What Is This Module About?

Look around you. What do you see? Life is all around you! Every day, you wake up to the sound of people talking and birds chirping. If you live in a rural area, you probably go to sleep to the sound of crickets and other insects. You see life on land and even in the air. And there is life underwater too.

The fish that you eat come from water. So do the shellfish, crabs and shrimps. These creatures live in an environment which is different from the one you live in. Being human, you live on land and are surrounded by air. Creatures who live underwater live in aquatic habitats, where, instead of air, water is all around. This type of environment requires special adaptations for water creatures to survive.

In this module, you will learn about aquatic ecosystems. You will study how life exists in seas and other bodies of water. Being in an environment different from yours, the aquatic creatures have different relationships with their environment. You will learn what these relationships are and how these relationships make life possible. You will also explore some ecosystems that are made by human beings. These are what you call man-made ecosystems.

This module is divided into four lessons. These are:

Lesson 1 – *The Ecosystem*

Lesson 2 – *Life Under the Sea*

Lesson 3 – *Freshwater Ecosystems*

Lesson 4 – *Man-Made Ecosystems*

What Will You Learn From This Module?

After studying this module, you should be able to:

- describe what an ecosystem is;
- discuss the characteristics of and identify organisms found in marine and freshwater ecosystems; and
- describe some man-made ecosystems.

Let's See What You Already Know

Before you proceed, find out first how much you already know the topics to be discussed by taking the following test. Answer the questions below by writing your answers on the lines.

1. Define **ecosystem.**

   _____
   _____
   _____
   _____

2. Give three characteristics that make aquatic ecosystems different from terrestrial ecosystems.

   a. _____
   _____

   b. _____
   _____

   c. _____
   _____

3. Give three differences between a marine and a freshwater ecosystem.

   a. _____
   _____

   b. _____
   _____

   c. _____
   _____

4. List five examples of man-made ecosystems.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 38.

If all your answers are correct, very good! This shows that you already know much about the topics. 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.

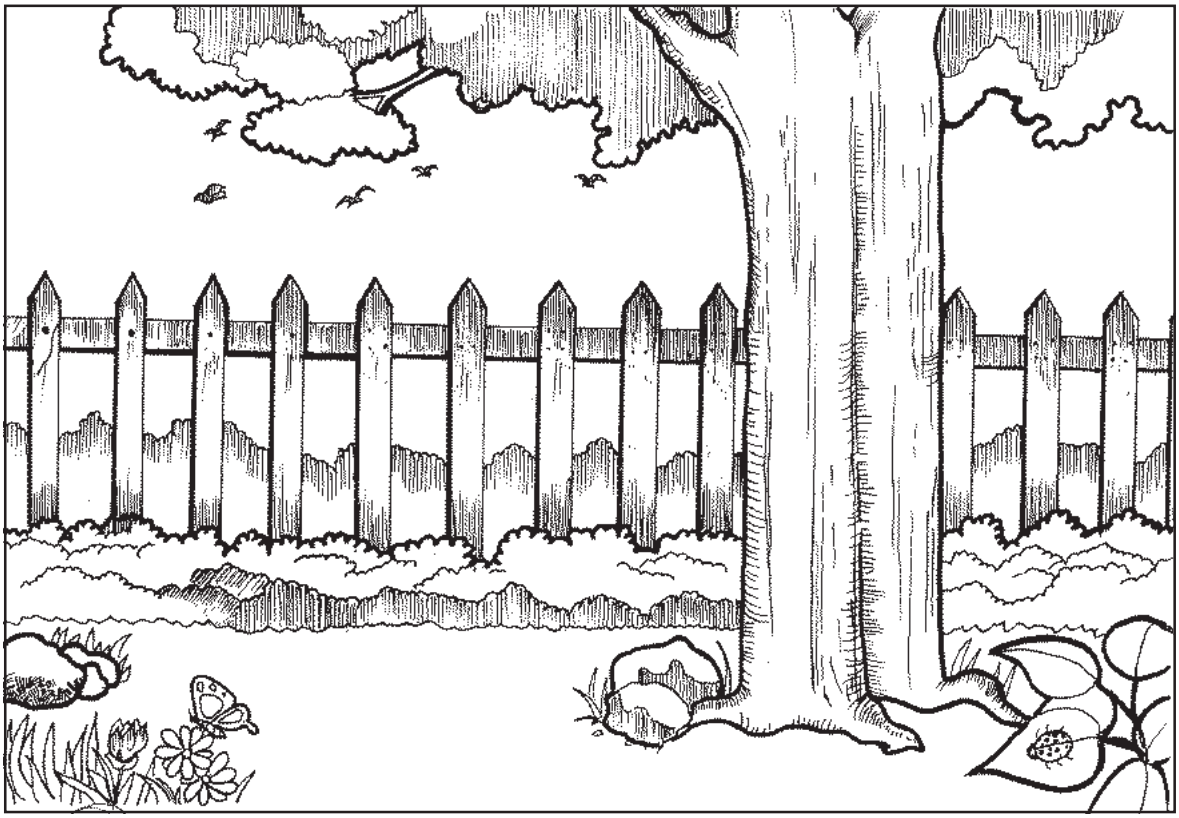
The Ecosystem

The planet you live in abounds with life. All around you, all kinds of organisms survive and thrive. How do you think these organisms are related to one another? How do these relationships work for the benefit of each organism? How do they ensure the survival of the organisms?

In this lesson, you will find out what an ecosystem is. You will learn to describe the nature and characteristics of an ecosystem. You will also find out what make up an ecosystem and how these components are related to each other. Are you eager to learn about ecosystems? Read on!

Let's Try This

Go to your backyard, if you have one. If you don't, go to a public garden or park. Identify the living things that you see in your yard or the garden/park. Afterward, identify as many nonliving things as you can. List your answers on a sheet of paper. Have your list checked by your Instructional Manager or Facilitator.



Let's Think About This

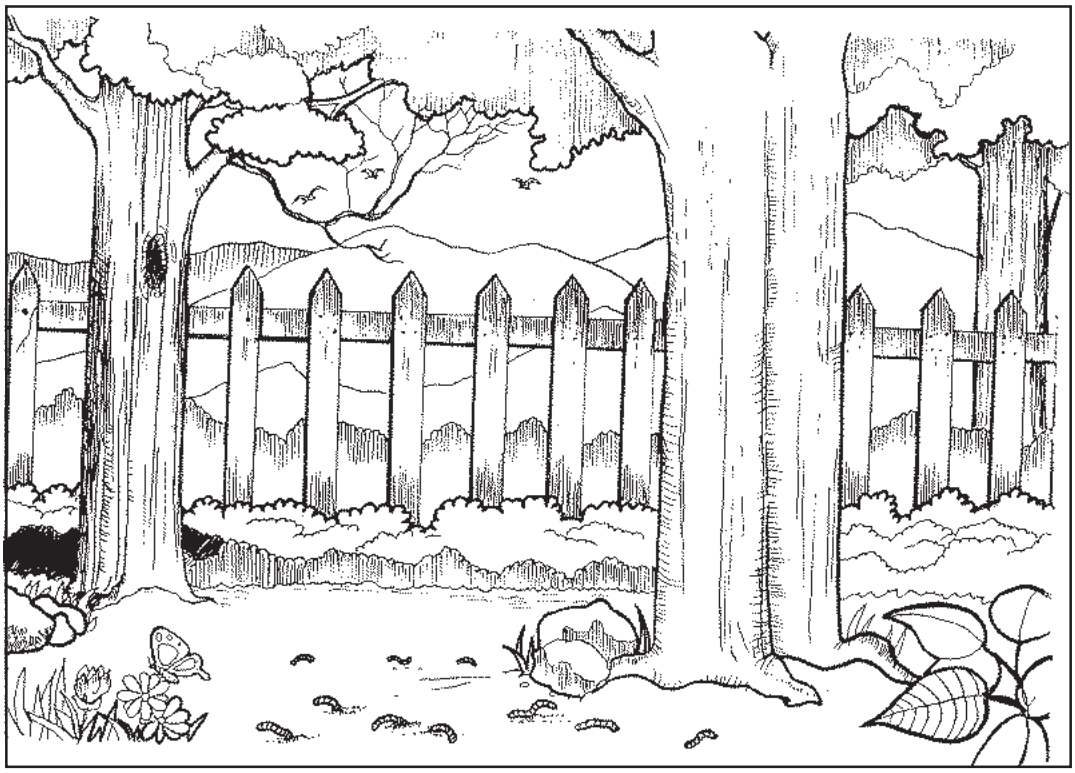
Think about the living things and nonliving things that you saw and identified. Think of any pair of living things from those in your list that help each other. What are these? How do they help each other? Then, think of a pair of living thing and nonliving thing that are related to each other. How are they related to each other?

Let's Learn

Were you able to think of any two living things that help each other? Or how a living thing is related to a nonliving thing? I'm sure you were.

In a yard or garden/park, you can easily see how two living things benefit each other. Flowering plants and insects such as butterflies, for instance, help each other. The plants provide food for the butterflies while the butterflies provide the pollen grains that the plants need in order to flower and bear fruits.

How about the relationship between a living thing and a nonliving thing? Did you see earthworms in the soil? The earthworms live in the soil. The soil provides a home for them. In return, the earthworms provide better air circulation in the soil by burrowing through it. This makes the soil richer, which in turn benefits the other living things in the backyard, especially the plants.



Do you now see how living things and nonliving things in a certain area affect one another? These living things and nonliving things make up an ecosystem. What is an ecosystem?

An **ecosystem** is a complex made up of living things, their physical environment and all their interrelationships in a particular unit of space.

Let's describe the characteristics of an ecosystem based on the definition above:

- **Living things and their physical environment**

  An ecosystem is made up of not just living things but of nonliving things as well. Let's consider the yard or garden/park that you studied in the preceding activity. It is an ecosystem because it is made up not just of plants, butterflies, earthworms and other living things, but of soil, water and air as well. It is the combination of living things and nonliving things that make a particular space an ecosystem.

  The components of an ecosystem are grouped into two—the **biotic** or living components and the **abiotic** or nonliving components.

- **Interrelationships**

  You saw how living things and nonliving things in your yard are related to one another. There are different kinds of relationships in an ecosystem. Some may be beneficial; others may be harmful to one party. Because of these interrelationships, whatever happens to one component will definitely affect all the other components of the ecosystem.

  Let's consider once again the ecosystem that you studied earlier. What do you think will happen if the number of ants in the ecosystem will increase drastically? The ants might deprive other organisms in the ecosystem of space and food. This may result in the decrease in population of another organism in the ecosystem.

  What if on the other hand, an abiotic component changes? Say, what if it did not rain for a long time? The plants would wither and die and the organisms that depend on these plants for food would die as well. There would certainly be drastic changes in the ecosystem if this would happen.

- **A particular unit of space**

  Keep in mind that each ecosystem can be found in a particular space. Different kinds of ecosystems can be found in different kinds of places. Each type of ecosystem is occupied by a specific group of organisms interacting with a physical environment that differs from other types of environments.

  Generally, there are two kinds of ecosystems—terrestrial and aquatic ecosystems. **Terrestrial ecosystems** are those that can be found on land; **aquatic ecosystems** are those that can be found in water.

There are various types of terrestrial ecosystems and aquatic ecosystems, each occupied by different organisms and with different physical conditions. A desert ecosystem, for instance, contains plants and animals that can survive with little water, such as cactuses and camels. It has a high temperature, receives little rainfall and has sand for its soil. A tropical rain forest ecosystem, on the other hand, is characterized by an abundance of rainfall and rich soil that enables a wide variety of plants and animals to survive.

Let's Try This

Look in your community for other types of ecosystems aside from the one you studied earlier. Remember that for something to be considered an ecosystem, it must meet the requirements I specified in the previous section—it must contain both living and nonliving things interacting with one another and they must occupy a particular unit of space. List as many ecosystems as you can find.

Have your Instructional Manager or Facilitator check your list.

Let's See What You Have Learned

State whether each item is a biotic or an abiotic component of an ecosystem. Then identify one ecosystem in which this component can be found.

1. ant _____
2. narra tree _____
3. monkey _____
4. sand _____
5. crocodile _____
6. sunlight _____
7. tilapia _____
8. water _____
9. cow _____
10. cactus _____

Compare your answers with those in the *Answer Key* on page 38. Did you get a perfect score? If you did, that's very good! If you did not, that's okay. Just review the parts of the lesson that you did not understand very well. Afterward, you may move on to Lesson 2.

Let's Remember

- An ecosystem is a complex of living things, their physical environment and their interrelationships in a particular unit of space.
- There are generally two kinds of ecosystems—terrestrial ecosystems and aquatic ecosystems.

Life Under the Sea

Did you know that life started in water? Three billion years before terrestrial (land) plants and animals came to exist, life existed in oceans. The sea is an example of an aquatic environment. It is a special environment wherein, instead of air, water is all around. Aquatic ecosystems like the sea have distinct properties and components.

In Lesson 1, you learned what an ecosystem is. You discovered that it is composed of biotic and abiotic components that exist together in an area and are interrelated. The relationships among the components of an ecosystem are important for the survival of the components of the ecosystem and the ecosystem itself. You also learned that ecosystems are different from one another. Ecosystems found on land are called **terrestrial ecosystems.** Ecosystems found in water are called **aquatic ecosystems.** Each ecosystem is special and has its own distinct characteristics and components.

In this lesson, you will learn about aquatic ecosystems, specifically the marine ecosystem. This is the ecosystem found in oceans and seas. Are you ready to know more about life under the sea? Read on!

Let's Think About This

Have you ever imagined how it would be like to live under the sea? What are the exciting things that you can discover and do in an environment surrounded by water? Imagine the creatures you will meet! Wouldn't life be exciting under the sea?

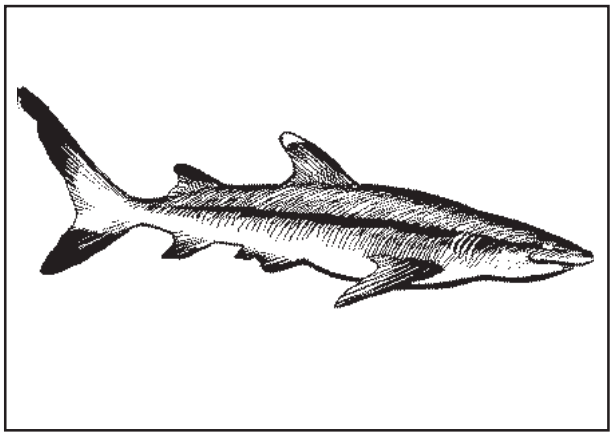
Let's Learn

Much as you would like to personally discover how it is to live in oceans, you know that you cannot. You are a human being who needs air to survive. However, there are many organisms that have developed special capabilities that let them survive underwater. The biggest water environment is the marine environment. It is the largest ecosystem in the world.

Aquatic environments are specialized environments. There are two major forms of aquatic environments. **Freshwater ecosystems** contain water that is not salty. In contrast, **marine or oceanic ecosystems** contain salty water. Freshwater environments contain only 1% of the saltiness that characterizes oceans and seas. Because of this major difference in environmental conditions, the two aquatic ecosystems are distinct from each other. This distinction is based on the physical and chemical differences in the water environments that influence the communities of organisms.

Let's Try This

The figures that follow show some organisms or biotic components found in marine ecosystems. Name each organism and describe what you know about it in the space provided.



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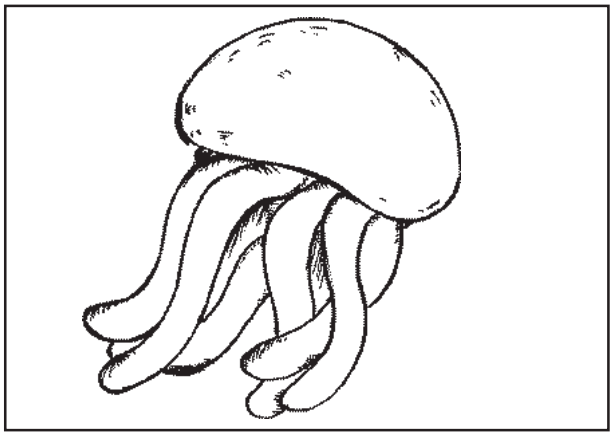

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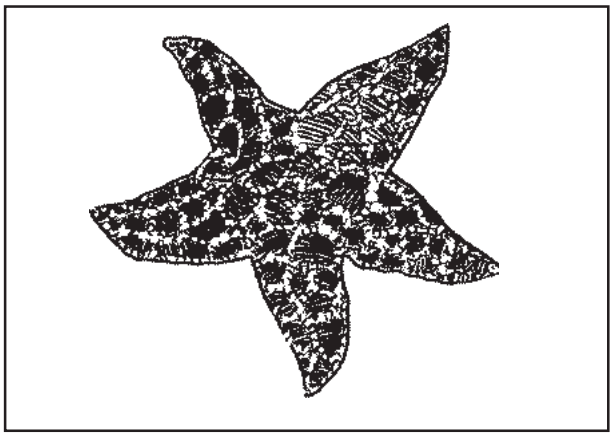
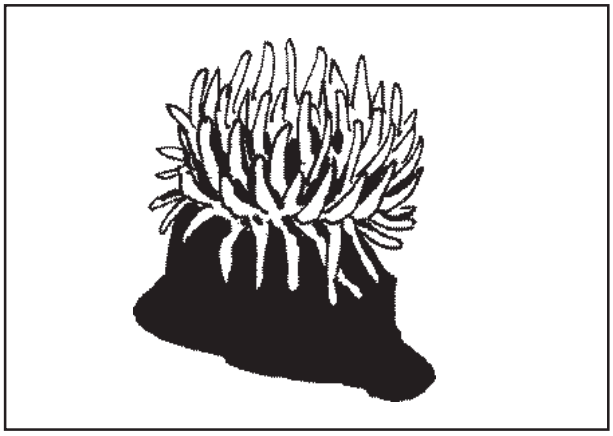
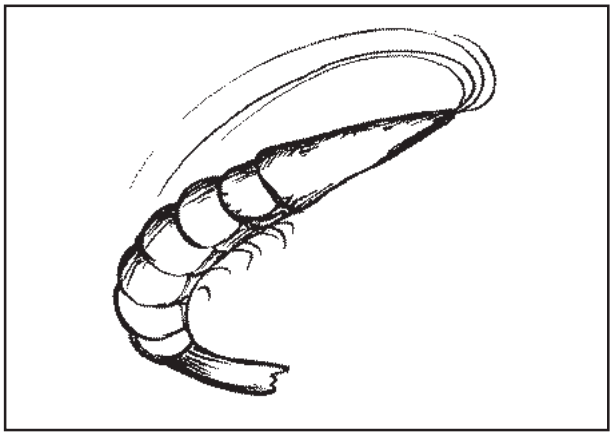




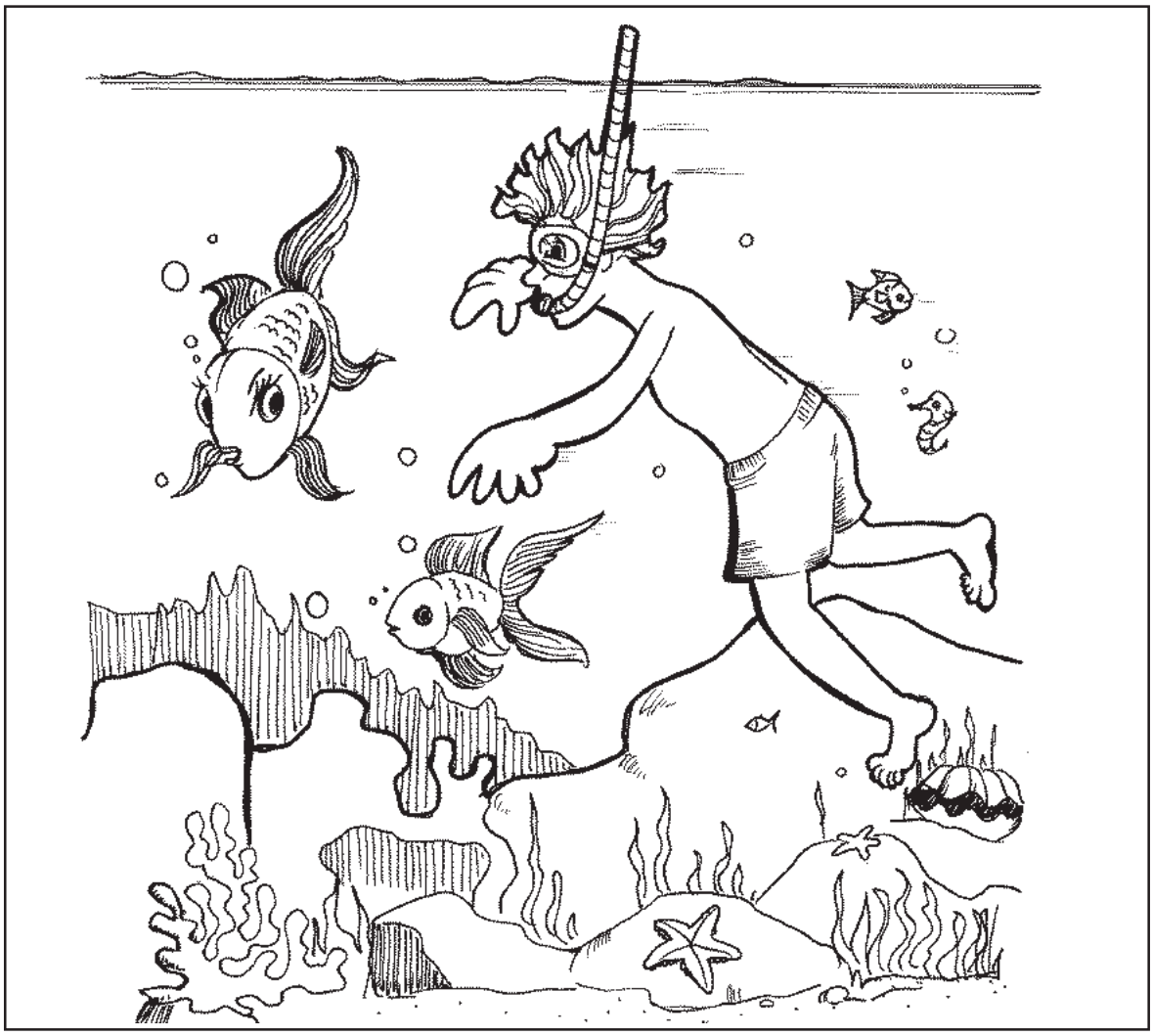


Compare your answers with those in the *Answer Key* on page 39.

Can you think of similarities among these organisms? What makes them survive in underwater environments?

Let's Learn

Aquatic animals need oxygen, just like terrestrial animals do. They have developed special body parts that enable them to extract oxygen from water. Fishes, for instance, have gills for this purpose. Other animals have similar parts that help them survive underwater.



The Marine Ecosystem

Oceans cover 75% of the earth's surface. Seas and oceans are important because they supply most of the water that evaporates which in turn forms into clouds and fall on land as rain. Ocean temperatures affect the global climate. Most of the oxygen present in the air and breathed by land animals comes from the plants found in seas.

A marine ecosystem is special because it has a high salt content. Oceanic creatures are able to survive under these conditions while human beings and other land-based animals will find these unsuitable.

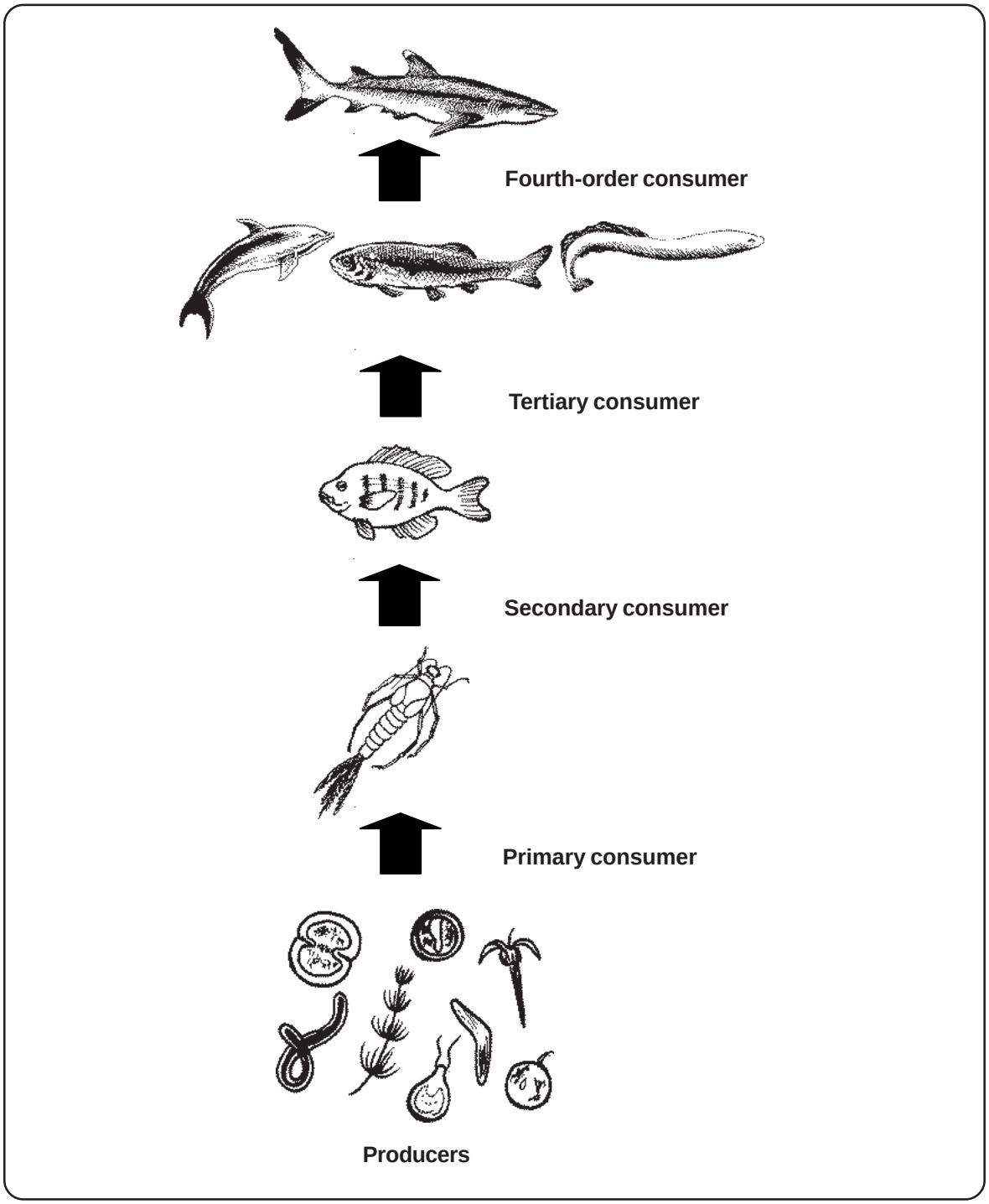
Study the example of a marine ecosystem below. It shows a forest of kelp under the sea. Kelp is a giant seaweed that can grow up to 150 feet. It provides food for fishes and other organisms in oceans.

Plankton are critical components of food chains in all marine environments because they provide nutrition for organisms such as crustaceans, fish and squid. Some phytoplankton are also important sources of oxygen which they release as a by-product of photosynthesis, the food-making process in plants.

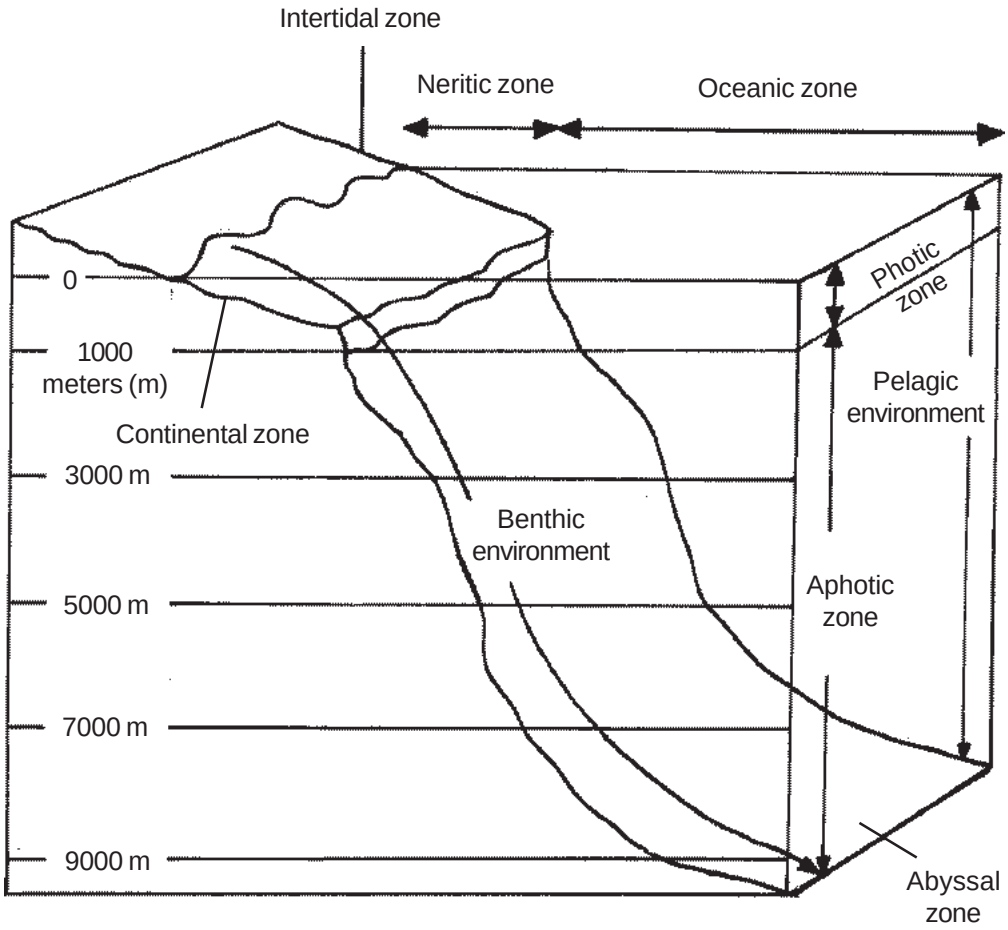
The word **plankton** comes from the Greek word *planktos*, meaning "wandering" or "drifting." This is how most plankton move, floating with the ocean's currents. There are some plankton, however, that can control their movements. Such plankton include the jellyfish.

Plankton actually include a wide variety of organisms—bacteria, algae, the larvae of some animals, protozoans. Most plankton, however, are protists (single-celled organisms that have a nucleus). They are grouped into **phytoplankton,** which are plants or plantlike protists; **zooplankton,** which are animals or animal-like protists; and microbes such as bacteria. Phytoplankton carry out photosynthesis and are the producers of the marine ecosystem.

The picture below shows a food chain in a marine ecosystem. The phytoplankton are the producers; zooplankton and other animals are the consumers.



Marine ecosystems are not all the same. There are many subecosystems found in oceans that have distinct physical environments. Study the picture on the next page.

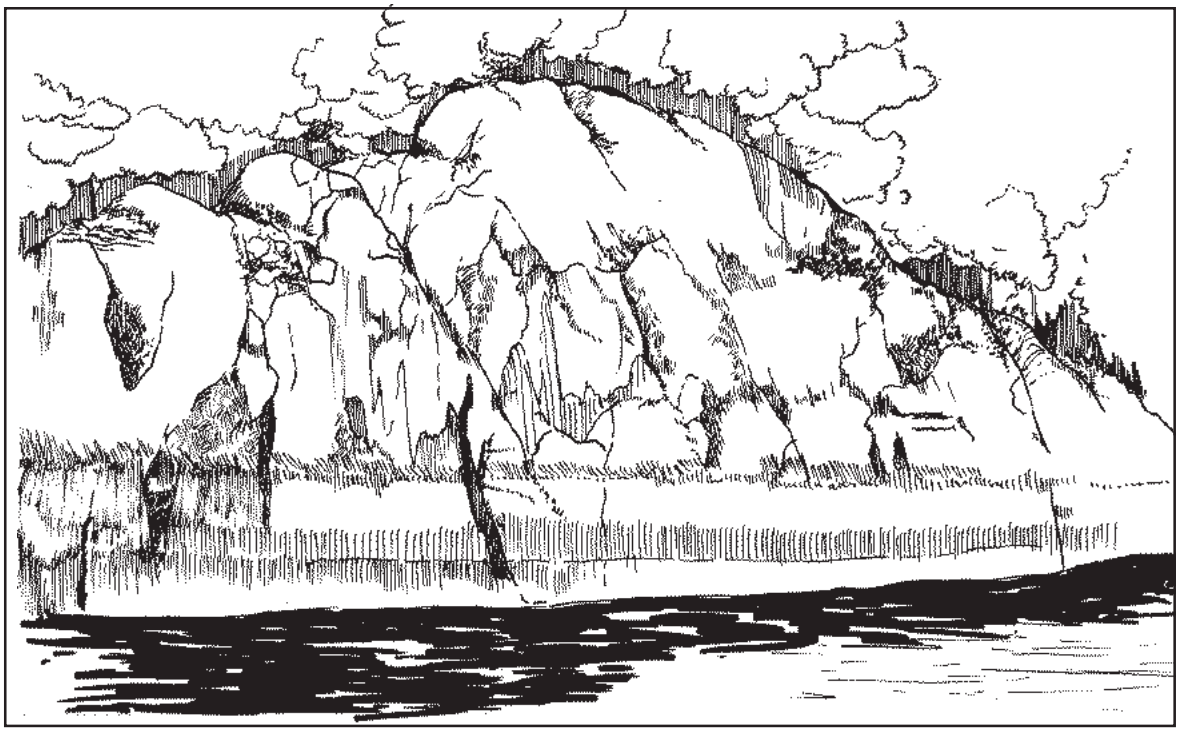


Oceans are divided into **marine zones.** These are special environments within oceans that are distributed according to depth and distance from the shore. The area where land meets water is called the **intertidal zone.** This is commonly referred to as the beach. The greater the depth of the water, the less sunlight can penetrate until below a certain depth, no light can penetrate at all. This area of darkness, which occupies the greater part of the ocean, is called **aphotic zone.** The illuminated region above it is called the **photic zone** which is where photosynthesis takes place.

The marine environment can be characterized as a water, or **pelagic environment** and a bottom, or **benthic environment.** The pelagic environment is divided into the **neritic zone,** which includes the water above the continental shelf (coastal plain found underwater), and the **oceanic zone,** which includes all waters beyond the continental shelf. Farther down is the **abyssal zone,** which represents a substantial part of the ocean.

Let's Think About This

Have you ever been to a beach? Imagine yourself there. What are the biotic components of the beach or intertidal zone that you can identify? What are the abiotic components present in an intertidal ecosystem?



Let's Learn

The biotic components in marine ecosystems can be classified into those living in the pelagic environment and those living in the benthic environment. Some organisms, however, are benthic in one stage of life and pelagic in another.

Pelagic organisms include the plankton and the nekton. You already know what plankton are. The phytoplankton are the producers in the pelagic ecosystem. **Nekton** are the active swimmers of the oceans. A majority of nekton are vertebrates (animals with backbones), such as fishes, reptiles (like turtles), whales and mollusks (squid, octopus) and crustaceans (crayfish, lobster).

Benthic organisms are called **benthos.** They are grouped into **macrobenthos** (organisms larger than one millimeter) and **microbenthos** (smaller than one millimeter). Benthos include starfish, bivalves (mussels, clams), diatoms and bacteria.

Each area in the ocean comprises a special submarine ecosystem that shows how sea-dwelling creatures interact with the special conditions present in their environment. As these creatures have special relationships with each other and with their particular environment, the fate of one affects another. This is how ecosystems work.

Let's See What You Have Learned

1. Enumerate the different marine zones and give the characteristics of each.

_____
_____
_____
_____
_____
_____
_____

2. Describe the kinds of organisms found in marine ecosystems.

_____
_____
_____
_____
_____
_____
_____

Compare your answers with those in the *Answer Key* on page 40. Did you get a perfect score? If you did, that's very good. If you didn't, that's okay. Just review the parts of the lesson that you did not understand very well before you move on to Lesson 3.

Let's Remember

- Aquatic ecosystems are divided into marine ecosystems and freshwater ecosystems.
- Oceans cover 75% of the earth's surface and are important for the maintenance of global climate.
- **Plankton** are the major producers in marine environments. Consumers such as fish eat these plankton as a source of energy.
- The marine environment can be characterized as pelagic environment and benthic environment.
- Marine organisms can be classified into those that live in the pelagic environment (plankton and nekton) and those that live in the benthic environment (benthos).

Freshwater Ecosystems

Seas and oceans occupy a big portion of the **biosphere**, the part of the planet where life can be found. About 75% of the surface of the earth is covered with water and only about 2% is covered with freshwater. Freshwater refers to water that has low **salinity** (salt content). The salinity of freshwater bodies such as ponds, rivers and lakes contain 1% of that found in sea or saltwater. Freshwater is precious to human life. Water comprises roughly 80% of the human adult body weight. Without freshwater, we would have no drinking water.

We get the water we drink from bodies of freshwater. These are lakes, rivers, ponds, streams and lagoons. Aside from containing freshwater, these bodies of water are similar because they are closely related to the landmasses that surround them.

In Lesson 2, you learned about marine ecosystems. In this lesson, you will learn about freshwater ecosystems. You will learn the characteristics of freshwater ecosystems that make them special. Are you ready to learn more? Read on!

Let's Think About This

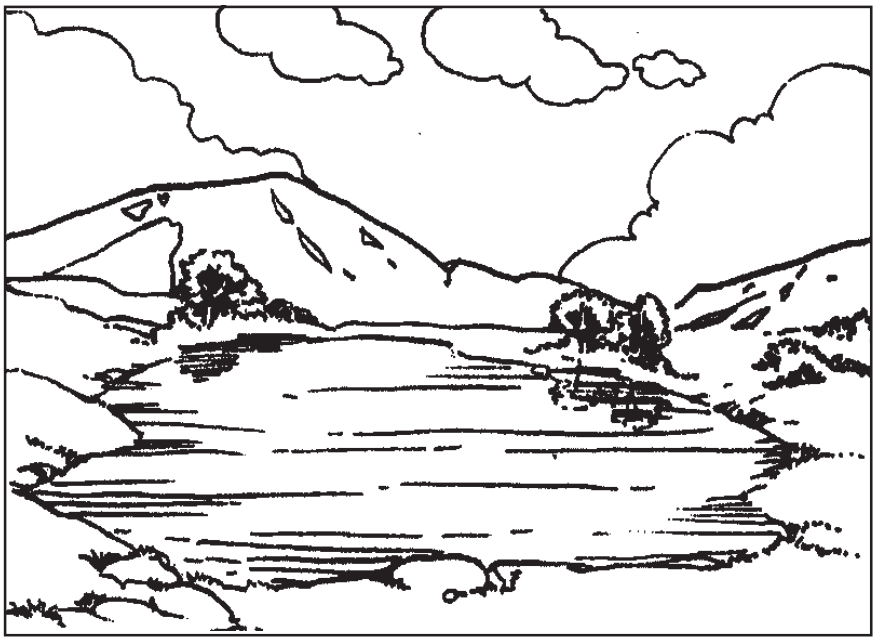
Have you gone to a lake before? What do you remember about that lake? Does it have waves like the ocean? Is it bigger than the sea? What do you think are the differences between the oceans and seas and bodies of freshwater?

Let's Learn

Aside from having lower salinity, bodies of freshwater are closely linked to where they are situated. There are four major bodies of freshwater namely, streams, rivers, ponds and lakes. Generally, streams and rivers are grouped together because their waters are fast flowing. They are created from runoffs from mountains and other highlands. Rainwater travels downward due to gravity and collects in streams and rivers, which generally move fast as they travel toward the oceans. Because of their nature, streams and rivers have long, winding routes. Streams emerge to form rivers. Study the picture below.

Streams and rivers are bodies of water that travel toward the sea. Ponds and lakes, on the other hand, are formed when runoff water accumulates in a landlocked basin. Therefore, the water is not fast flowing because it does not rush toward the sea. Both ponds and lakes contain standing water. Ponds are smaller versions of lakes.

Have you ever swum in a pond or lake before? Can you remember what it looked like? Picture the pond or lake in your mind as you learn more from this lesson.



Whether moving or not, long or wide, fast or slow, bodies of freshwater contain life. The relationship between living and nonliving things in these bodies of water is referred to as **freshwater ecosystem.** Since you have learned that ecosystems differ when physical conditions differ, there are two general types of freshwater ecosystems—the **standing freshwater ecosystem** of the ponds and lakes and the **running water ecosystem** of streams and rivers.

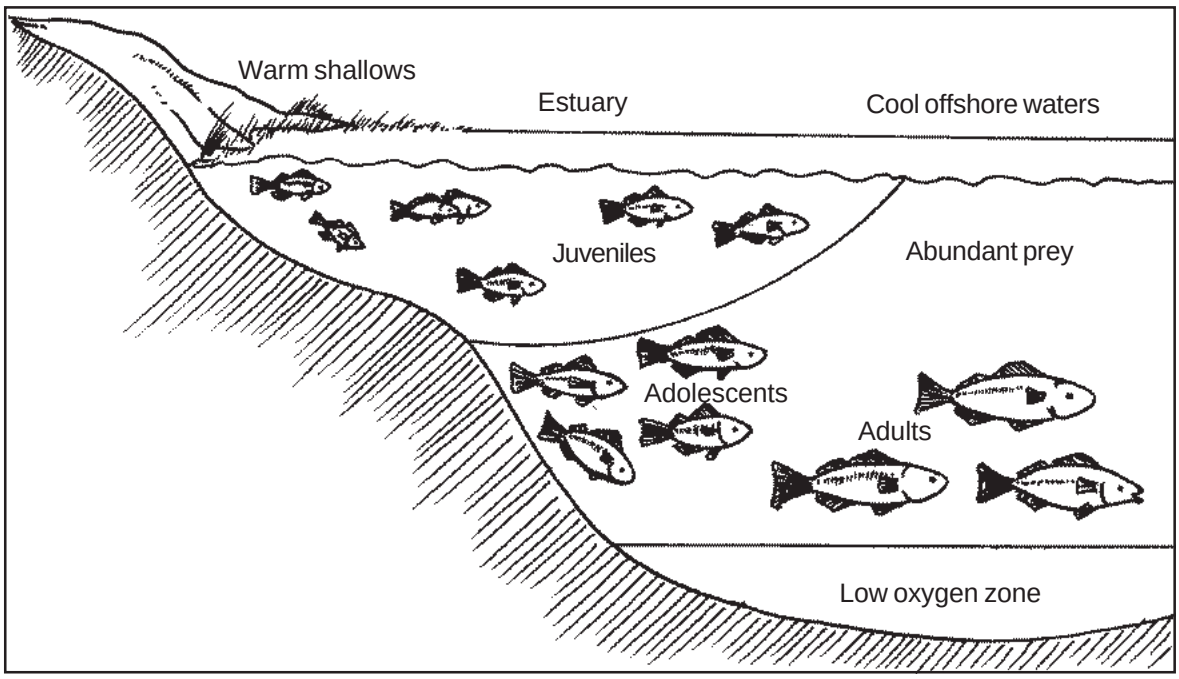
Let's Try This

Make a list of 10 living things that can be found in freshwater ecosystems. What organisms are found in oceans and seas, but are not found in rivers and lakes? Why do you think it is impossible for creatures that are well adapted to a salty environment to survive in freshwater? How come there are no sharks or whales in rivers? Why are starfish found only in the sea?

Let's Learn

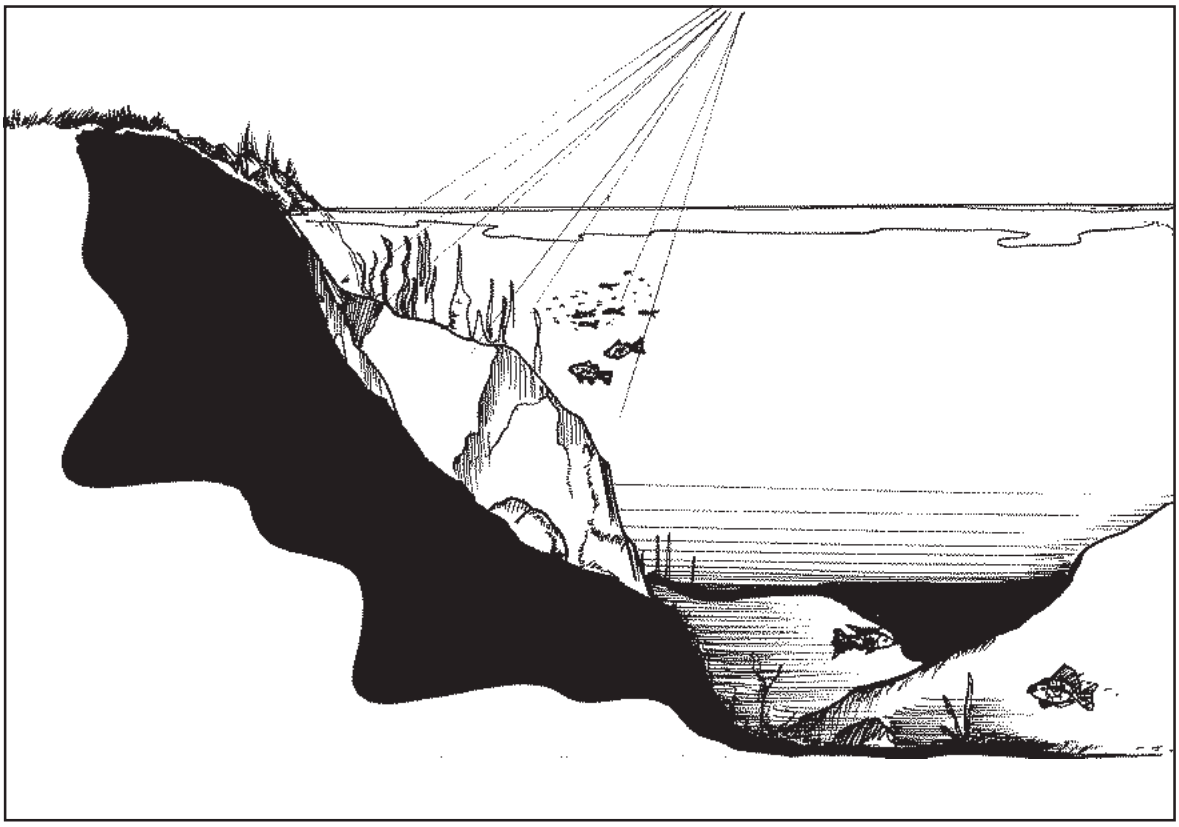
Underwater creatures are adapted not only to life under water in general but to the particular conditions of their water environment. An example of such condition is salinity or salt content. A freshwater fish like tilapia, for example, cannot survive in the sea. Sharks would also die if they were placed in rivers. Although there are some organisms that can tolerate both environments to a certain extent, generally, organisms prefer to live in the environment to which they are most adapted. Adaptation may be physical or behavioral. Physical adaptations include changes in the shape of the body and development of special body parts that are most suited to the present environment. Behavioral adaptations refer to such things as mating patterns and feeding habits.

In bodies of standing water like ponds and lakes, light intensity decreases with depth. Study the picture below.



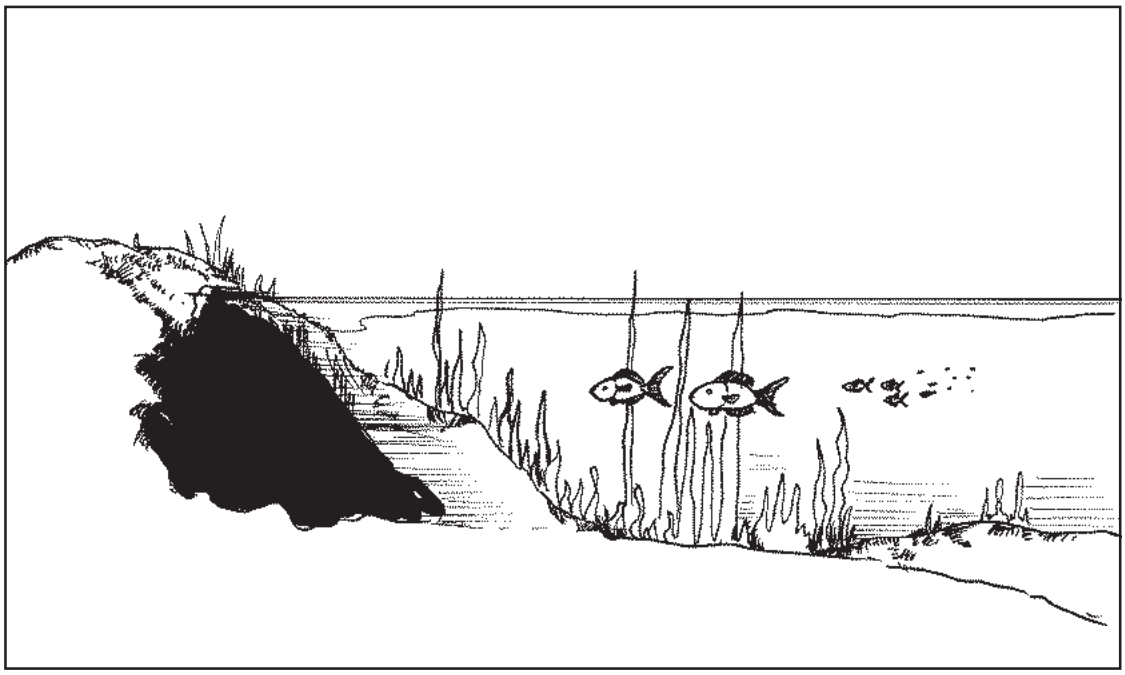
As in marine ecosystems, fishes and other creatures in freshwater environments depend on phytoplankton as the producers of energy. Food is supplied to the ecosystem by plants. Plants produce food through photosynthesis, a process that requires energy from sunlight.

A standing water ecosystem is divided into the **upper photic zone** and the **lower aphotic zone**. The farther the water from land, the deeper it is. Hence, shallower areas (upper photic) have sufficient light for photosynthesis. Light may be less or totally absent in the lower aphotic areas. This fact is also true in the case of the temperature of the water. Shallow parts are warmer because of exposure to sunlight. Deeper parts are colder. The distribution of communities of plants and animals varies according to the depth of the water and its distance from land. Study the picture on the next page.

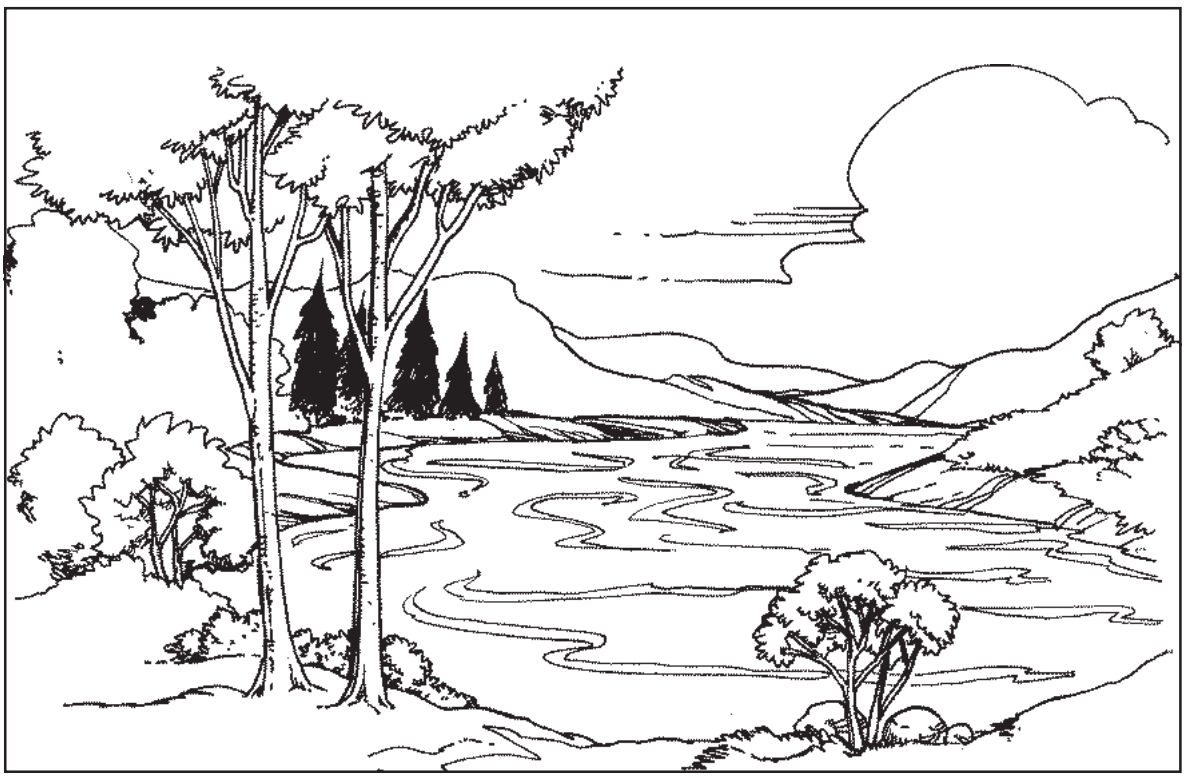


Aquatic floaters (phytoplankton) and rooted plants abound in the **littoral zone.** This is the zone in a standing water environment that receives sufficient sunlight. Since water plants abound, other organisms abound too. The upper photic regions contain more algae, diatoms, snails, clams, fishes and even insects. Hence, there is **diversity** in this region, meaning, a large number of different types of biotic components occupy the area.

The **aphotic zone** is also capable of supporting life. No photosynthesis occurs in this zone but algae and rooted plants that fall as **detritus** or sediments to the lower zones of lakes and ponds are utilized by the consumers. Other stray fishes in the area are consumed by bigger fishes.



The flowing water ecosystems in streams and rivers do not have distinct aphotic and photic areas. Water is continuously flowing hence there are also higher rates of "churning" of the sediments that fishes and other creatures require for food. Algae and rooted plants also abound along the banks of streams and rivers. These plants, along with the floating phytoplankton, are important food sources in rivers and streams.



Let's Think About This

If the fishes used to living in standing water ecosystems are suddenly transferred to a flowing freshwater ecosystem, what do you think will happen to them? Will they survive the sudden change in environment? To survive, what do you think are the necessary changes needed by the fishes (physical and behavioral)?

Let's See What You Have Learned

Write your answer to each question in the space provided.

1. Why is there a greater variety of biotic components in the shallow areas of bodies of freshwater?

   _____
   _____
   _____
   _____
   _____

2. Certain creatures that have adapted to a certain environment may survive in another environment if they can make certain adaptations. Adaptations may be physical or behavioral. Can you give some examples of such adaptations?

   _____
   _____
   _____
   _____
   _____

Compare your answers with the answers in the *Answer Key* on page 40. If you got a perfect score, that's very good. If you did not, that's okay. Review the parts of this lesson that you did not understand very well. Afterward, you may move on to Lesson 4.

Let's Remember

- Freshwater only makes up about 2% of all the water available on earth but it is very important for life. Life also abounds in freshwater environments.
- The two major types of freshwater habitats are the standing freshwater (ponds and lakes) and the flowing freshwater (streams and rivers) ecosystems. Each ecosystem has distinct characteristics and qualities.
- There are two major zones in standing freshwater ecosystems. The upper aphotic zone is penetrated by sunlight. This is the shallower area of a pond or a lake where photosynthesis takes place. Because of the increased food available, there is a high degree of diversity in this region. The deeper end comprises the lower aphotic zone where, although photosynthesis is not actively occurring, sediments or detritus from producers in the photic zone rain down.
- The running or flowing water ecosystem is unique because of the speed of change of the environment considering the continuous movement of these bodies of water toward the sea. Despite this fact, flowing water ecosystems thrive.

LESSON 4

Man-Made Ecosystems

Human beings have proven themselves to be the most successful species on the planet. Because of the special abilities of human beings to change their environment, nature never looked the same ever since humans first walked on the face of the earth. Human beings constantly change the environment. They cut down forests to make way for farms; they reroute rivers, build dams and reclaim land from the sea. All these places I mentioned are the **habitats** or homes of many plants and animals. When habitats change, ecosystems change too.

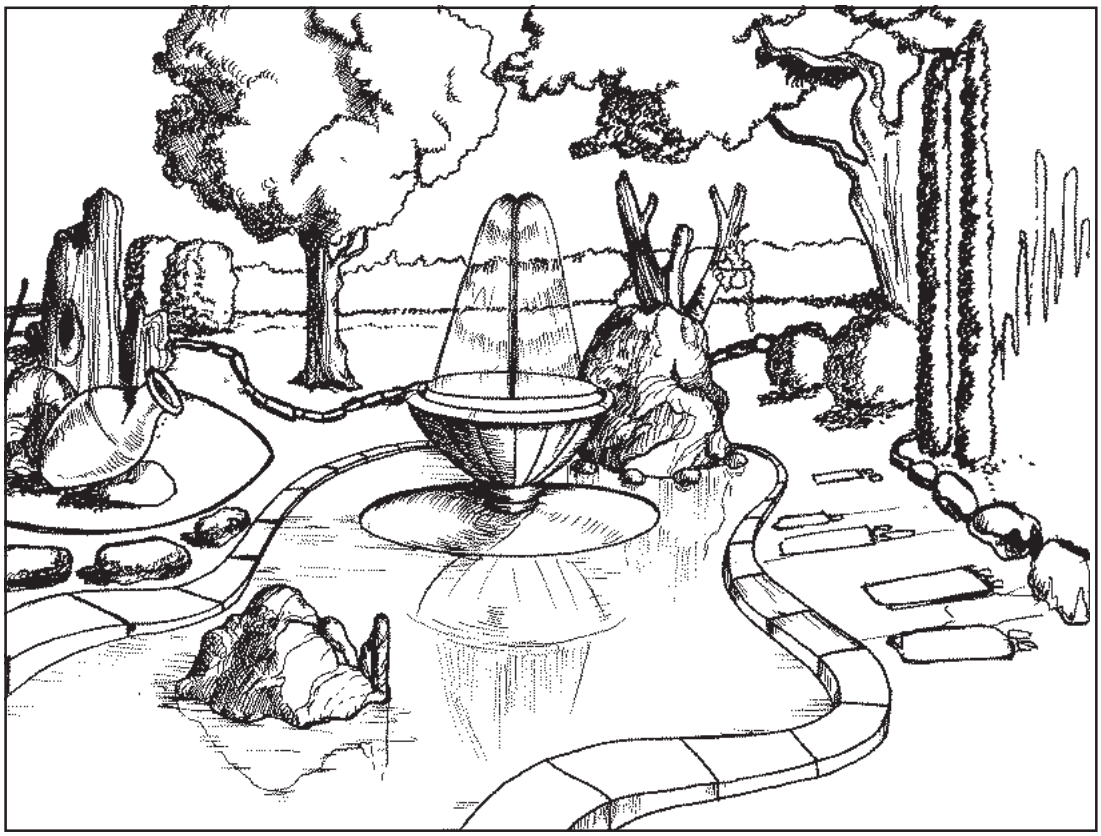
In the previous lessons, you learned about the biotic and abiotic components that make up an ecosystem. These components affect one another. A change in the environment affects organisms. Some perish while others thrive. Ecosystems are fragile but support very important relationships among living and nonliving things.

In this lesson, you will learn about the impact of human activities on natural ecosystems. You will discover some of the ecosystems that humans altered to suit their own needs. This alteration of the environment and ecosystems does not always lead to good results.

Let's Think About This

Have you heard of landscaping? **Landscaping** is the practice of changing the environment to suit a person's own needs or preferences. In a garden, landscaping may involve clearing old plants, removing rocks and soil, arranging channels of water and introducing new plants. Have you done landscaping before?

What were the changes in the environment that your family made to make your own backyard suit your family's needs? What do you think are the effects of the changes your family made in the ecosystem that previously existed there?



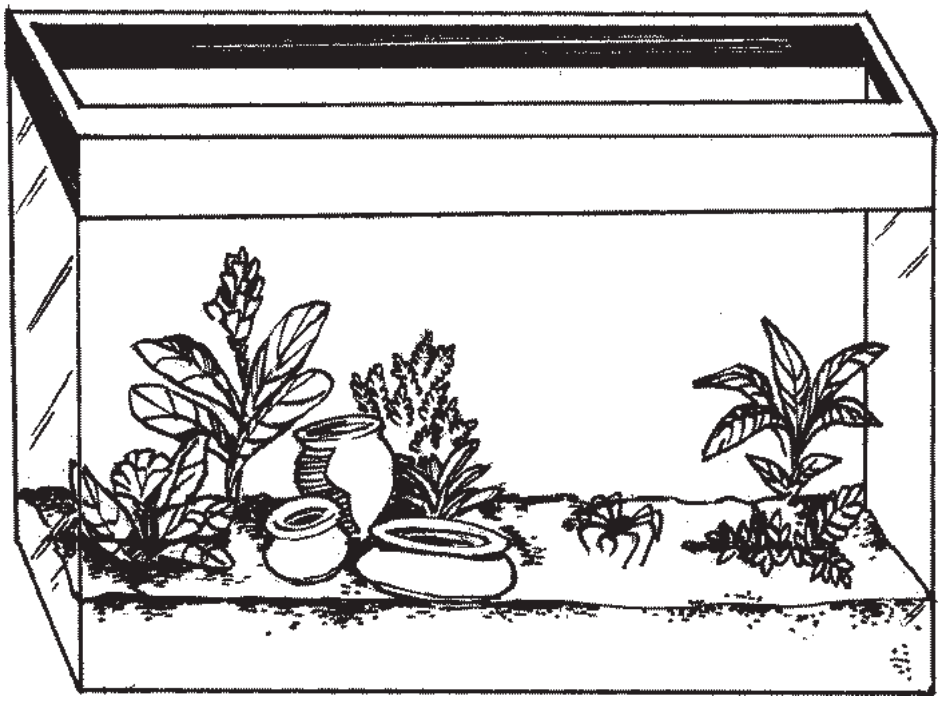
Let's Learn

Changing the appearance of land to create a garden shows how human activities affect ecosystems. Previously, the place carried an original ecosystem that was altered when the place was landscaped to create a garden. Some species, such as earthworms, could have been driven out of the area. New plants may crowd out old growth. New organisms that can adapt most to the present conditions of the garden will come in and multiply. The coming in of new organisms and the phasing out of old ones affect the ecosystem of which they are a part. Human beings are indeed a major force in altering ecosystems. In the next part of this lesson, you will study some examples of man-made ecosystems.

Terrarium

An ecosystem does not necessarily have to occupy a very large space. Ecosystems can be as large as an ocean or as small as a flowerpot. As long as there are related biotic and abiotic components occupying a specific area, an ecosystem exists.

An example of a man-made ecosystem occupying a small area is a **terrarium.** A terrarium is a container, usually made of glass, that houses a collection of plants and other organisms. Terrariums are usually displayed indoors. A terrarium is like a tiny garden inside a glass container. Study the picture of a terrarium below.



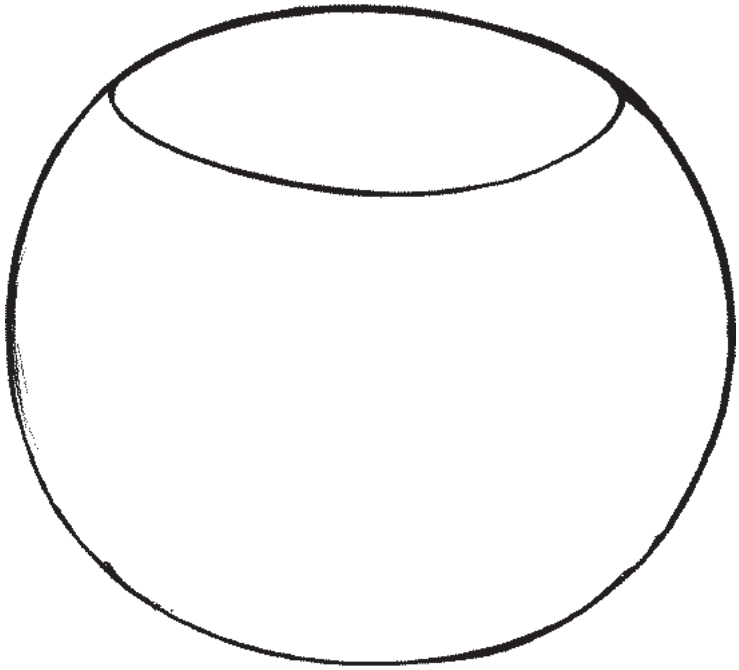
A terrarium ecosystem has biotic components such as plants and small organisms such as insects. The soil, rocks and even the glass container itself comprise the abiotic components. Each component is related to another. If the plants grow too big, they might crowd out the other organisms inside the container. If ants increase too fast, the other animals inside the terrarium might be deprived of food. Removing the soil would also affect the plants and other organisms. A terrarium is a good place to start studying ecosystems. It is small but complete and illustrates the relationships found in terrestrial ecosystems.

Aquarium

An **aquarium** is a glass tank or bowl filled with water. If a terrarium represents a terrestrial or land-based ecosystem, an aquarium represents a small-scale aquatic ecosystem. Instead of ants, fishes are the main organisms. The aquarium ecosystem thrives on oxygen dissolved in water. As in other ecosystems, the biotic and abiotic components are interrelated. The changes in one causes changes in the others.

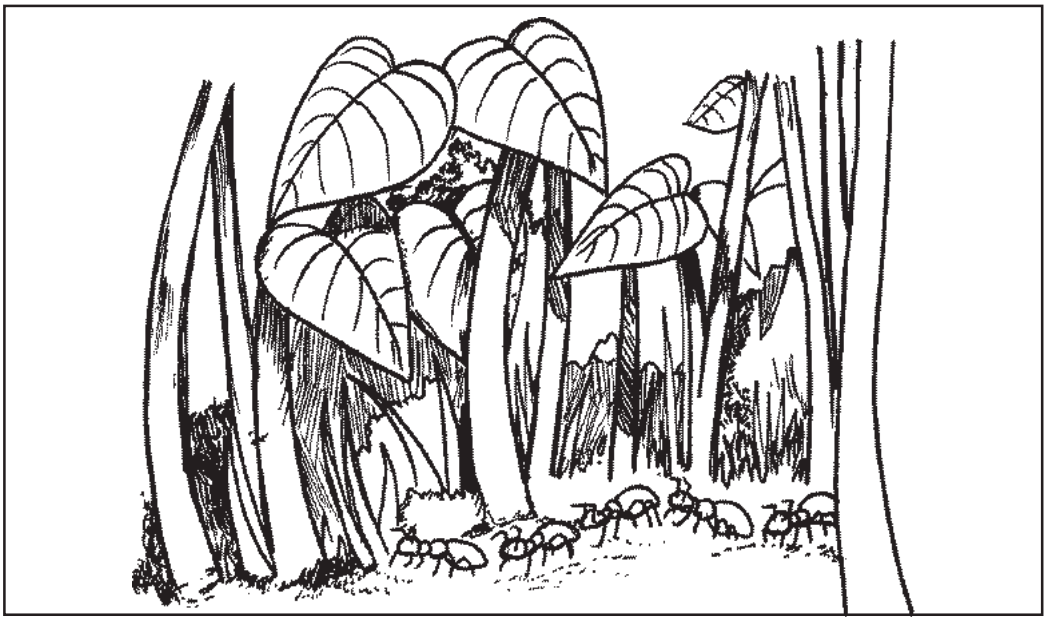
Let's Try This

Below is a picture of an empty aquarium. Draw the biotic and abiotic components that are usually found in this ecosystem. If you have an aquarium at home, you can draw what you see in your aquarium.



Let's Think About This

Imagine yourself as a small ant inside a terrarium. As an ant, what are the things you need to do to survive? Which organisms would you like to be friends with? How important is your role in the terrarium ecosystem where you belong?



Let's Learn

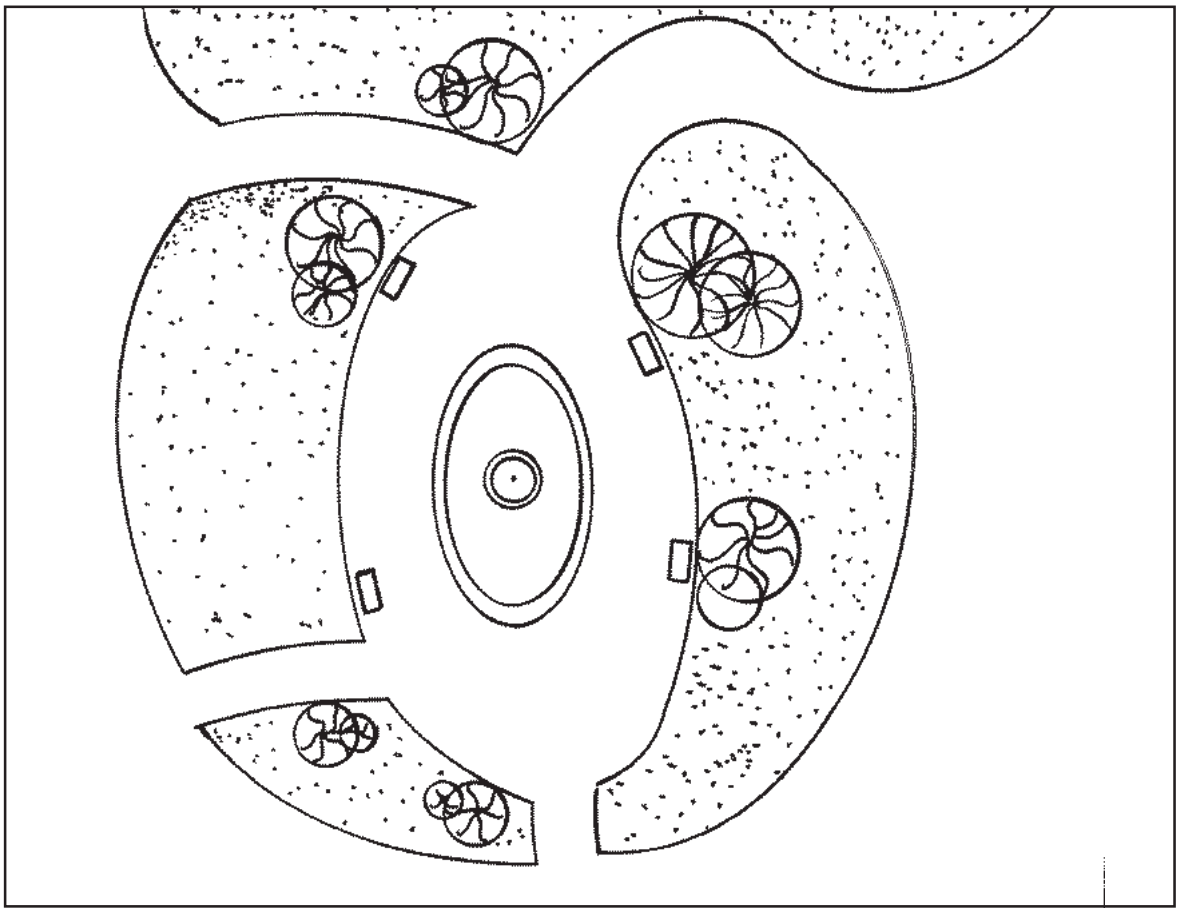
Gardens and Parks

Your own backyard is a big terrarium. You are an active part of this ecosystem.

Human beings have the capability to change their environment. Soil is shaped, removed, replaced and rearranged through landscaping. New plants are introduced in gardens. Bodies of water are often altered in the process. Prior to any place becoming a park or garden, an ecosystem existed there. This ecosystem had different organisms thriving under different conditions. When human beings alter their environment, ecosystems are either changed or totally replaced.

Let's Try This

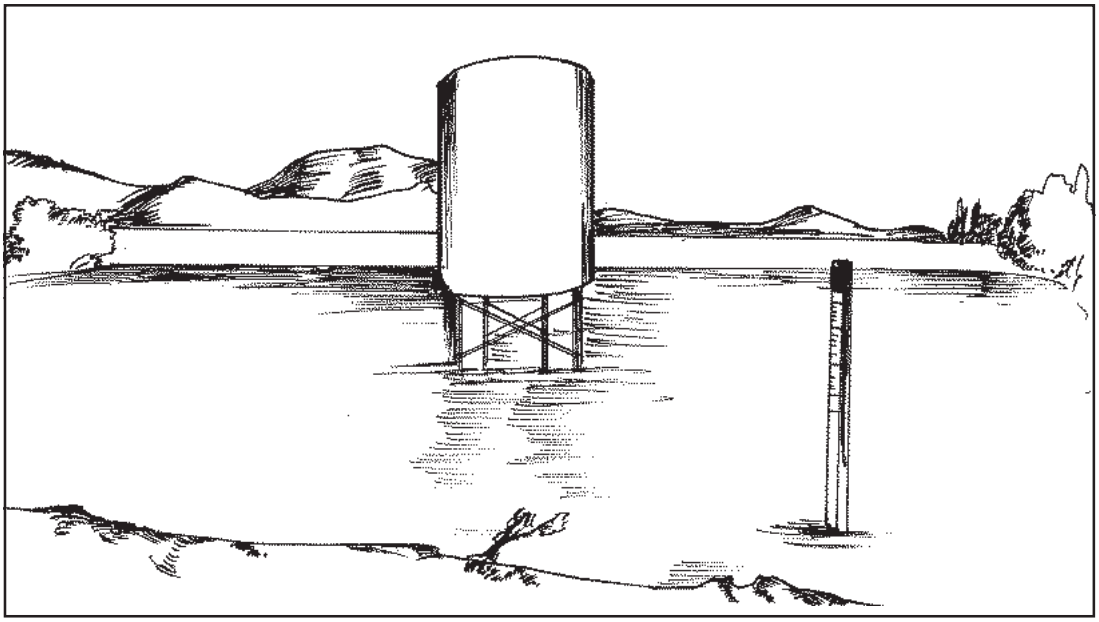
Do you live near a park? Or do you have a garden in your house? Go there and observe. What are the biotic and abiotic components that you can identify? Draw a map of your garden or a small area of a park. Then indicate the location of each organism you see. What do you observe about the relationships between the plants and organisms in your drawing? How did landscaping create the changes in the ecosystem of the area? Below is a sample illustration of a park to guide you.



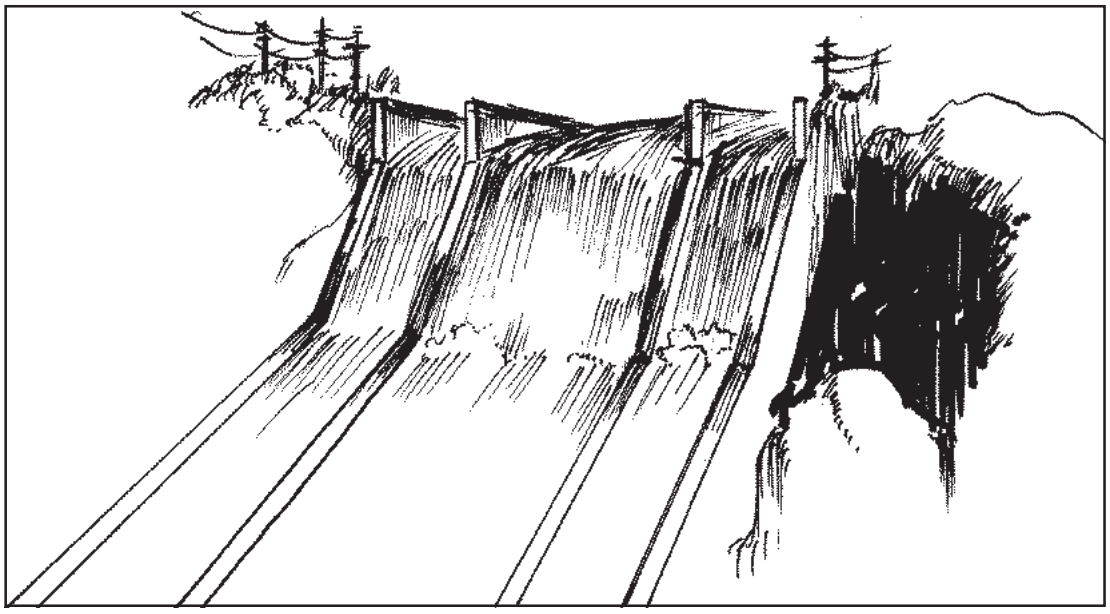
Let's Learn

Dams

Dams are man-made lakes. Rivers are fast-flowing bodies of water that are stopped in their tracks by dams. The water collected in this man-made lake is released. Releasing water causes turbines to turn, thus creating electricity. This source of electricity is called **hydroelectric power.**



Since the ecosystem of a flowing water habitat of the river was transformed by human beings into the steady water habitat of a lake, there were also changes in the biotic and abiotic components of that ecosystem. Fishes that used to swim in fast-moving currents had to adjust to steady water. Because of temperature changes, phytoplankton and algae are given more time to proliferate or increase. Lakes contain an amazing variety of plants and animals that thrive in still water conditions.

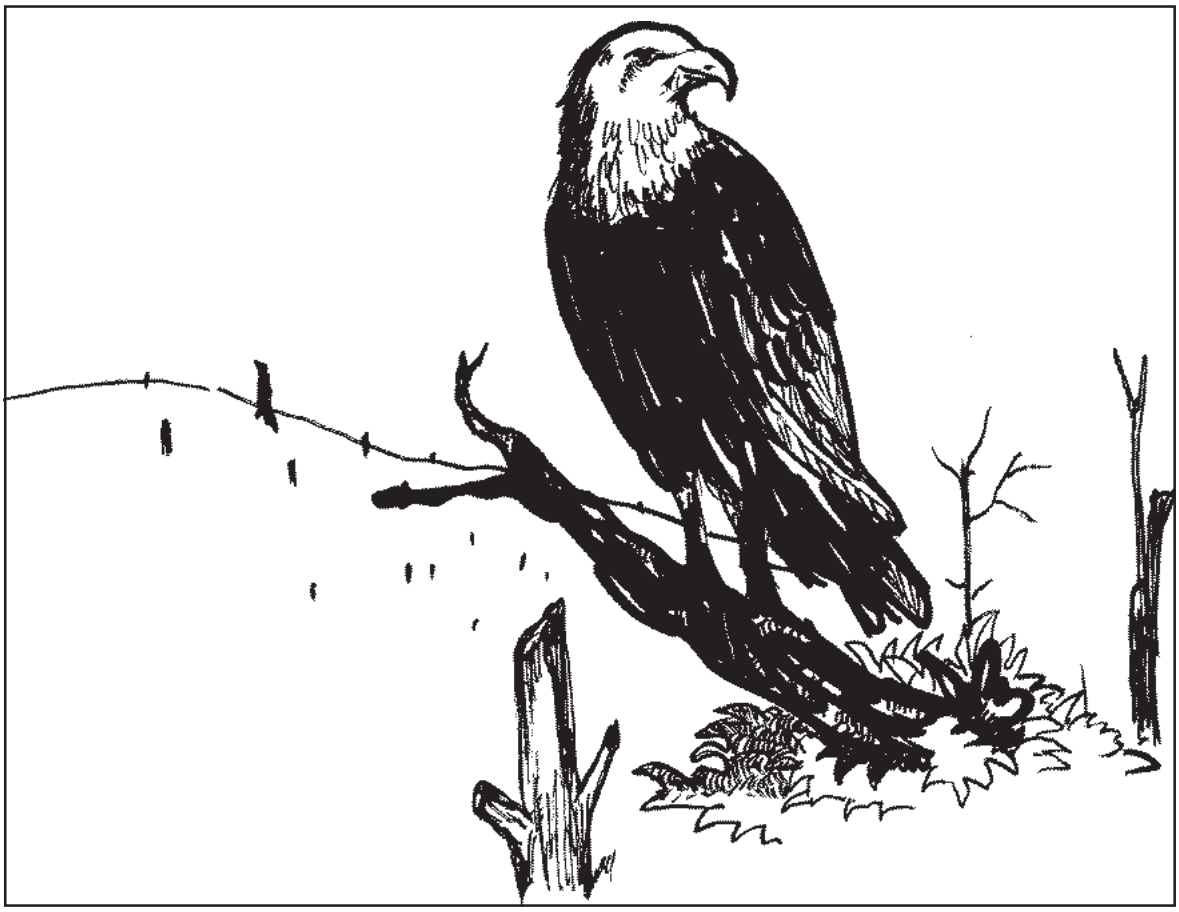


From Forests to Farms

The increasing number of human beings has resulted in greater pressure to provide more food to feed the growing population. Because land is limited, forests are being transformed into farms at an alarming rate. Trees are cut down at alarming rates. This does not allow forests to recover.

When human beings alter forests, they also change one of the richest ecosystems on earth. A large percentage of all species of plants and animals are found in forests. Forests have high levels of diversity. Many species live in these areas. When forests are cut, that diversity is replaced by the single-crop character of farms. A hectare of forest that contains a million species is transformed into an acre of field that grows only one product. What do you think are the effects of this change on animals and insects that thrive in forests?

The alteration of natural ecosystems by human beings may result in the extinction of some species. **Extinction** refers to the loss of all the members of a species. For example, if a species of eagles becomes extinct, there will be no more trace of that species on earth. If the number of a certain eagle species becomes very low, that species will be classified as **endangered,** which means it is under threat of being extinct.



Extinction reflects the fragility of the ecosystem. Ecosystems are vulnerable to many influences. Human beings create the most devastating alterations. Man-made ecosystems, such as farms and dams, are not always good for the ecosystem. The ecosystem represents the chain of life. If a part of the chain breaks, the rest of the chain suffers. You, too, have an important role to play in the chain of life. What do you think your role is in the ecosystem?

Let's See What You Have Learned

Explain the similarities and differences between the following ecosystems. Write your answers in the spaces provided.

1. terrarium and garden

_____
_____
_____
_____

2. aquarium and dam

_____
_____
_____
_____

3. forest and farm

_____
_____
_____
_____

Compare your answers with those in the *Answer Key* on pages 40 and 41. If your answers are similar, you learned a lot about man-made ecosystems from this lesson. That's good! If not, review the parts of the lesson that you did not understand vey well.

Let's Remember

- **Ecosystems** are composed of related biotic and abiotic factors in a given location. When human beings enter an ecosystem, changes are usually made. Human beings have the capability to drastically alter existing ecosystems in any given area. When ecosystems are changed in accordance with the needs of human beings, they are called man-made ecosystems.
- A **terrarium** is a small ecosystem similar to a garden. An **aquarium** is a smaller version of a freshwater aquatic ecosystem. **Forests** are being cut down at an alarming rate and transformed into farms. This practice creates an artificial ecosystem that does not favor some species. Because of the inability to adapt to the man-made changes in their environment, some animals become endangered. If this continues, they might become extinct.
- Human beings play a major deciding factor in maintaining or destroying ecosystems. Your role in the chain of life is a decision you make for yourself.

Well, this is the end of the module. Congratulations for finishing it. Did you enjoy studying it? 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

This module tells us that:

- An **ecosystem** is made up of all the living and nonliving things found in a particular area. The living creatures found in an ecosystem are called the **biotic components.** The nonliving things are referred to as the **abiotic components.**
- Ecosystems found on land are called **terrestial ecosystems** while ecosystems found underwater are called **aquatic ecosystems.**
- There are two major forms of aquatic environments, namely, freshwater ecosystems, which contain water that is not salty and marine or oceanic ecosystems that contain salty water.
- Phytoplankton are the major producers in marine environments.
- The seas and oceans occupy a bigger portion of the biosphere. About 75% of the surface of the earth is covered with water and only 2% is covered with freshwater.
- There are two major types of freshwater ecosystems—standing freshwater (ponds and lakes) and flowing freshwater (streams and rivers). Each ecosystem has distinct characteristics and qualities.
- A man-made ecosystem is an ecosystem which was developed by human beings by changing or altering the structure or form of a natural ecosystem. Examples of man-made ecosystems are terrariums, aquariums, parks, gardens, dams and farms.

What Have You Learned?

Fill in the blanks with the correct words. Choose the answers from the box.

dam	biotic	abiotic
ecosystem	phytoplankton	photic
rivers	aquarium	extinction
salinity	marine	detritus

1. Oceanic ecosystems are also called _____ ecosystems.
2. Sediments falling to the bottom of a lake are called _____.
3. An _____ is an example of a small man-made aquatic ecosystem.
4. The _____ components are the nonliving components of an ecosystem.
5. The disappearance of a species is referred to as _____.
6. The _____ zone receives sunlight and has plants that can perform photosynthesis.
7. A _____ is a man-made lake.
8. _____refers to the saltiness of a body of water.
9. Fast-flowing aquatic ecosystems include _____.
10. An _____has interrelated biotic and abiotic components.
11. _____include plantlike protists.
12. The _____ components of an ecosystem refer to plants and animals.

Compare your answers with those found in the *Answer Key* on page 41.

If you got a score of:

0–4 You need to study the whole module again.

5–10 Good! You just need to go back to the parts of the module that you did not understand very well.

11–12 Congratulations! You learned a lot from this module. You are now ready for the next module.

Answer Key

A. Let's See What You Already Know *(page 2)*

1. An ecosystem is a complex of living things and their physical environment, as well their interrelationships, occupying a particular unit of space.

2. a. Aquatic ecosystems are found in water while terrestrial ecosystems are found on land.

   b. Aquatic ecosystems are affected by such factors as water temperature, salinity and exposure to sunlight.

   c. Aquatic ecosystems contain unique organisms that cannot be found on land, such as fishes, plankton and algae.

3. a. Marine ecosystems have salty water; freshwater ecosystems do not.

   b. Marine ecosystems cover much larger areas than freshwater ecosystems.

   c. The organisms found in marine ecosystems are different from those found in freshwater ecosystems. For example, sharks and whales can be found only in marine ecosystems while tilapia and mudfish are found only in freshwater ecosystems.

4. Some examples of man-made ecosystems are: parks or gardens, aquariums, terrariums, dams and farms.

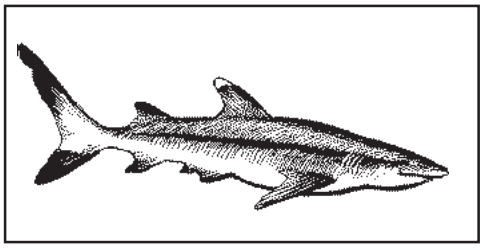
B. Lesson 1

Let's See What You Have Learned (page 7)

1. biotic; garden, park, farm
2. biotic; park, forest
3. biotic; forest
4. abiotic; ocean, sea, desert
5. biotic; swamp
6. abiotic; important component of all ecosystems
7. biotic; river, pond, lake
8. abiotic; ocean, sea, river, lake, pond
9. biotic; farm, meadow
10. biotic; desert

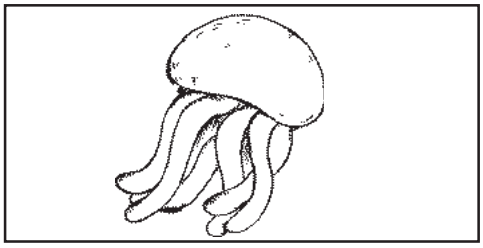
C. Lesson 2

Let's Try This (pages 10–11)



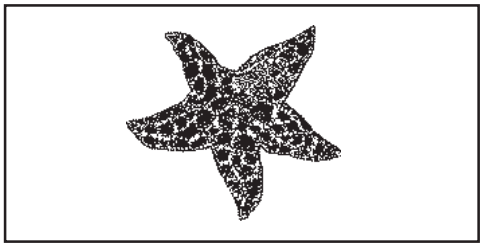
Shark

The shark is a feared predator of the sea. It is big and ferocious and eats smaller fishes.



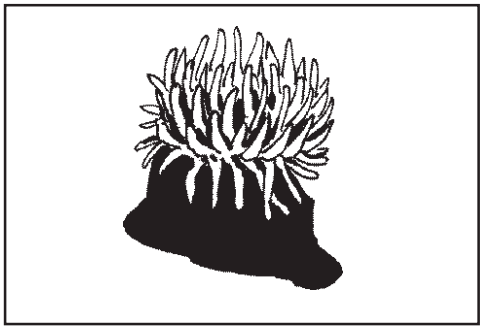
Jellyfish

A jellyfish has a very soft, often transparent body. Some jellyfish are edible.



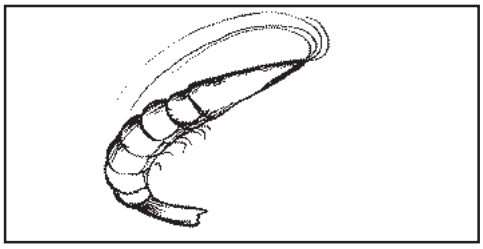
Starfish

These star-shaped creatures are sometimes mistaken for plants but are actually animals.



Seaweeds

They are the plants of the sea. Seaweeds provide food for fishes and other sea-dwelling creatures. Some seaweeds can be eaten by humans. Others are transformed into raw materials for industries.



Shrimps

Shrimps are crustaceans. They are also edible.

Let's See What You Have Learned (pages 17–18)

1. The intertidal zone is where land meets water. The aphotic zone is the area of darkness, where no light can penetrate at all. The photic zone is the illuminated zone above the aphotic zone.

   The marine environment can also be divided into the pelagic environment and the benthic environment. The pelagic environment is divided into the neritic zone, the water above the continental shelf, and the oceanic zone, which includes all the waters beyond the continental shelf. Farther down is the abyssal zone.

2. The organisms in a marine ecosystem can be classified as those living in the pelagic environment and those in the benthic environment. Pelagic organisms include the plankton and the nekton. The plankton are the tiny organisms in the pelagic zone, while nekton are the active swimmers. Benthic organisms are called benthos, which include starfish, bivalves, diatoms and bacteria.

D. Lesson 3

Let's See What You Have Learned (page 25)

1. The shallower areas of bodies of freshwater receive adequate sunlight. This allows for more plants to thrive in the upper photic zone. Plants are food sources for organisms. This rich food supply promotes a greater variety of organisms in that zone.

2. Organisms in the aphotic regions are able to create energy even without sunlight. Giant worms in these regions are able to utilize sulfur and other gases from the ocean floor to create energy. Some fishes can change color to match their environment. This is called camouflage.

E. Lesson 4

Let's See What You Have Learned (pages 34–35)

1. terrarium and garden

   Similarity Both are man-made or terrestrial ecosystems.

   Difference A garden is bigger than a terrarium.

2. aquarium and dam

   Similarity Both are aquatic freshwater ecosystems.

   Difference An aquarium is smaller than a dam. An aquarium is usually constructed for display while a dam is constructed to provide hydroelectric power.

3. forest and farm

   Similarity Both are terrestrial ecosystems.

   Difference Forests have a great diversity of species. Farms, on the other hand, are planted with a single crop that does not promote diversity in the ecosystem. Farms cannot renew themselves while forests can.

F. What Have You Learned? *(page 37)*

1. marine
2. detritus
3. aquarium
4. abiotic
5. extinction
6. photic
7. dam
8. salinity
9. rivers/streams
10. ecosystem
11. Phytoplankton
12. biotic

Glossary

Abiotic Nonliving.

Aphotic zone Refers to the deeper area in a sea or ocean where sunlight cannot penetrate.

Aquatic ecosystem Ecosystem found in water.

Aquarium A glass tank or bowl that is filled with water; represents a small-scale aquatic ecosystem.

Biosphere A portion of the planet where life can be found.

Biotic Living.

Ecosystem A complex of interrelated living and nonliving things found in a particular area.

Endangered Under threat of being extinct.

Freshwater environment Contains water that is not salty.

Habitat The place where an organism lives.

Hydroelectric power Electricity from water.

Intertidal zone The area where land meets water, also commonly referred to as the beach.

Landscaping The practice of changing the environment to suit one's own needs or preferences such as in a garden.

Neritic zone The area farther out in the sea.

Oceanic zone The deepest area of the ocean.

Photic zone Refers to the shallower part of the big marine or oceanic ecosystem where plants such as algae, seaweeds and phytoplankton that can manufacture food are found.

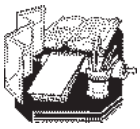
Phytoplankton Plants or plantlike protists in the pelagic environment.

Salinity Salt content.

Terrarium A container usually made of glass that houses a collection of plants and other organisms.

Terrestrial ecosystem Ecosystem found on land.

Zooplankton Animal or animal-like protists in the pelagic environment.



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