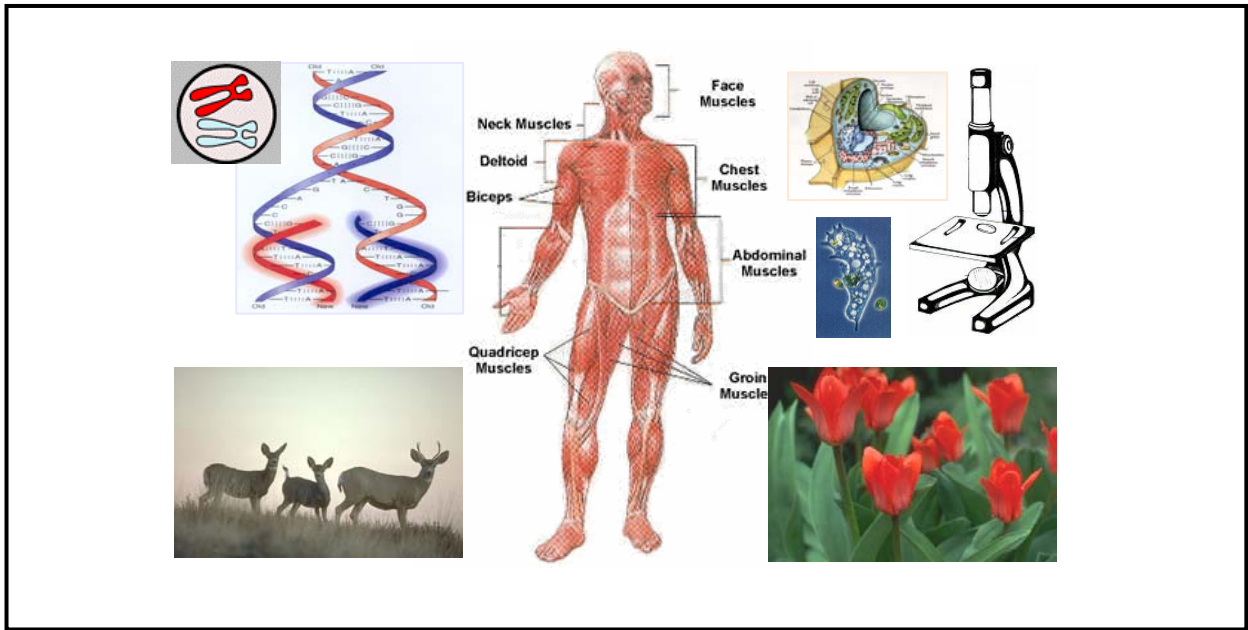


Project EASE

(Effective Alternative Secondary Education)

BIOLOGY



MODULE 19 *Ecosystem*



BUREAU OF SECONDARY EDUC
Department of Education
DepED Complex, Meralco Avenue
Pasig City



Module 19

Ecosystem



What this module is about

Hello, good day to you! I know that you have been through a number of exciting adventures in the science modules prepared just for you. But would you like to join in another trip?

This module will take you to another exciting and yet relaxing tour to the environment that surrounds us.

You must have been to many places before with your family and friends. But have you thanked the works of nature that made you feel happy, light and relaxed? Well then, this module will allow you to appreciate once again the beauty of mother Earth!

The following lessons comprise this module:

- **Lesson 1 – Ecosystem Ecology**
- **Lesson 2 – Interactions in the Ecosystem**
- **Lesson 3 – Energy flow in the Ecosystem**
- **Lesson 4 – Environmental Issues**



What you are expected to learn

After going through this module you should be able to:

1. Differentiate natural (managed) and man-made (unmanaged) ecosystems.
2. Identify the kinds of interaction in the ecosystem.
3. Describe some preventive measures to some ecological problems.



How to learn from this module

Before getting started, I have here some tips for you to successfully achieve the objectives of this self-learning kit.

1. Read and follow instructions carefully.
2. Answer the pretest before you start the lesson.
3. Take note and record points for clarifications.
4. Try to achieve at least a 75% level of proficiency in the tests.
5. Work diligently and honestly.
6. Answer the posttest honestly.



What to do before (Pretest)

Multiple Choice. Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. What is generally agreed upon as being the greatest threat to our wildlife resources?
 - a. global warming
 - b. habitat loss
 - c. ozone depletion
 - d. pollution
2. Which action can have the greatest impact on reducing the threat of global warming?
 - a. composting
 - b. recycling
 - c. reducing
 - d. planting a tree
3. Why should we care about the rainforests?
 - a. They provide or nurture biodiversity.
 - b. They are sources of food and other resources.
 - c. They are a source for medicines and other chemicals.
 - d. All of the above.
4. Suppose that planktons are small autotrophs that absorb energy from the sun. The shrimp eats the plankton. The tuna eats the shrimp. The shark eats the tuna. Which of these is the primary consumer?
 - a. plankton
 - b. shark
 - c. shrimp
 - d. tuna
5. Which of the following biomes is with permafrost and no large trees?
 - a. desert
 - b. grasslands
 - c. temperate deciduous forest
 - d. tundra

6. Which of the following is characteristic of predation?
- One organism kills and consumes another.
 - One organism lives in or on another and benefits.
 - Two organisms live together and neither is harmed.
 - Two organisms nourish each other; both benefit.
 - Two organisms feed side by side from the same food.
7. Which land biome has more varied plant life than any other biome?
- deciduous forest
 - grassland
 - tropical rain forest
 - tundra
8. In a food pyramid, the amount of energy that any level of organism receives decreases
- up the pyramid
 - in all levels
 - down the pyramid
 - across the pyramid
9. Which of these is a consumer-producer relationship?
- birds eating beetles
 - snakes eating frogs
 - hawks eating rabbits
 - caterpillars eating tomatoes
10. The relationship in which one organism is helped and the other is harmed is known as
- commensalisms
 - mutualism
 - parasitism
 - symbiosis
11. All of the following are abiotic factors **EXCEPT**:
- air
 - animals
 - soil
 - sunlight
12. Freshwater biomes include all of the following **EXCEPT**:
- estuaries
 - lakes
 - ponds
 - rivers
13. The level of the food chain which contains the most energy are the:
- decomposers
 - herbivores
 - omnivores
 - producers
14. Which of the following is **NOT** a way to prevent extinction?
- preserving natural areas
 - keeping endangered animals as pets
 - breeding endangered animals in captivity
 - reintroducing endangered animals to nature
15. How might products be designed so that they are more "environment-friendly"?
- Less energy should be required for their use.
 - Less energy should be used in their manufacture.
 - Products should be designed to be recycled or reused.
 - All of the above make products more "environment-friendly".



Key to answers on page 28.

Lesson 1. The Ecosystem

What is ecology? If you break the word ecology down to “eco” and “logos”, what will it give you? Very good! If “eco” means house and “logos” means study, then ecology means studying our house. Well, in the biggest sense, it means studying our Planet Earth!

Ecology is the study of how living organisms (biotic) and non-living parts (abiotic) of the environment interact with and depend on each other.

What does an ecologist do?

Anyone who loves the nature can be an ecologist. Ecologists are concerned with how organisms interact with their environment. Some ecologists focus on specific organisms and the place they live in while some ecologists are curious about many different species that either depend on each other, or compete with each other for food and space.

What is an ecosystem?

Did you know that living things depend on their physical and chemical environment for food, shelter, protection, and reproduction? Of course, who does not need food and water and shelter to live? The non-living components such as soil, water, temperature and sunlight can also affect the type and number of organisms living in an ecosystem. For example, in the desert, only plants like cactuses and animals like camels are able to survive since they need little amount of water for life maintenance. On the other hand, organisms like mushrooms, moss plants, earthworms, and snails live in moist and shaded place.

REMEMBER THIS!

Together the living and non-living components in an area is called an ecosystem.

Different Kinds of Ecosystems

An ecosystem can be small like an aquarium or a small pond in your backyard, with only a few organisms interacting, or it may be large, like a forest with lots of organisms interacting.

Generally speaking, there are two types of ecosystem: man-made and natural. When we speak of natural ecosystem, we are referring to those areas with little or no human intervention. A forest is a natural ecosystem as long as it remains to be unchanged by human activities. Other natural ecosystems include the oceans, the seas and the rivers.

On the other hand, man-made ecosystems are areas that are created, controlled and manipulated by humans. In creating man-made ecosystems such as an aquarium, a fishpond, and a terrarium, you can control the types and numbers of organisms to be included in such ecosystem. You can also manipulate the abiotic factors such as the amount of light, water or soil in your ecosystem.

A number of natural ecosystems have been changed by man's selfish purposes. Forests are cleared for agriculture and timber production. Hills and mountains are flattened for recreation or urban development.

But, wherever we live, we are part of a large ecosystem called **biosphere** (area on earth where life exists). The biosphere is composed of different biomes.

What is a biome?

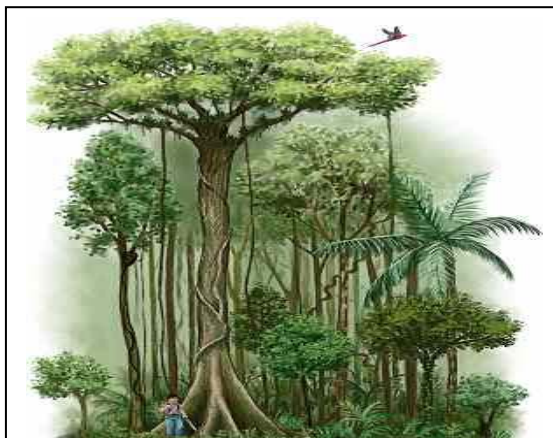
Biome is an area with a distinctive climate and with distinctive organisms. There is no definite number as to how many biomes are in the world. In this module, we will explore the following biomes: forest, taiga, tundra, grasslands, desert, and aquatic.

Terrestrial Biomes

Forests

There are two types of forest: tropical and temperate.

The tropical rainforests are found close to the equator. The climate has a lot of sun and very slight seasonal variation. Are you wondering why it is called a rainforest? Since they are located near the equator, evaporation is high, which results to frequent heavy rainfall and brief thunderstorms. Look at the figure below. It shows that the rainforest receives the highest rainfall among the biomes of the world.



Rain Forest
www.yahoo.com images

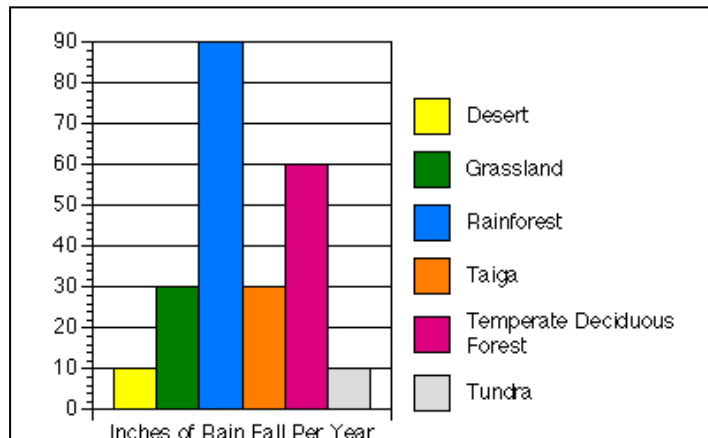


Figure 1.1 Inches of Rain Fall Per Year

What makes the tropical rainforest very important?

Did you know that the Philippine forests are among the world's richest? The Philippines is famous for its hardwoods such as Tangile, Yakal, Bagtikan and red and white Lauan.

We are very lucky to have tropical forests in our country. Do you know why? Can you give some benefits humans can get from forests?

Think of this!

Forests are important to us because it supports an exceptional diversity of plant and animal wildlife. Do you want to see the biggest and most colorful butterfly? Do you want to know how big or how small is the wildest and most poisonous snake? Do you want to touch and smell the biggest flower on earth? Or maybe you want to know how it feels to lie down on a carpet-like mossy ground while listening to the chirping and humming of birds?

Well then, there is no greater place to appreciate the works of nature than in our own forests!

Have you seen a tribal group of Cordillera or the tribal group of Oriental Mindoro called Mangyans? Where do you think they live? Very good! Our rainforests are also home to tribal cultures that have survived successfully in the forests for many thousands of years.

Did you know that rainforests are the primary source of pharmaceuticals? The plants used to cure cancer are found in tropical rainforests.

Another importance of rainforests is they help maintain global rain and weather patterns. Much of the water that evaporates from the trees returns in the form of rainfall.

The rainforests of North and South America, Australia and New Zealand are examples of temperate forest. The climate is cold with moderate seasonal variations. They have fewer species than tropical rainforests. Typical in this forest are ferns, mosses and very tall trees such as Douglas fir, Sitka Spruce, Redwood.

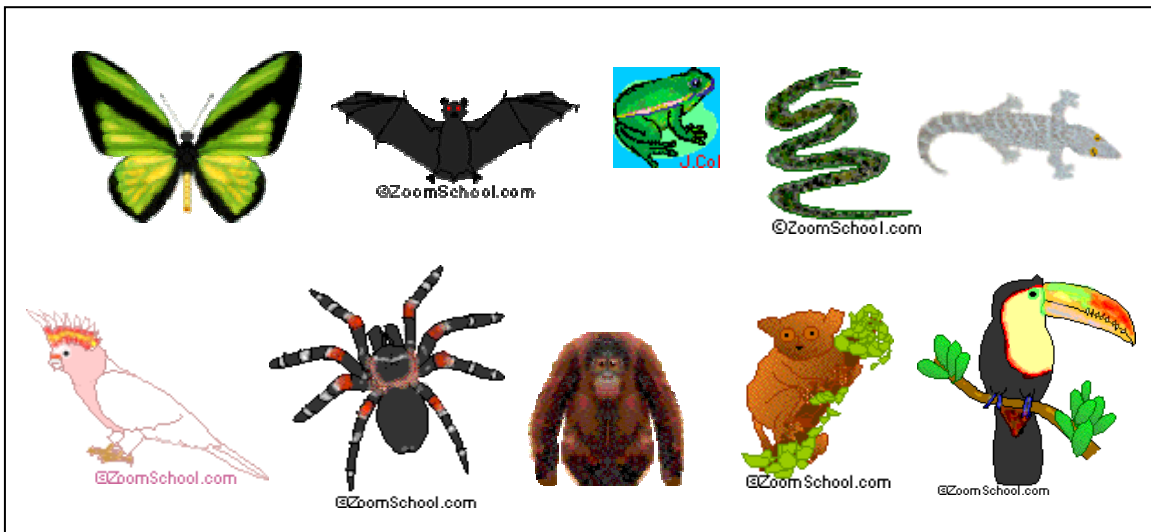


Figure 1.2 Some tropical rainforest animals
(pictures from www.yahoo.com images and clip art)

Grasslands

Grasslands are found all over the world, except in the Polar Regions, such as Alaska and Antarctica.

Grassland is a place where there is less rainfall. It is also subject to frequent fires that suppress the growth of bushes and trees. A grassland is also called prairie or savanna. Below are some typical animals in grasslands.



www.yahoo.com images

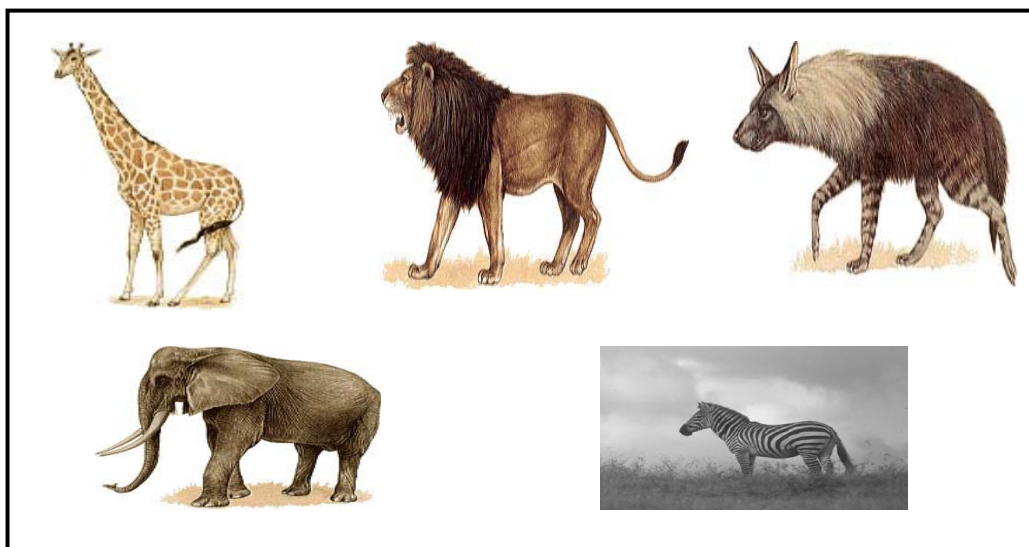


Figure 1.3 Some grassland animals
From left to right: Giraffe, Lion, Hyena, African elephant, and zebra.
(Pictures from www.yahoo.com images and clip art.)

Taiga

The Taiga is the largest terrestrial biome in the world. It is found in the large portion of Canada, Europe and Asia. The average temperatures are below zero. Winters are cold, while summers are warm. Lots of coniferous trees, such as June, hemlock, fir and spruce trees grow here. Wolves, moose, elk, hares and migratory birds are typical animals to taiga biome.

Tundra

The tundra biome is found around the North Pole. It is at the top of the world!

Did you know that there are no trees in a tundra? Only shrubs, lichens and mosses dominate the place. The soil in a tundra is permanently frozen or permafrost. Arctic hares, snowy owls, arctic foxes, wolves and reindeers dominate this snowy and cold region.



www.yahoo.com images

Deserts

Deserts are the driest biome on earth. They are found in along 30 degrees latitude north and 30 degrees latitude south. Believe it or not, there are two types of deserts: hot and cold. Sagebrush plants and few species of cacti are common in a cold desert. In warm deserts, cacti, and other drought resistant plants are abundant. Animals in deserts include reptiles with scaly skin, camels, insects with thick outer body shells and other animals adapted to intense heat, searing sun, and lack of water.



www.yahoo.com images

Aquatic Biomes

There are two types of aquatic biome: freshwater and marine. Both of them are important to humans because they provide water for drinking, recreation, transportation, energy, and means of living.

The freshwater biomes include ponds, lakes, streams and rivers. Lakes and ponds are not flowing water, while streams and rivers are flowing. Many plant and animals live in freshwater biomes. Water lilies, phytoplanktons,



www.yahoo.com images

and mosses are typical freshwater plants. Fish, crustaceans, amphibians, insects and birds are just some of the animals thriving in freshwater biomes.

The marine biome includes seas and oceans of the world. It covers about 75% of the earth. Marine plants and algae are very important because they provide much of the world's oxygen supply and take in huge amounts of carbon dioxide. The tropical oceans of the world are home to diverse fish, mammals, invertebrates, and birds.



What you will do

Activity 1.1 Observing Living and Non-Living Things in a Natural and Man-Made Ecosystem

Part I.

1. Go to your backyard or school garden. Observe some living things such as plants (mosses, ferns, flowering plants), animals (insects, worms, frogs, lizards), and fungi (mushrooms and lichens). Take note where you find these living things. Are they freshwater or terrestrial organisms? Are they in shaded areas or exposed to sunlight? Do they live in moist soil or dry soil? What non-living factors affect their survival and reproduction?
2. Observe an aquarium. Identify the biotic and abiotic components present in that ecosystem.

Part II.

1. Get a 2-liter bottle, elodea plant (any water plant), gravel, water and fish food.
2. Create your own ecosystem in a 2-liter bottle.
3. Explain how the fish will be able to survive in this ecosystem. What other factors must be considered in making this ecosystem?

Part III.

1. Compare the type of ecosystem found in your garden and that in the aquarium. How is the survival of organisms affected in each type of ecosystem?



Key to answers on page 28.



What you will do
Self-Test 1.1

Direction: Name the following biomes.

1. _____ very dry, either hot or cold
2. _____ cool, treeless and dry
3. _____ cool and dry with coniferous trees
4. _____ cool and rainy with deciduous trees
5. _____ windy, partly dry sea of grass with few trees
6. _____ warm and very wet, the most diverse terrestrial biome
7. _____ includes ponds, lakes, rivers, seas and oceans



Key to answers on page 29.

Lesson 2. Interactions in the Ecosystem

Ecologists love to find out how various species interactions happen in a community. A community is a group of two or more populations of individuals.

There are two types of species interactions: the trophic and non-trophic. How is trophic interaction different from that of non-trophic?

When we say trophic interaction, it involves the use of organism such as food by another. Examples of trophic interactions are herbivory, predation and parasitism. On the other hand, non-trophic interaction does not involve eating and being eaten. These are commensalisms, competition, and mutualism. The gain is something other than direct access to food provided by other organisms. The table below describes the trophic and non-trophic interactions.

Trophic Interactions	
Herbivory	Plant eating
Predation	One member kills (predator) and utilizes the other member (prey)
Parasitism	One member benefits (parasites) while the other is harmed (host)
Non-Trophic Interactions	
Commensalisms	One member benefits while the other is not harmed
Competition	Two or more species compete for a limited resource.
Mutualism	Members are both benefited from the interaction



What you will do

Activity 2.1 Interactions in the Community

Direction: Look at the following pictures below. Write the type of interaction shown by the following organisms (pictures taken from www.yahoo.com images and clipart).



1. Caterpillar eating plant leaves



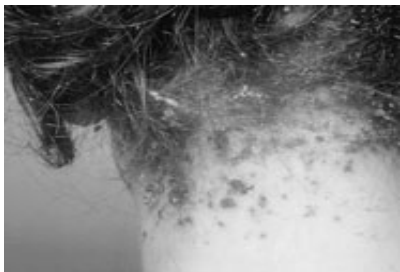
2. Barnacles enjoy free rides on a whale



3. A snake feeding on a rat



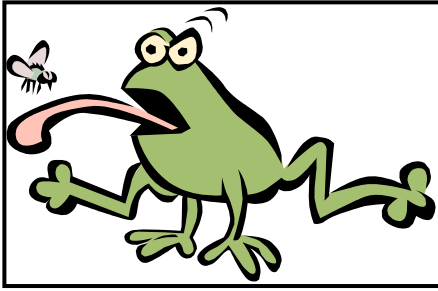
4. Ants and aphids



5. Lice on a girl's scalp.



6. Tapeworm in a pig's intestine



7. Frog snapping fly



8. Rats that feed on the same resource.



9. Remora and shark



10. Deer grazing on grasses



Key to answers on page 29.



What you will do
Self-Test 2.1

1. What is meant by the saying, “Everything is connected to everything else”?
2. What is meant by the saying “The closer our food source comes to the bottom trophic levels, the more Earth-friendly we are”?



Key to answers on page 29.

Lesson 3. Energy flow in the ecosystem

What are food chain and food web?

A **food chain** is a food relationship that shows the flow of energy in an environment. It is a straight line diagram of who eats whom. The food chain moves food from one organism to another, giving energy to the organism digesting the food. The **food web** consists of interlocking food chains. It is the summary of all pathways by which energy moves from one level to another through an ecosystem.

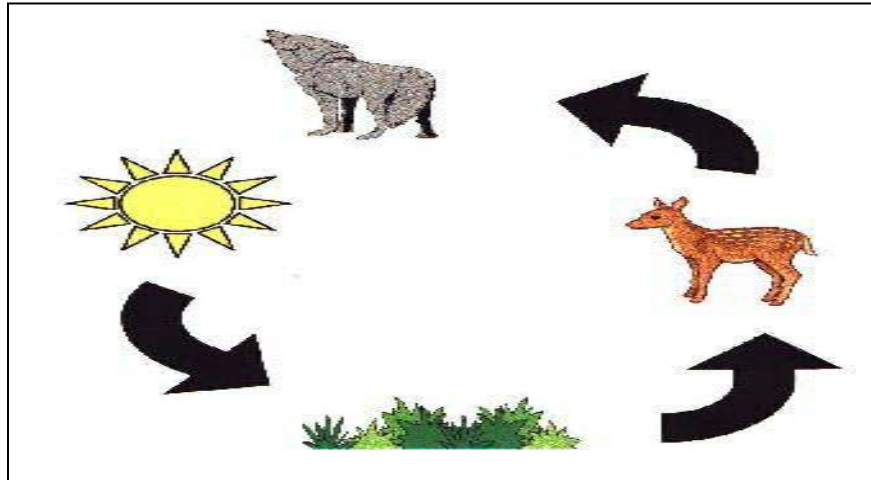


Figure 3.1 Food Chain

<http://www.transylvania.k12.nc.us/J0113170/forest/food.html>

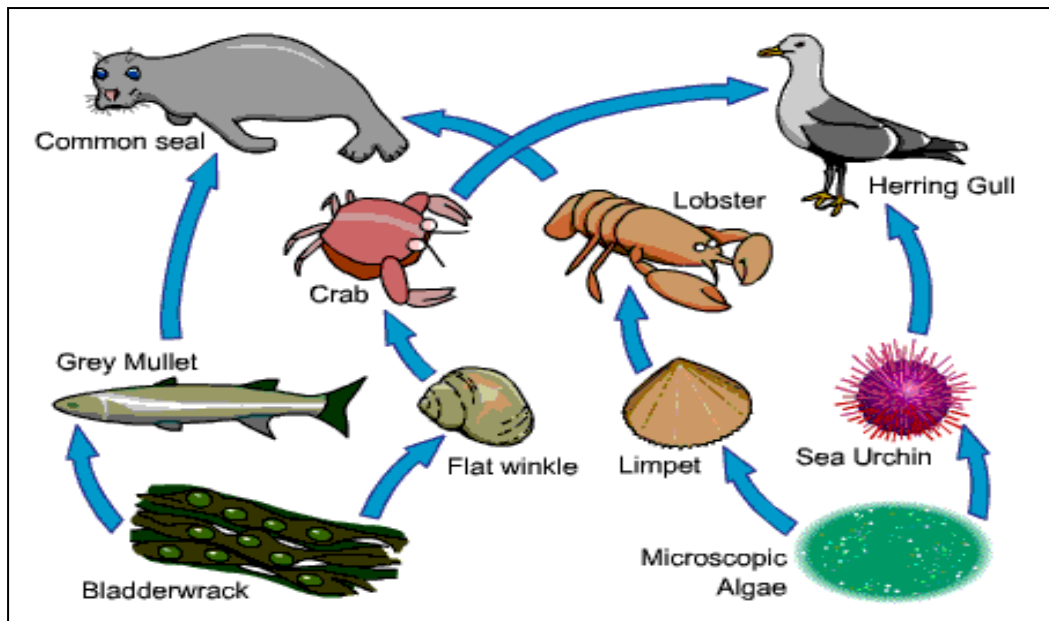


Figure 3.2 Food web

<http://www.warwick.surrey.sch.uk/student%20zone/GCSE%20Science%20Website/03%20Environment%20Food%20Chains.htm>

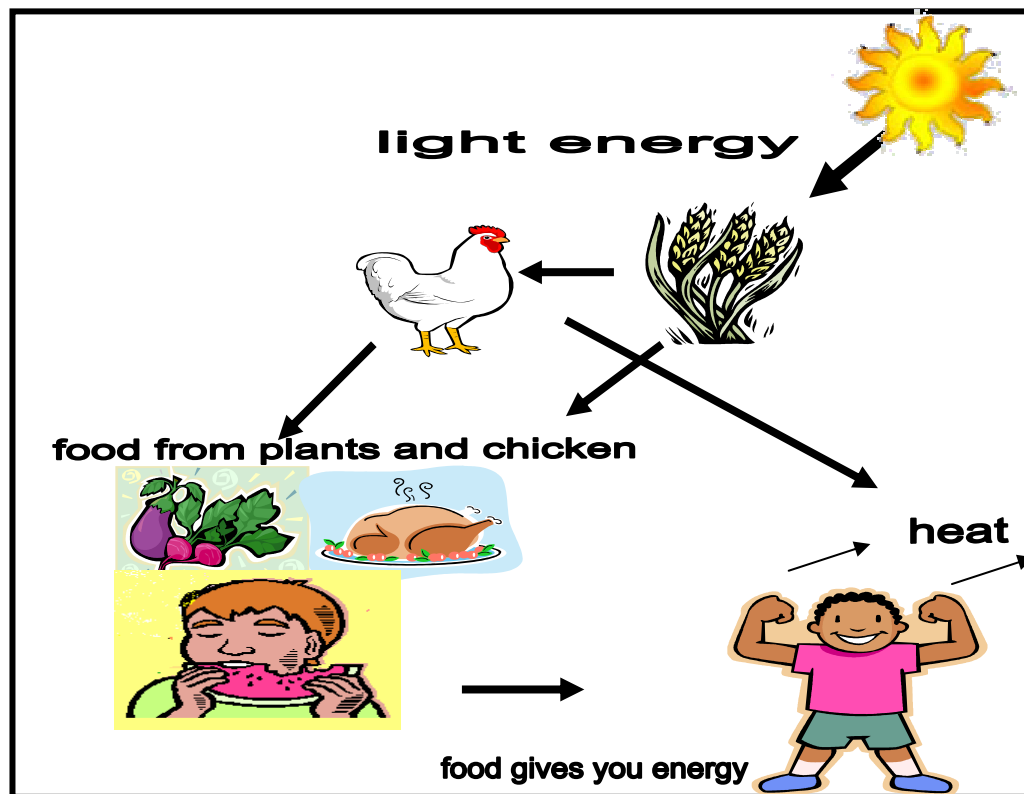
How does energy flow in an ecosystem? The next activity will help you explain this.



What you will do

Activity 3.1 Energy Flow in an Ecosystem

Direction: Take a closer look at the picture and answer the following questions:



Microsoft Clip Art
www.yahoo.com images

Questions:

1. Describe the boy in the picture. What does he love to eat? Does he look like a healthy and strong boy? Do you think he is active and energetic? What makes him active and energetic?
2. What is stored in the meat of the chicken? Where did it come from?
3. What is stored in the fruit and vegetables that he eats? How can plants make food in the form of starch? What energy is needed to start photosynthesis?
4. Where do plant and animals, including humans, get the energy they need to maintain life?

5. How do you describe the transfer of energy in the ecosystem? Is it cyclical or not cyclical? Why?



Key to answers on page 29.

Analyzing the picture, it will tell you that unlike nutrients and chemicals, energy does not cycle through an ecosystem. It is a one-way process.

Know this!

All food chains start with the sun. Plants make food using sun's energy. Animals, including humans get their energy from plants. Decomposers are microscopic organisms that break down the bodies of dead animals and plants. The nutrients that come from this decomposition get back to the soil and are re-used by new plants, and the cycle begins again. The ultimate fate of energy is to be lost as heat. Therefore, energy does not recycle!

How much energy is transferred from one organism to another?

The transfer of energy from one organism to another is not 100% efficient. The amount of energy available at each successive level is called **trophic level**. It becomes progressively less. For example, the chicken (look again at the picture) consumed 1000 units of plant materials, but only 10% or 100 units of the stored energy in plants are used up when the chicken respire and makes tissues. When the boy eats the chicken, only about 10% or 10 units of energy stored in chicken tissues are utilized for his respiration, growth and maintenance.

In an ecosystem, the primary consumers, or **herbivores**, eat plants. The herbivores have much less energy available to them than the plants originally produced in photosynthesis. Only 10% of the energy obtained by plants is available for herbivores' growth of new tissues, locomotion, and other activities. With all these animal activities, the energy is converted to heat.

The secondary consumers, the **carnivores**, obtain energy from herbivores. The energy here is much less than that taken in by the herbivores. The pyramid next page illustrates this transfer of energy in the ecosystem.

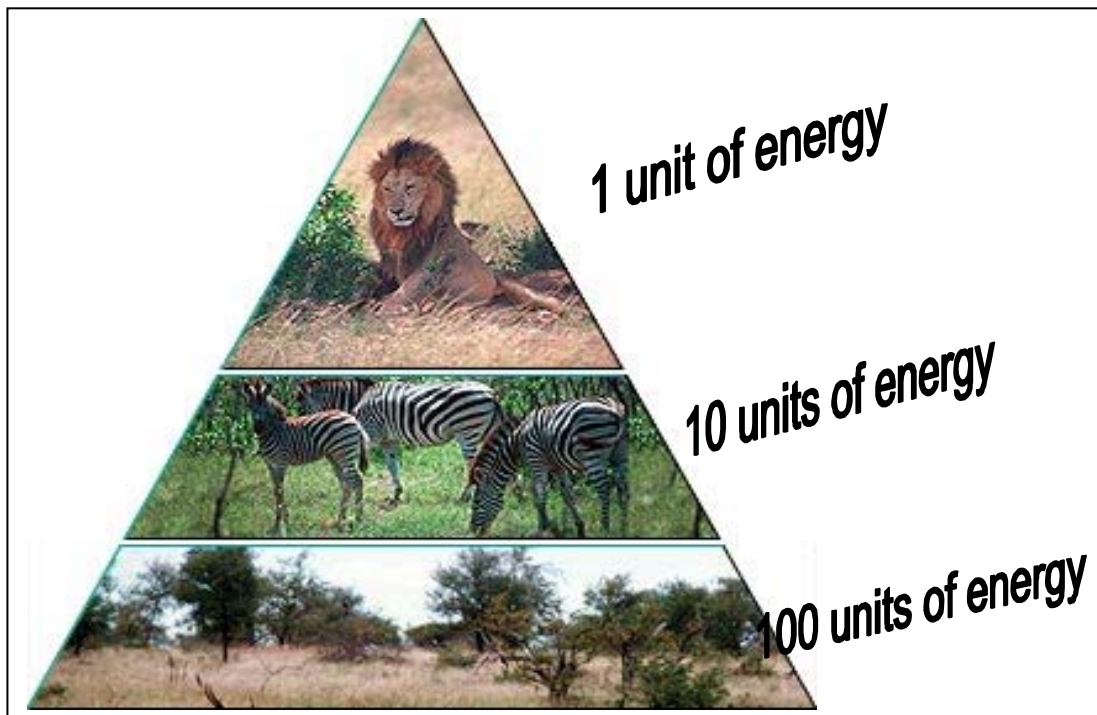


Figure 3.3. Pyramid of energy

http://www.harcourtschool.com/glossary/science/define/ar4/energy_pv4.html



What you will do

Self-Test 3.1

1. Why is a food chain normally limited to four or five links?
2. Create your own food chain/food web.



Key to answers on page 29.

Lesson 4. Environmental Issues

What is the Environment?

Everything that surrounds us is part of the environment. This includes living things like plants and animals, and also beaches and mountains, the air we breathe, the sunlight that provides warmth, and the water that we use in our homes, schools, and businesses.

The world's population has been growing very fast. In 1850 there were around a billion people in the world. In 1950 there were around 2.5 billion people, and in 2001, there



www.yahoo.com images

were more than six billion people. Human activities have put a lot of strain on the environment.

What is Global Warming and Climate Change?

Global warming and climate change refer to an increase in average global temperatures. Natural events and human activities are believed to be contributing to an increase in average global temperatures. This is caused primarily by increases in “greenhouse” gases such as Carbon Dioxide (CO₂).



Figure 4.1
Cartoon representation of a debate on global warming.
Source: <http://www.epa.gov/globalwarming/kids/index.html>

What is the Greenhouse Effect?

The term *greenhouse* is used in conjunction with the phenomenon known as the *greenhouse effect*.

- Energy from the sun drives the earth's weather and climate, and heats the earth's surface.
- In turn, the earth radiates energy back into space.
- Some atmospheric gases (water vapor, carbon dioxide, and other gases) trap some of the outgoing energy, retaining heat somewhat like the glass panels of a greenhouse.
- These gases are therefore known as greenhouse gases.
- The greenhouse effect is the rise in temperature on Earth as certain gases in the atmosphere trap energy.

Remember this!

Six main gases considered to be contributing to global climate change are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), plus three fluorinated industrial gases: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). Water vapor is also considered a greenhouse gas.

Many of these greenhouse gases are actually life-enabling, for without them, heat would escape back into space and the Earth's average temperature would be a lot colder. However, if the greenhouse effect becomes stronger, then more heat gets trapped than

needed, and the Earth might become less habitable for humans, plants and animals.

What are the impacts of Global Warming?

- Rapid changes in global temperature

Increased greenhouse gases and the greenhouse effect are feared to contribute to an overall warming of the Earth's climate, leading to a global warming (even though some regions may experience cooler or wetter weather, while the temperature of the planet on the average would rise).

- Extreme Weather Patterns

Most scientists believe that **the warming of the climate will lead to more extreme weather patterns** such as hurricanes and super storms.

- Rising Sea Levels

Water expands when heated and sea levels are expected to rise due to climate change. Rising sea levels will also result as the polar caps begin to melt.

- Ecosystem Impacts

With global warming on the increase and species' habitats on the decrease, the chances for various ecosystems to adapt naturally are becoming low.



What you will do

Activity 4.1 Global Warming Crossword Puzzle

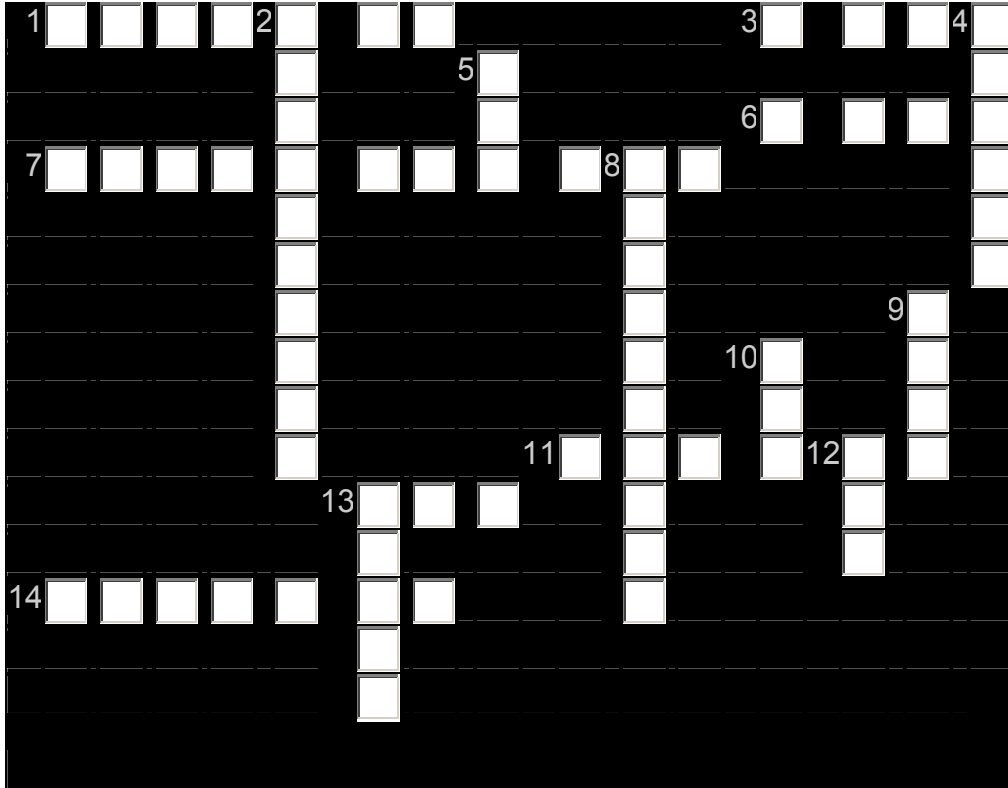
Welcome! Complete the crossword by writing the correct letters on the boxes. When you have filled in EVERY box, check the key to correction on page 32.

Clues Across


1. _____ change
3. _____ something you can ride instead of a car
6. Plant _____
7. This means the study of weather
11. _____ fuel
13. The _____ provides heat and light
14. You can _____ your glass bottles

Clues Down

2. Part of the climate system
4. Solar is one type
5. A fossil fuel made
8. A type of gas
9. Used for fuel; comes from fossils
10. Greenhouse
12. _____ age
13. _____ energy from the sun



Source: <http://www.epa.gov/globalwarming/kids/games/crossword/crossword.html>

 Key to answers on page 30.

Seeing the Forest and the Trees

Trees and forests are very important to the environment. In addition to holding water, trees hold the soil in place. Trees use carbon dioxide and give off oxygen, which animals and plants need for survival. They also provide homes and food for millions of types of animals.



Figure 4.2 Deforestation images

<http://images.search.yahoo.com/search/images?p=deforestation&fr=FP-tab-img-t&toggle=1&ei=UTF-8>

Cutting down large numbers of trees to use the land for something instead of a forest

is called **deforestation**. Although people often have good reasons for cutting down trees, deforestation can have serious effects like what happened to Ormoc, Leyte in 1991 and Infanta and Real, Quezon in 2004.

Why Do We Cut Down Trees?

People cut down trees for many reasons. When the population grows, people cut down trees to clear space to build houses, schools, factories, and other buildings. People may clear land to plant crops and feed livestock. Sometimes all the trees in an area are cut and sold for lumber and paper.

What Happens When Trees Are Cut Down?

Cutting down trees can affect the climate. After rain falls on a forest, mist rises and new rain clouds form. When forests are cut down, this cycle is disrupted, and the area eventually grows drier, causing a change in the local climate.

If large areas of trees are cut down, the carbon dioxide builds up in the atmosphere and contribute to the greenhouse effect. And without trees to hold the soil and absorb water, rain washes topsoil away, a process called **soil erosion**. Farming on the poorer soil that is left can be very hard.



Flooding caused by deforestation

What Are We Doing to Save Forests?

More people are becoming concerned with the effects of deforestation, thus more and more agencies/organizations are involved in saving our forests. Today, in many countries trees are being planted faster than they are being cut down. Forestry companies are working on more efficient methods of replacing and growing forests. In addition, communities and individuals are helping to save forests by recycling paper.



What you will do


Activity 4.2 Want to Save the World? Then: There's No Place Like Home!

Who says it's not easy being green? You can help make your home (and the world) a better place to live by doing some simple, earth-friendly tips.



List at least 5 earth-friendly tips that can be done at home:

1. _____
2. _____
3. _____
4. _____
5. _____

 **Key to answers on page 30.**

Endangered Species

Any plant or animal species whose ability to survive and reproduce has been jeopardized by human activities is an endangered species.

Why Save Endangered Species?

Plants and animals hold medicinal, agricultural, ecological, commercial and aesthetic/recreational value. Endangered species must be protected and saved so that future generations can experience their presence and value.

Medicinal

Plants and animals are responsible for a variety of useful medications. In fact, about forty percent of all prescriptions written today come from the natural compounds of different species. These species not only save lives, but they contribute to a prospering pharmaceutical industry worth over \$40 billion annually. Unfortunately, only 5% of known plant species have been screened for their medicinal values, although we continue to lose up to 100 species daily.

Agricultural

There are an estimated 80,000 edible plants in the world. Humans depend upon only 20 species of these plants, such as wheat and corn, to provide 90% of the world's food. Modern agricultural techniques provide humans with the means to develop new crops that can grow in inadequate lands such as in poor soils or drought-stricken areas to help solve the world hunger problem.

Ecological

Plant and animal species are the foundation of healthy ecosystems. Humans depend on ecosystems such as coastal estuaries, prairie grasslands, and ancient forests to purify their air, clean their water, and supply them with food. When species become endangered, it is an indicator that the health of these vital ecosystems start to deteriorate.

Commercial

Various wild species are commercially raised, directly contributing to local and regional economies. Freshwater mussels which are harvested, cut into beads, and used to stimulate pearl construction in oysters form the basis of a growing industry which supports jobs.

Aesthetic/Recreational

Plant and animal species and their ecosystems help tourism industry. They also supply recreational, spiritual, and quality-of-life values as well.

Our national heritage of biological diversity is an invaluable and irreplaceable resource. Our quality of life and that of future generations depend on our preservation of plant and animal species.

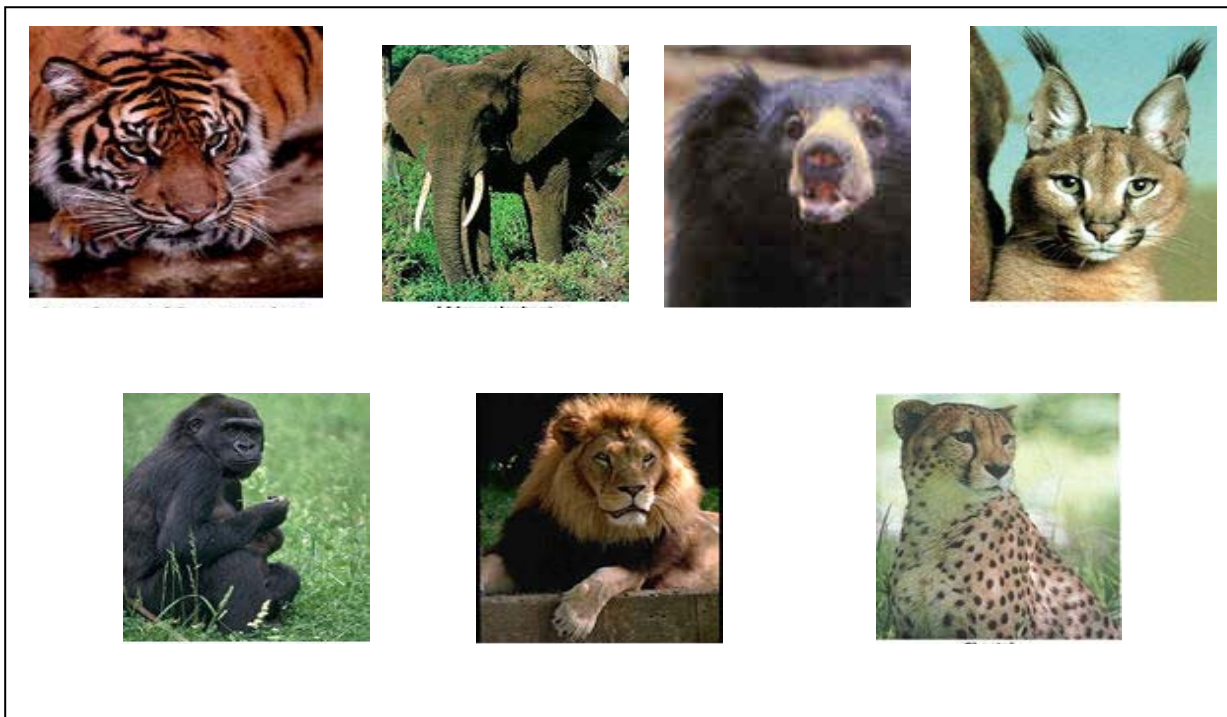


Figure 4.3 Some endangered animals
From left to right: Sumatran tiger, African elephant, Sloth bear, Caracal (cat),
Western lowland gorilla, African lion, Cheetah

www.yahoo.com images

There are many reasons why a particular species may become endangered. Below are several factors leading to their endangerment:

Habitat Destruction

Our planet is continually changing, causing habitats to be altered and modified. Natural changes tend to occur at a gradual pace, usually causing only a slight impact on individual species. However, when changes occur at a fast pace, there is little or no time for individual species to react and adjust to new circumstances. This can create disastrous results, and for this reason, rapid habitat loss is the primary cause of species endangerment.

Did you know that?

The strongest forces in rapid habitat loss are human beings. The deterioration of soil, burning and clearing of forests, the extinction of fish and various aquatic species in polluted habitats, and changes in global climate brought about by the release of greenhouse gases are all results of human activity.

Introduction of Alien Species

Native species are those plants and animals that are part of a specific geographic area. They are well adapted to their local environment and are accustomed to the presence of other native species within the same general habitat. Exotic species, however, are new species. They are introduced into new environments by way of human activities, either intentionally or accidentally. Alien species are viewed by the native species as foreign elements. The presence of alien species may threaten the lives of other native species since alien species are more competitive than the native species.

Overexploitation

A species that faces overexploitation is one that may become severely endangered or even extinct due to the rate in which the species is being used. Unrestricted whaling during the 20th century is an example of overexploitation, and the whaling industry brought many species of whales to extremely low population sizes. Due to the trade in animal parts, many species continue to suffer high rates of exploitation. Even today, there are demands for items such as rhino horns and tiger bones in several areas of Asia. It is here that there exists a strong market for traditional medicines made from these animal parts.



What you will do

Activity 4.3 Use Your Artistic Imagination!

Recreate the habitat of an endangered or extinct species in a medium of your choice. Use one of the media listed below. Show the elements of the ecosystem that human activities have affected and that are contributing to the decrease of species.

You can create one of the following (pictures from www.yahoo.com images)



a diorama like this,



a painting like this,

or a drawing or a writing that uses vivid imagery.



Key to answers on page 30.



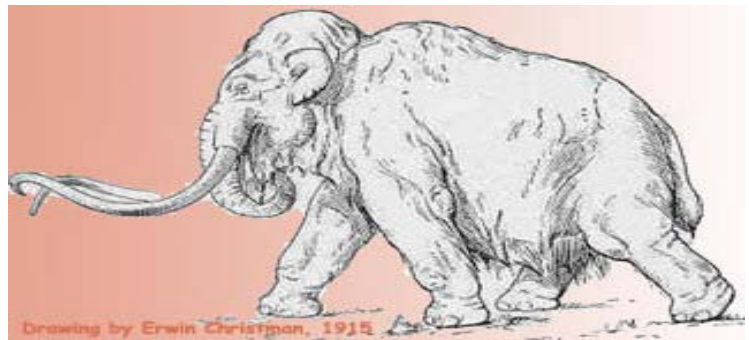
What you will do

Self-Test 4.1 Reading Comprehension

What Happened to the Mammoths?

Mammuthus primigenius

Woolly mammoths are perhaps the best known mammals of the Ice Age. Much is known about their appearance because dead bodies have been found preserved in frozen ground in Siberia, and wall pictures by stone-age artists can be seen today in ancient European caves. Woolly mammoths grew to about the size of present-day Asiatic elephants, possessed warm coats consisting of long, brown guard hairs and soft underwool, large curved ivory tusks.



<http://www.sciencenetlinks.com/Esheet.cfm?DocID=43>

They once traveled the northern parts of Eurasia and North America, feeding on plants such as grasses, sedges, and shrubs. One of the best preserved Canadian specimens consists of most of an entire skeleton from Whitestone River in the Yukon Territory. It died there about 30,000 years ago, according to a radiocarbon date. Their thick coats and heavy layers of fat fitted them for life in cold, tundra-like conditions.

Primitive hunters were sometimes successful in killing them for food.

Use a separate sheet of paper in answering the following questions:

Part I

1. When did the woolly mammoths live?
2. How big were the woolly mammoths?
3. When did they die out?
4. Where were they found?
5. How do we know about them?
6. Are there any animals today that are like the woolly mammoth?

Part II

1. What is endangered species?
2. Why save endangered species?



Key to answers on page 31.



Let's Summarize

1. Ecology is the study of organisms and their relationships with their environment.
2. Biomes are the earth's major aquatic and terrestrial communities of plants and animals. There are different biomes: rainforests, grasslands, tundra, taiga, deserts, and aquatic biomes.
3. Natural ecosystems refer to those areas with little or no human intervention, while man-made ecosystems are areas that are created, controlled and manipulated by humans.
4. Interactions in the environment include predation, commensalisms, parasitism, herbivory, competition, and mutualism.
5. A food chain is a food relationship that shows the flow of energy in an environment. It is a straight line diagram of who eats whom. The food web consists of interlocking food chains.
6. The ultimate fate of energy is to be lost as heat. Therefore, energy does not recycle!
7. Trophic interaction involves the use of organism as food by another. Predation and parasitism are trophic interactions.

8. The non-trophic interaction does not involve eating and being eaten. The gain is something other than direct access to food provided by other organism. Examples of this interaction are commensalism, competition and mutualism.
9. Global warming and climate change refer to an increase in average global temperatures.
10. The greenhouse effect is the rise in temperature on Earth as certain gases in the atmosphere trap energy.
11. Cutting down large numbers of trees to use the land for something instead of a forest is called **deforestation**.
12. Plants and animals hold medicinal, agricultural, ecological, commercial and aesthetic/recreational value. Endangered species must be protected and saved so that future generations can experience their presence and value.
13. Some earth-friendly tips to consider are the following: conserve fuel and water, recycle old papers and plastic containers, buy fruits and vegetables that are not wrapped in plastic, styrofoam and other materials that don't biodegrade, and help save the soil through decomposition of biodegradable materials.




Posttest

Multiple Choice. Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. What is generally agreed upon as being the greatest threat to our wildlife resources?
 - a. global warming
 - b. habitat loss
 - c. ozone depletion
 - d. pollution
2. Which action can have the greatest impact on reducing the threat of global warming?
 - a. composting
 - b. recycling
 - c. reducing
 - d. planting a tree
3. Why should we care about the rainforests?
 - a. They provide or nurture biodiversity.
 - b. They are sources of food and other resources.
 - c. They are a source for medicines and other chemicals.
 - d. All of the above.
4. Suppose that planktons are small autotrophs that absorb energy from the sun. The shrimp eats the plankton. The tuna eats the shrimp. The shark eats the tuna. Which of these is the primary consumer?
 - a. shark
 - b. shrimp
 - c. plankton
 - d. tuna
5. Which of the following biomes is with permafrost and no large trees?

- a. desert
 - b. grasslands
 - c. temperate deciduous forest
 - d. tundra
6. Which of the following is characteristic of predation?
- a. One organism kills and consumes another.
 - b. One organism lives in or on another and benefits.
 - c. Two organisms live together and neither is harmed.
 - d. Two organisms nourish each other; both benefit.
 - e. Two organisms feed side by side from the same food.
7. Which land biome has more varied plant life than any other biome?
- a. deciduous forest
 - b. grassland
 - c. tropical rain forest
 - d. tundra
8. In a food pyramid, the amount of energy that any level of organism receives decreases
- a. up the pyramid
 - b. in all levels
 - c. down the pyramid
 - d. across the pyramid
9. Which of these is a consumer-producer relationship?
- a. birds eating beetles
 - b. snakes eating frogs
 - c. hawks eating rabbits
 - d. caterpillars eating tomatoes
10. The relationship in which one organism is helped and the other is harmed is known as
- a. commensalism
 - b. mutualism
 - c. parasitism
 - d. symbiosis
11. All of the following are abiotic factors **EXCEPT**:
- a. air
 - b. animals
 - c. soil
 - d. sunlight
12. Freshwater biomes include all of the following **EXCEPT**:
- a. estuaries
 - b. lakes
 - c. ponds
 - d. rivers
13. The level of the food chain which contains the most energy are the:
- a. decomposers
 - b. herbivores
 - c. omnivores
 - d. producers
14. Which of the following is **NOT** a way to prevent extinction?
- a. preserving natural areas
 - b. keeping endangered animals as pets
 - c. breeding endangered animals in captivity
 - d. reintroducing endangered animals to nature
15. How might products be designed so that they are more "environment-friendly"?
- a. Less energy should be required for their use.
 - b. Less energy should be used in their manufacture.
 - c. Products should be designed to be recycled or reused.

- d. All of the above make products more "environment-friendly".

 **Key to answers on page 31.**



Key to Answers

Pretest

- | | | |
|------|-------|-------|
| 1. b | 6. a | 11. b |
| 2. c | 7. c | 12. a |
| 3. d | 8. a | 13. d |
| 4. b | 9. d | 14. b |
| 5. d | 10. c | 15. d |

Lesson 1

Activity 1.1

Part I.

1. Answers of students may vary depending on their chosen ecosystem.
2. The biotic components in the aquarium are fish and water plant. The abiotic components are the water, sand/gravel, oxygen, and sunlight.

Part II.

3. The fish and all other living things in the aquarium must have clean and enough amount of water, adequate supply of fishfood, oxygen, and sunlight in order to survive. This type of ecosystem must be managed very well considering those factors that affect the survival of the living things therein.

Part III.

1. The garden is more of a natural ecosystem while the aquarium, is a man-made ecosystem. Many types of organisms are found in the garden compared to the aquarium. A natural ecosystem like the garden can be at its best when left alone, while a man-made ecosystem like the aquarium can not. Organisms in the natural ecosystem depend on the resources available in the environment, while in aquarium, the fish and plants depend on the resources supplied by the one who creates and/or manages this ecosystem.

Self-Test 1.1

- | | |
|---------------------|---------------------|
| 1. desert | 5. grasslands |
| 2. tundra | 6. tropical forests |
| 3. taiga | 7. aquatic biomes |
| 4. temperate forest | |

Lesson 2

Activity 2.1

- | | |
|------------------|------------------|
| 1. herbivory | 6. parasitism |
| 2. commensalisms | 7. predation |
| 3. predation | 8. competition |
| 4. mutualism | 9. commensalisms |
| 5. parasitism | 10. herbivory |

Self-Test 2.1

1. Everything is connected to everything else. It means that no living thing exists entirely by itself. All organisms interact with others of their own species, with other species and with the physical environment that surrounds them. The abiotic components of the environment can affect the lives and behavior of living things.
2. The closer our food source comes to the bottom trophic levels, the more Earth-friendly we are. Less grain/plant materials would have to be grown if we ate cereal or any plant materials as our food source rather than steak. Five to ten times as much grain must be grown if we obtained our energy source from a plant fed animal (like cow, pig) than if we just ate the plant itself. The grain and the land it is grown on are limited resources.

Lesson 3

Activity 3.1

1. The boy looks healthy and strong. He loves to eat meat, fruits, and vegetables. Yes, he looks healthy. Yes he is active and energetic. The food he eats makes him active and energetic.
2. Energy. The energy comes from the plants that the animals eat.
3. Energy. In the process called photosynthesis. Sunlight.
4. Sun's energy.

Self-Test 3.1

1. A food chain is normally limited to four or five links because as energy flows from one trophic level to another trophic level, the energy becomes less.
2. For an example of a food chain and a food web, refer to Figure 3.1 and Figure 3.2 on page 13.

Lesson 4

Activity 4.1

Crossword puzzle

Across	Down
1. climate	2. atmosphere
3. bike	4. energy
6. tree	5. oil
7. meteorology	8. greenhouse
11. fossil	9. coal
13. sun	10. gas
14. recycle	12. ice
	13. solar

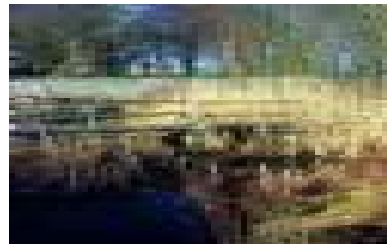
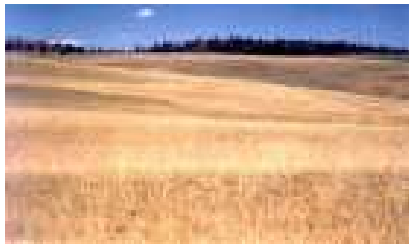
Activity 4.2

Earth-friendly tips (Some possible answers)

2. Use pencils, notebooks and other school materials leftover from last year instead of buying all-new supplies. (Hey, just because they're old doesn't mean they don't work anymore!)
3. Conserve water by taking a five-minute shower instead of a long bath.
4. Wet yourself down in the shower, then turn the water off while you lather your hair and body. This saves water. (Don't forget to rinse afterward!)
5. Decide what you want before opening the refrigerator door. That way, you'll prevent too much warm air from entering the fridge. This conserves energy that the fridge would otherwise use to keep things cool.
6. Buy fruits and vegetables that are not wrapped in plastic, styrofoam, and other materials that don't biodegrade -- or break down -- in garbage dumps.
7. No need to include throwaway junk in your lunch -- especially when you can pack a garbageless meal to school. Just carry your food and drinks in reusable containers, like a thermos and lunchbox or cloth lunchbag.

Activity 4.3

Use your artistic imagination!



Source: http://images.search.yahoo.com/search/images?p=environment+of+endangered+species&ei=UTF-8&fl=0&qp_p=environment+endangered+species&imgsz=all&fr=FP-tab-img-t&b=81

Self-Test 4.1

Reading Comprehension (What happened to the Mammoths?)

1. ice age
2. They were about the size of present-day Asiatic elephants.
3. 30,000 years ago
4. Siberia
5. They possessed warm coats of long brown hairs and soft underwool, large curved ivory tusk, and knob-like heads.
6. They are like modern-day elephants.

Part II.

5. Any plant or animal species whose ability to survive and reproduce has been jeopardized by human activities is an endangered species.
6. Plants and animals hold medicinal, agricultural, ecological, commercial and aesthetic/recreational value. Endangered species must be protected and saved so that future generations can experience their presence and value.

Posttest

- | | | |
|------|-------|-------|
| 1. b | 6. a | 11. b |
| 2. c | 7. c | 12. a |
| 3. d | 8. a | 13. d |
| 4. b | 9. d | 14. b |
| 5. d | 10. c | 15. d |

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