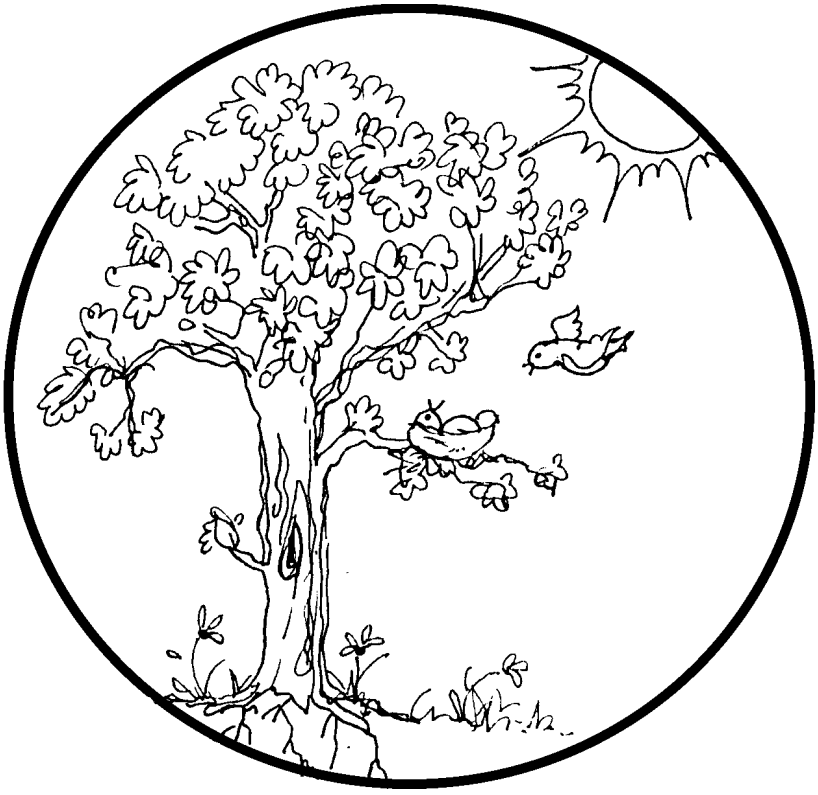
Life Cycle

Diversity in a Balance

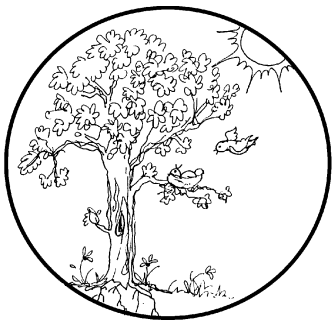
FOURTH GRADE

NATURAL ENVIRONMENT



2 WEEKS
LESSON PLANS AND
ACTIVITIES

LIFE CYCLE
OVERVIEW OF FOURTH GRADE



ORGANISMS

WEEK 1.
PRE: *Exploring the components of a cell.*
LAB: *Comparing cells, tissues, and organs.*
POST: *Classifying different organisms.*
WEEK 2.
PRE: *Understanding the reasons for invertebrate classification.*
LAB: *Comparing and contrasting invertebrates.*
POST: *Comparing characteristics of the 5 kingdoms.*

HUMAN BIOLOGY

WEEK 3.
PRE: *Describing how the human body works.*
LAB: *Discovering if boys are more flexible than girls.*
POST: *Exploring four types of tissues.*
WEEK 4.
PRE: *Exploring how the circulatory system works.*
LAB: *Comparing the pulse rate of males and females.*
POST: *Exploring the components of blood.*

PLANT LIFE

WEEK 5.
PRE: *Defining the characteristics of plants.*
LAB: *Comparing monocots and dicots.*
POST: *Identifying monocots and dicots in the field.*
WEEK 6.
PRE: *Explaining how light is transformed into food.*
LAB: *Discovering that starch is important to plants.*
POST: *Analyzing components of drugs.*

NATURAL ENVIRONMENT

WEEK 7.
PRE: *Investigating soil.*
LAB: *Exploring a soil profile.*
POST: *Investigating the ecosystem of the school yard.*
WEEK 8.
PRE: *Identifying plants in a saline environment.*
LAB: *Creating a San Francisco Bay mud fauna food web*
POST: *Examining a fresh water aquarium ecosystem.*

LIFE CYCLE - NATURAL ENVIRONMENT (4A)

Students use a worksheet to learn about soil horizons.

PRE LAB:

OBJECTIVE:

1. Investigating soil.
2. Exploring how ecosystems live in soil.

VOCABULARY:

soil
soil horizons
topsoil

MATERIALS:

worksheet

BACKGROUND:

The soil that we walk on is an underground city. In this city, every organism does its part to make sure the city works together. The actions of the animals, insects, and microorganisms that live in the soil not only influence what happens in the soil but also what happens above the soil. Soil is made of inorganic matter mixed with organic matter. Soil is formed from the weathering of minerals derived from bedrock and contains living organisms and the products of their decay. Soil can be considered a mixture of mineral materials, organic matter, water, and air in varying proportions. Topsoil, the A horizon, is usually the upper ten inches of a soil in a well-developed soil profile. Plant roots, bacteria, fungi, and small animals are abundant in this area along with plants who thrive in this type of environment. Topsoil has less organic matter than in the O horizon (the surface) which is the reason that topsoil is lighter than surface soil. Topsoil is one of our most valued commodities since it provides the nutrients and environment for the growth of plants.

Subsoil or the B horizon, is the middle soil layer. It has fewer organisms and less organic materials than both the A and O horizons. Consequently, the B horizon cannot support the growth of plants very well. If subsoils are clayey, they usually are harder when dry and sticky when wet than the surrounding soil layers.

The C horizon is the lowest layer and is partially weathered parent material from which the other horizons are formed. It is less altered and weathered than the layers above and has less living matter. The parent material is sometimes named the D horizon.

PROCEDURE:

1. The information given on the worksheet should help students to write a paragraph describing the different horizons of soil.

LIFE CYCLE - NATURAL ENVIRONMENT (4A) PRE

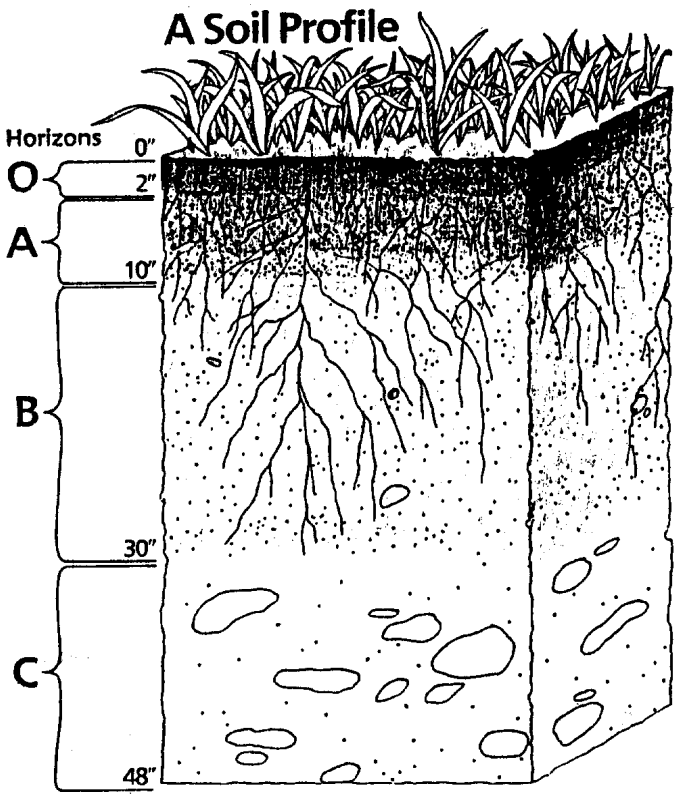
Use the picture of a soil profile to write a paragraph describing soil. Start with the surface and describe each layer working down the section.

Surface: organic material
dead plants, animal material
O horizon

Topsoil: plant roots,
bacteria, fungi, small animal
A horizon

Subsoil: Fewer organisms
less topsoil; plants don't
grow well
B horizon

Altered Parent Material:
Weathered, less living matter
layers above were formed form it
C horizon



title _____

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LIFE CYCLE - NATURAL ENVIRONMENT (4A)

Students determine types of soil.

LAB

OBJECTIVE:

1. Exploring a soil profile.
2. Discovering the components soil layers.

VOCABULARY:

humus
loam
soil profile
topsoil

MATERIALS:

Life Cycle - Natural Environment (4A)
magnets
water
Pre Lab worksheet

BACKGROUND:

The constituents of soil are extremely variable in size, shape and chemical composition. The size of particles is one of the most significant characteristics. Water absorption, air movement, rate of solution and ease of tillage are a few things that are affected by particle size. The texture of soil refers to particle sizes and is classified on an arbitrary scale. It can be coarse, sandy, or clayey. Sand would be about the size of sand, coarse would refer to soil that is larger and clayey would be smaller. You can also describe the structure of soil by how the soil particles tick together. When particles are rather porous and small, the soil is considered to have a granular or crumby structure, which is characteristic of many soils high in organic matter. Soil that is lumpy stick together. Sometimes soil has magnetite in it, a magnetic mineral that is attracted to a magnet. Humus, the partially decayed organic matter accumulated in soils, is a dark-colored structure less material.

Soil horizons can be different for high productive areas versus low productive areas. You can use the following to help guide you with your students.

PRODUCTIVE

A - contains more organic matter in most areas, most weathered and leached at all levels, loose, easily tilled, fertile

B - Yellow layer containing small quantities of clay and easily penetrated by air, water, and plant roots

C - slightly weathered, permeable, calcareous

NON PRODUCTIVE

A - light gray layer, low in fertility and difficult to till

B - heavy clay layer impermeable to air, water, and plant roots, massive stable aggregates of small particles

C - heavy clay parent matter

PROCEDURE:

1. A soil profile is a slice of earth several feet deep that illustrates the layers of soil. Most soil profiles have a surface layer of organic material and two or three layers of soil layers with different characteristics. Students in this lab will look at different soil samples and try to assess which layer they belong to, by describing the sample and predicting what soil horizon it may have come from. Give students soil samples, magnet, microscope, and beaker of water. It would be ideal to get local samples for this lab and to record where the sample came from.

2. Instruct the students to look at the soil sample under the microscope and describe what they see. They should ask themselves if the sample has broken up rocks or very fine clay particles. They should also see if there are other distinguishing characteristics like plant debris or animal remains.

3. Instruct students to put a little amount of the soil in some water to see if anything floats. Plant debris that may not have been obvious under the microscope may float.

4. Use the magnet to see if there is any magnetite, which is a magnetic mineral. The presence of magnetite means that the parent rock may have been granitic. Magnetite erodes out of the rock and is left in the soil.

5. Use the worksheet from the Pre Lab to determine which horizon the sample may have come from.

LIFE CYCLE - NATURAL ENVIRONMENT (4A)

PROBLEM: How can you distinguish the different soil horizons?

PREDICTION: _____

PROCEDURE:

MATERIALS: different soils samples, magnet, microscope, hand lens, cup of water

Look at the soil samples. Use different techniques described by your teacher to learn about soil. Write the information down in complete sentences. Predict which soil horizon your sample may have come sampled from.

SOIL	DESCRIBE CHARACTERISTICS	HORIZON

CONCLUSION: Which characteristics were the most valuable in describing soil?

_____

_____

LIFE CYCLE - NATURAL ENVIRONMENT (4A)

POST LAB:

Students go outside to investigate the school yard.

OBJECTIVE:

1. Exploring the ecosystem of the school yard.
2. Investigate the importance of soil.

VOCABULARY:

community
ecosystem
fertility
population

MATERIALS:

worksheet
Hand shovel
sticks
1 meter length string
containers or trays

BACKGROUND:

An ecosystem is a community of plants and animals, which consists of many individuals and populations. Ecosystems can be any size from a small puddle containing algae and protozoa to the Amazonian rain forest. An ecosystem is made of two components: the physical environment and the biological community.

In soil, animals, insects, and microorganisms help to maintain a cycle that is very important to the survival of life, the nutrient cycle. Animals such as rabbits, gophers, and badgers use the soil for shelter and food. These animals burrow into the ground and cause large pieces of soil to be loosened. Once the larger pieces of soil are loosened, it is easier for insects and worms to travel and move about in the soil. The moving action of these insects and worms causes the smaller particles of soil to be loosened and mixed with air and water that has penetrated the soil. The air and water can easily enter the soil once it is loosened. The air and water mix with nutrients and creep down into the soil and provide the necessary growing conditions for plant roots. These roots absorb the air, water, and nutrients, and provide food for humans and animals.

Soil microorganisms such as bacteria break down organic materials and rock and release nutrients. Without this breakdown, the soil would not have the nutrients for use by plants. These organisms that break down organic material are called decomposers and are responsible for the fertility of the soil. Although your students may not see all this

occurring, they can start to understand the importance of soil.

PROCEDURE:

1. Prior to this exercise, go outside and find a place that might look interesting for students to investigate. An area where there is overgrown vegetation would be ideal or under a tree. Freshly mowed grass would not be a good area, nor asphalt. If you have trouble finding an area, you could set an area where students may play and assign as a homework assignment.

2. You may want the students to work in groups of 4. They should measure an area about 1 meter square. They can put sticks at each corner so they try to keep inside the square. This helps to compare equal areas.

3. Instruct the students to describe on the worksheet the soil, animals, and vegetation that are present. Record what you see.

4. After students record their information, you may want to discuss if there is an ecosystem in the school yard. Are there plants and animals that are dependant on each other, or it ecosystem not well defined and maintained by the school gardener.

LIFE CYCLE - NATURAL ENVIRONMENT (4A) POST

INVESTIGATING A SCHOOL YARD ECOSYSTEM

MATERIALS: Hand shovel, sticks, 1 meter length string, containers or trays

PROCEDURE: Go outside and measure a 1 meter square area following instructions from your teacher. Describe the soil, animals, and vegetation that are present. Record what you see.

OUTSIDE OBSERVATION
DESCRIPTION OF AREA
ANIMALS PRESENT
DESCRIPTION OF SOIL (TOP)
VEGETATION PRESENT

How are the plants surviving? What are the animals eating? Is this area a permanent living place for the organisms you found? How long do you think the "ecosystem" will survive?

_____

_____

LIFE CYCLE - NATURAL ENVIRONMENT (4B)

PRE LAB:

Students learn about saline environments.

OBJECTIVE:

1. Exploring the plant life of a salt marsh.
2. Identifying plants in a saline environment.

VOCABULARY:

cordgrass
pickleweed
saltgrass

MATERIALS:

pictures or samples of cordgrass, pickleweed, and saltgrass (can collect in salt marsh)
Internet

BACKGROUND:

Salt marshes are an important, but highly disregarded resource, vital to both the environment and wildlife. They are usually located between bays, sloughs, and dry land and are subject to periodic flooding. The water and soil of a salt marsh are highly saline, consequently, the plants and animals have adjusted to these conditions. The majority of plants could not survive in such an environment because the salt would clog their pores and cause the plants to die. Certain plants, however, called halophytes have adjusted to saline environments and have developed certain ways to get rid of excess salt. Plants such as cordgrass, pickleweed, and saltgrass can be found within the boundaries of a salt marsh. If you have samples of these plants, you can show the students. Their survival modifications are especially noticeable under a magnifying glass on the underside of the leaf.

One of the most abundant plants found in a salt marsh is cordgrass which is found closest to the bay in the wetter parts of the marsh. When cordgrass decomposes it breaks apart and releases small particles, that microscopic organisms use as food. These microscopic organisms are in turn eaten by larger sealife such as shrimp. The most important function of cordgrass is not the production of food, but the production of one of our most valuable resources, oxygen. Cordgrass cleans the air and makes oxygen. In fact, cordgrass takes in more carbon dioxide than any other plant and produces 5-10 times more oxygen per square acre than wheat.

Salt marshes are important habitats for many different wildlife and sealife species. The ponds serve as resting areas for migrating birds and also as food sources for the local

waterfowl. They are nurseries to many fish species.

The plants of the salt marsh provide an environment where other organisms can live.

PROCEDURE:

1. Students should try and get more information on plants that live in a salt marsh. Instruct students to do a search on: salt marsh, pickleweed, cordgrass, and saltgrass. Record any more information that they may find.

Below is an example of a east coast marsh area.

http://www.baylink.org/lessons/marsh.html

Virginia Beach, Virginia salt marsh

2. You may want the students to try and draw the relationship of pickleweed, cordgrass, and saltgrass. Use the pictures below to help you draw the plants.

Cordgrass

saltgrass

pickleweed

LIFE CYCLE - NATURAL ENVIRONMENT (4B)

LAB

Students look at organisms from the San Francisco Bay mud.

OBJECTIVE:

1. Classifying organisms that live in the San Francisco Bay.
2. Creating a San Francisco Bay mud fauna food web.

VOCABULARY:

food web
food chain
primary consumer
primary producer
secondary consumer

MATERIALS:

Use Life Cycle - Natural Environment (4B)
Magnifier Kit
Swift-GH Microscope

BACKGROUND:

The students have learned the characteristics used in classifying organisms and should have knowledge of the reasons why classification is important. This lab will examine a different kind of classification dealing with eating habits rather than appearance. Emphasize that classification is used to help describe an organism in its natural environment.

In an ecosystem, organisms play different roles in the food chains. But first, you have learn about that organism. In this lab, the students will first take a look at the different components of the mud of a marsh land (from the San Francisco Bay) and then they will analyze their positions in the food chain.

Have the students draw and describe the samples of sea life by name and key characteristics. The students need not name the sea life by their scientific names. They can devise or invent names for the organisms. However, if you want them to use the correct scientific names, enclosed is a sheet that describes the different organisms.

PROCEDURE:

1. Discuss with students how they can determine the role that an organism plays in an ecosystem. It may be difficult for students to see the food chain in the marsh land. Usually they think that the animals that eat other animals are always bigger, well this is not

always the case. For example one of the gastropods (the spindle-shaped shell) eats almost all the other organisms, even the larger bivalves!

2. On the enclosed information sheet, the position of each organism in the food chain is outlined, and a food web can be created.

Remember that the plants are the primary producers and the smaller snails and bivalves are the primary consumers, the spindle-shaped shell is a secondary consumer, and is at the top of the food web among these specimens.

SAN FRANCISCO BAY MOLLUSCAN FAUNA

The molluscan life of the San Francisco Bay is dominated by little critters. None of the organisms that are in your bag of San Francisco Bay mud life are exceptionally beautiful nor unique, but they do dominate the mud life.

Using these specimens you can devise several activities with your students, not only the prescribed lab. Mix all the shells together and have them separate the different groups. Depending on the verbal and written skills of your students, you may want them to start writing a description of the little organisms. Direct their attention to size, shape, color, and ornamentation on the shell. You can also have them draw the different types, as drawing tends to really develop their observational skills.

Biologists classify organisms because it is easy to talk with other biologists if the name is standardized. When students select the different groups, have them name the organism as a class. The scientific name is fine, but naming their own organism can even be fun. Try to get them to name the organism to reflect what that shell looks like. Have them select two parts of the name (Genus + species). For the older students you can tell them about genus and species; for the younger students you can tell them you are naming these organisms just like most people have two parts to their name. You can use the analog that people's names help identify them, so genus + species helps scientists identify the different organisms.

In your bag you have 5 to 7 different types of organisms on the species level. You may have one or two organisms that are not in the following description. These mollusks represent only a fraction of the population. These shells were collected under the Dumbarton Bridge (between the cities of Fremont and Menlo Park, California). The proportion that is in your container reflects the ratio in which they were found, which changes seasonally. You can discuss with your students why some are more abundant than others. This has to do with which organisms are more abundant but also how they were transported after they died.

BIVALVES

Gemma gemma - Shell no longer than high, slightly triangular; general color white with purple tinge, shell very thin, hinge and teeth very reduced. Introduced to the San Francisco Bay from the east coast. This bivalve is a filter feeder, meaning that it takes in water and "filters" the algae from it to digest. It is considered a primary

consumer.

Macoma nasuta - Also called the bent-nosed macoma. Lives in shallow water with muddy bottoms. Some are 2 inches long, color grayish white. Anterior end broadly rounded; posterior end bluntly pointed, partially truncated and noticeably bent to one side and is a filter feed like G. gemma.

Mytilus edulis - Shell elongated -triangular, rather plump, with scarcely noticeable beaks at the apex. Length about 3 inches on the average. Adult shells are deep bluish black with a shiny periostracum (outer covering); juveniles show various shades of gray, green and brown, often exhibiting rays of color. Also called the bay mussel, lives in rock areas in colonies. M. edulis is a filter feeder with very few natural enemies.

Ostrea lurida - No longer than 2 inches, the shape quite irregular, depending on the surface of the object on which it grows. Shells are not especially thick or heavy. Lives in shallow waters with stony bottoms. This is a common native oyster along the west coast and is also a filter feeder.

GASTROPODS

Ocenebra interfossa - A spindle-shaped shell about 3/4 of an inch high. There are 5 whorls, high spiral, and a sharp apex. Lives in the shoreline or on rocks. Commonly called the sculptured rock shell, because of the large wavy ridges that revolve with the whorls. This little gastropod is top of the food chain in the mud, eating many of the bivalves and other gastropods.

Nassarius obsoletus - Black Dog Whelk; medium sized, surface blackish with obscure spiral and longitudinal lines, introduced and extremely abundant in the San Francisco Bay (mud snail), nearly one inch high, with about 6 whorls. Apex rather blunt, and commonly more or less eroded. The only sculpture consists of weak revolving lines, plus a few vertical folds on the early whorls. Inner lip deeply arched. Color deep purplish black. This is an east coast snail, probably introduced into California water with young oysters. It is a scavenger that eats dead fish or other organic debris.

Nassarius tegulus - Commonly called the Mud Doug Whelk. Lives in the mudflats, about 3/4 of an inch high, a stocky shell of 5 or 6 whorls with a sharply pointed apex. Sculpture of weak revolving lines, sometimes faintly banded. Inner lip broadly expanded, outer lip thickened. This group eats similar to N. obsoletus and is hard to distinguish between the two.

Turritella sp. - Greatly elongated, many whorled shells. A large group of organisms that live mainly in tropical waters. A few will venture into he San Francisco Bay, but this group is very rare. This groups eats similar to N. obsoletus.

Acmaea sp - Limpet is the common name for this group. Shells conical, oval, and open at base, with no opening at the top. No spiral at any stage of growth and does not have the pearly look to its inside shell. These gastropods live on stones and grasses at the shoreline, generally between the tide limits. They are herbaceous which means they eat small algae or bacteria.

LIFE CYCLE - NATURAL ENVIRONMENT (4B)

PROBLEM: How many different types of organisms live in a mudflat?

PREDICTION:_____

PROCEDURE: Using the bag of organisms from the San Francisco Bay mud, determine how many different organisms there are. Then discuss with your instructor the possible "food chain" of these organisms. You may use the back of this lab sheet if you need more room.

DRAW SPECIMEN AND NAME	DESCRIBE

CONCLUSION: Recreate the food chain of these organisms by stating who eats whom._____

Sketch a food web of organisms in the San Francisco Bay mud by linking the food chains you've identified on the back of this lab sheet.

LIFE CYCLE - NATURAL ENVIRONMENT (4B)

POST LAB

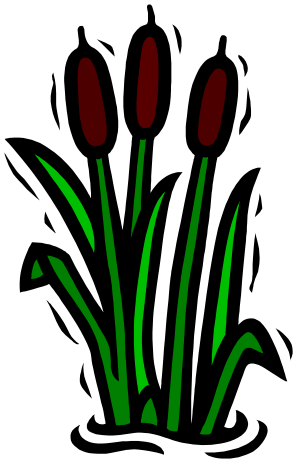
Students use a worksheet to describe an ecosystem.

OBJECTIVE:

1. Examining a fresh water aquarium ecosystem.
2. Differentiating a food web and a food chain.

VOCABULARY:

ecosystem
food chain
food web
photosynthesis
primary consumer
secondary consumer



MATERIALS:

work sheet
aquarium (optional)

BACKGROUND:

An ecosystem illustrates the relationship of plants and animals with each other and with the environment. Ecosystems can be as large as the ocean or as small as an aquarium. The only factor in determining an ecosystem is the exchange of nutrients, gases, or processes that aid or overcome another organism. Simply, an organism will help another one to survive by doing something essential to the other's survival or to survival of the environment, or will simply kill or eat the other. Irrespective of the size of the ecosystem, plants and animals will continuously live in a never-ending cycle of life.

The first step in the ecosystem begins with the Sun. The majority of primary producers are plants whether they are in, the water or on land. Plants use the energy from the sun to produce food in the form of simple sugars. Photosynthesis, is very vital to the survival of animal life. Animals depend just as much on photosynthesis as plants do. The plants that produce sugars by photosynthesis are called producers. The producers are then eaten by several different kinds of organisms. The animals that eat primary producers are called primary consumers. In the water, fish and other animals eat tiny green plants called algae. The algae are primary producers and the animal and fish are consumers.

As the cycle continues, the small fish that eat the algae will be eaten by larger fish. This cycle that exists from producer to different consumers is called the food chain.

PROCEDURE:

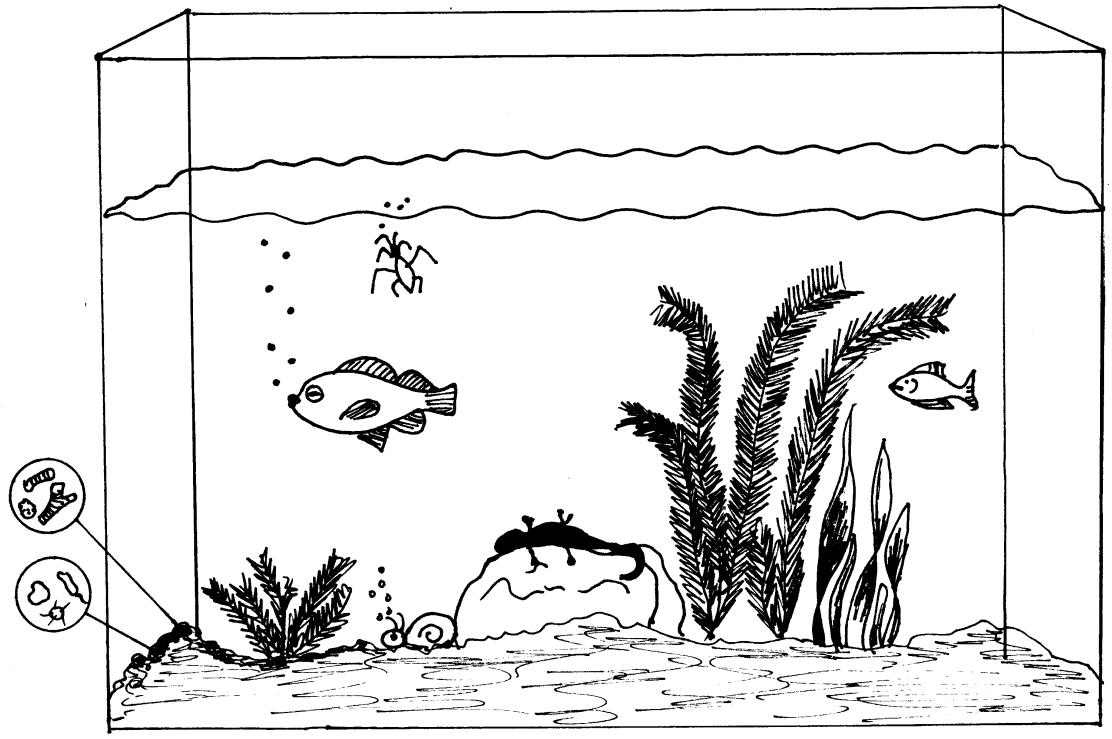
1. Discuss with students the food chain and food web.

2. If you have an aquarium in your classroom, you may want your students to use that instead of the worksheet. The purpose of this worksheet is to determine the food chains that might be in an aquarium. For instance, in the worksheet one food chain is: Sun - algae - protozoa - insect - fish. Ask the students if there are more than one food chain in the aquarium? Yes, another food chain would be Sun - algae - newt. Sun-algae -snail - fish, may be another food chain. Together they create a food web, which also takes into account that the fish might actually eat the poop of the snail. Food webs can be intriciate.

3. If you discuss a real aquarium, you would have to discuss the different types of fishes because some fish eat other fish. Also, when fish have babies, they are usually eaten by bigger fish.

LIFE CYCLE - NATURAL ENVIRONMENT (4B) POST

A FRESH WATER AQUARIUM ECOSYSTEM



DESCRIBE THE FOOD CHAIN THAT IS OCCURRING IN THIS AQUARIUM. IS THERE MORE THAN ONE FOOD CHAIN? DESCRIBE THE FOOD WEB?