community interacts.
- Environment** Everything that surrounds an organism.
- Fauna** The wild animals in a particular area or time period.
- Flora** The wild plants in a particular area or time period.
- Habitat** The place where a species lives and grows.
- Herbivores** Plant-eating consumers.
- Heterotrophs** The consumers in an ecosystem.
- Mangrove** A group of evergreen trees that grow along the coastal area and whose roots form a dense tangled network that serves as shelter for many organisms.
- Marine** Relating to the sea or ocean.
- Niche** The role a species occupies in its habitat.

Omnivores Consumers that eat both plants and animals.

Photosynthesis The process of food making in plants.

Population A group of organisms of the same species that live together and reproduce in a particular area at a given time.

Saprophytes The decomposers in an ecosystem.

Species A group of organisms that can and normally reproduce offsprings that are themselves able to reproduce.

Succession Process that occurs when one community gradually replaces another.



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