DOCUMENT RESUME

ED 100 712 SE 018 657

TITLE	Environmental Education Curriculum Development, Grade 6, For St. Martin Parish.
INSTITUTION	Saint Martin Parish School Board, St. Martinville, La.
PUB DATE	[74]
NOTE	242p.
EDRS PRICE	MF-$0.75 HC-$11.40 PLUS POSTAGE
DESCRIPTORS	*Conservation Education; *Curriculum Guides; Ecology; *Elementary Education; Environment; *Environmental Education; Grade 6; Instructional Materials; Natural Resources; Pesticides; Pollution; *Science Education; Teaching Guides
IDENTIFIERS	Air; Minerals; Soil; Wildlife

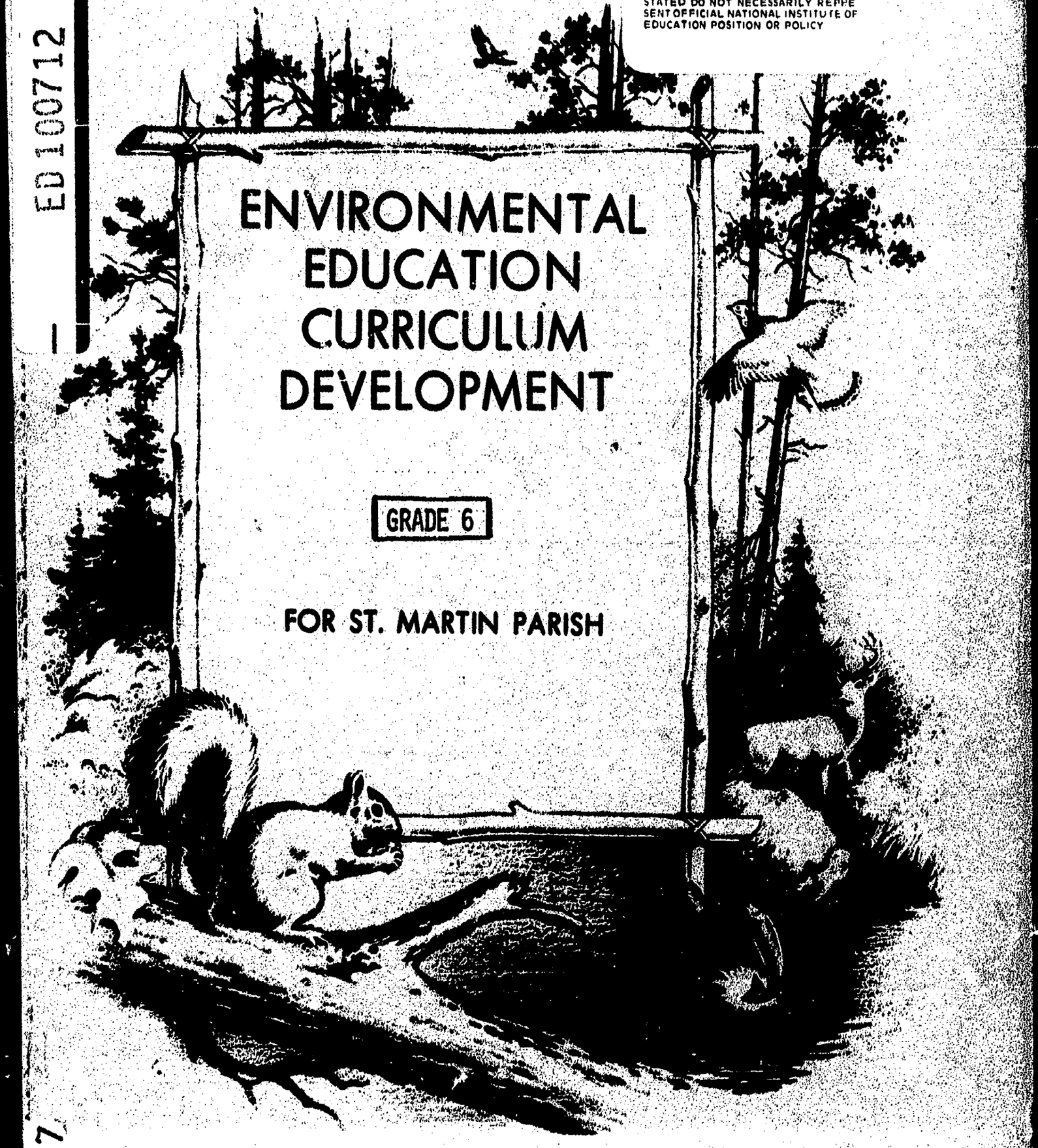
ABSTRACT

This environmental education curriculum guide is designed for teacher use in the sixth grade. It contains seven units that aim to help the students acquire basic understanding of environmental relationships, environmental problems, environmental quality and to help the students develop skills to solve current environmental problems. Each unit, based on several concepts, includes objectives, activities, student work sheets, discussion questions, resource materials and vocabulary words. The techniques of discussion, observation, classification, discovery, inquiry, and field work are employed. The guide includes the following units: Unit 1, environmental relationships; Unit 2, soil conservation; Unit 3, air pollution; Unit 4, the hydrosphere; Unit 5, wildlife and related problems; Unit 6, mineral resources; and Unit 7, pesticide problems. (TK)

ENVIRONMENTAL EDUCATION CURRICULUM DEVELOPMENT

GRADE 6

FOR ST. MARTIN PARISH



ST. MARTIN PARISH SCHOOL BOARD

This is the first curriculum guide written by the St. Martin Parish Environmental Education Curriculum Development Program. Should you have any questions or suggestions on how to make this guide more effective for classroom use, please feel free to get in touch with:

Mr. Isadore Inman, Jr.
Director, Environmental Program
St. Martin Parish Schools
305 Washington Street
St. Martinville, LA 70582

FOREWORD

Man lives in a closed life support system. Along with all other life on Earth, he is dependent upon air, water and food furnished by the systems of the planet, systems which have evolved over a period of some three billion years.

The delicate balance maintained by this natural system over the years is now in danger from man's activities which threaten to insert unknown quantities into the equation of life.

These units contain concepts, objectives, and activities that can be used as part of the regular science curriculum. Each unit has built-in flexibility to allow a teacher to decide which activity will be used. The units may be used in any order preferred. Not all activities need be covered since there may be several activities suggested to bring out the desired behavioral objective. With few noted exceptions, activities may be accomplished in any order the teacher selects.

Some of the activities may also be used in other areas such as social studies, art and mathematics. Activities include suggestions for research topics, classroom displays, puzzles, films, filmstrips, transparencies, charts and investigations.

The general objectives of the program are:

1. Help students acquire a basic understanding of the natural and man-made components of the environment.
2. Help students understand man's relationship with his environment.

3. *Help students acquire a basic understanding of environmental problems.*
4. *Help students acquire a concern for the quality of their environment.*
5. *Help students develop the skills necessary to solve and help prevent environmental problems.*

The unit investigations of the environment are designed to lead students to a better understanding, a fuller awareness of the world in which they live, and upon which their existence depends.

INTRODUCTION

To The Teacher

If an individual travels around St. Martin Parish, he will soon become aware of the multitude of environmental problems which exist. The indescriminate use of pesticides, the presence of litter along many roadsides, the polluted streams, and the mountains of garbage in the municipal garbage dumps are but a few examples of the results of ignorance and/or carelessness of many of the people of the parish.

Since the best way to overcome ignorance is with education, and since proper education usually results in more responsible citizens, it is logical to assume that an effective environmental education program will help to solve many of the environmental problems which exist. It is the aim of the St. Martin Parish Environmental Education Curriculum Development Program to produce for the students of St. Martin Parish schools, meaningful and effective units of study in environmental education, and thus, help to alleviate some of the parish's environmental problems.

It is the opinion of the director and the staff of the program that if the units of study are to be meaningful to the students, the units must concern themselves with local situations with which the students are familiar. For this reason, many of the activities in the various units require that the students get involved in studying the environment of the area in which they live, and the problems which are affecting it. The students are also asked to devise, and possibly implement ways to help solve environmental problems in their area.

This series of units has been designed so that it can be used by any teacher, regardless of his educational background, and in any teaching situation, regardless of the previous achievements of the students. The units have been prepared for grades K through 12, but they need not be used for the specific grade for which they were written. For example, if a sixth grade teacher feels that the fourth grade units would be better suited to a particular class, he could use the fourth grade units and would cover basically the same material, but on a lower elementary level.

It should be noted that the units of study for each grade level may be used in their entirety or in part, depending on the needs and abilities of the teacher and students, and on factors such as location of the school, availability of transportation for field trips, and availability of laboratory facilities.

UNIT I ECOLOGY

UNIT 2 SOIL

UNIT 3 AIR

UNIT 4 WATER

UNIT 5 WILDLIFE

UNIT 6 MINERALS

UNIT 7 PESTICIDES

UNIT I
ECOLOGY

UNIT 1 ECOLOGY

The study of the relationships of living things to their surroundings and to each other is called *ecology*. The root of the word *ecology* comes from a Greek word meaning *house*. The *house* of a plant or an animal may be a meadow, a pond, a field, an ocean, a desert, the woods, or even a vacant lot. The *house* of a plant or an animal, the place where it lives, is called the *habitat*. All plants and animals have either land, water, or both land and water habitats.

All things depend on one another. Living things are affected by the place in which they live and by the other living and non-living things that are present. The place where a plant or an animal lives should provide all the things necessary for life.

All living things interact with non-living forces and substances in their environment. Some of these non-living forces include water, air, soil, minerals, light and heat. A living thing also depends on other living things in its environment. Animals get food from plants, and plants, in turn, depend on animals for some of their needs. Green plants are the food makers (producers) and animals are the food users (consumers). Non-green plants become the decomposers as these animals and plants die, thus creating a cycle.

All of the non-living things, producers, consumers, and decomposers are linked together in what is known as a *food chain*. Some of these food chains have many links and illustrate the interdependence of living things in their environment. This interdependence results in a combination of food chains, creating a *food web*. All the organisms, both plant and animal, that compose these food chains and webs, are referred to as the *biotic community*. The biotic (living) community interacting with its abiotic (non-living) counterpart, makes up an *ecosystem*.

Man is the chief agent in altering the ecology of various environments. For instance, by covering wide areas of land with roads, parking lots, and buildings, he changes the weather of the region making it warmer; by irrigating large areas of arid land, the air becomes less dry. Thus, various animal and plant communities are displaced or exterminated, causing havoc in various components of the food chain. Ecologists, therefore urge individuals and governmental agencies to take extreme care and consideration when undertaking projects which might upset the ecology of a given area.

CONCEPT 1:

Ecology is the interrelationship of living things in their environment. All living and non-living things depend on each other.

OBJECTIVES:

1. Provided with test tubes, snails, aquatic plants, and other laboratory equipment and supplies, the students will set up three communities in test tubes to show that a plant uses the carbon dioxide given off by an animal. Performance level to be determined by the teacher.

2. The students will conduct a survey of their immediate environment to determine relationships between living and non-living factors. Each student shall list at least five of these relationships.

ACTIVITIES:

1. Students will construct a plant-animal community to show plant and animal interdependence.
   (See Student Worksheet)

2. Students will list at least five relationships between living and non-living factors in the immediate environment.

STUDENT WORKSHEET

To Accompany: Concept 1, Activity 1

ECOLOGY

TASK:

Illustrate that a plant uses the carbon dioxide given off by an animal.

MATERIALS:

3 test tubes with corks
2 small snails
2 aquatic plants (Suggest use of Elodea about 2½ inches.)
Test tube rack
Soda straw (plastic preferred)
Medicine dropper
Bromothymol blue solution
Distilled water
Tweezers (forceps)

PROCEDURE:

1. Place the three test tubes in the rack, then pour distilled water into each, about 3/4 full.

2. Using the medicine dropper, put equal amounts of Bromothymol blue solution in each test tube to make the water light blue.

3. Place the straw into the first test tube and blow air through it for about five minutes. Using the tweezers, put one piece of the Elodea into the test tube and cork it. Label this test tube "A."

4. In the middle test tube, put the other piece of Elodea and one of the snails and cork it. Label this test tube "B."

5. In the third test tube, put the other snail and cork it. Label this test tube "C."

6. Place the test tube rack next to a bright light overnight and observe the following day.

NOTE: Bromothymol blue solution is yellow in an acid solution and remains blue in a solution that is basic.

RESULTS:

1. Which of the three test tubes contained an acid solution after setting overnight? 1._____

2. In your own words, tell what could have formed this acid. 2._____

3. Which of the test tubes did not contain an acid? 3._____

4. In your own words, tell what probably happened to the carbon dioxide in these test tubes. 4._____

5. What did you discover about the relationship between plants and animals in this experiment? 5._____

CONCEPT 2:

Basic units of ecology are non-living forces, producers, consumers, and decomposers. Green plants (producers) are the source of food for most living things.

OBJECTIVES:

1. Provided with a diagram of a green plant and samples of bean plants, the students will label the main parts of a green plant and determine which plant part is responsible for photosynthesis. Then, provided with samples of mushrooms, the students will note the differences between green plants and non-green plants. Performance level to be determined by the teacher.

2. Provide the students with samples of food (pictures of food, canned goods, fresh fruits and vegetables, etc.) and a chart on which the students will record the food sample (*milk*), the source (*cow*), and the green plant (*grass*), to illustrate that all foods are the products of green plants. Each student is to list ten food samples and trace each to its primary and secondary sources, attaining 80% accuracy.

ACTIVITIES:

1. Students will determine where photosynthesis takes place in a green plant, and they will note how green plants differ from non-green plants.
   (See Student Worksheet.)

2. Students will view the film *How Green Plants Make Food* to reinforce Activity 1.

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 1

ECOLOGY

TASK:

Determine how green plants differ from non-green plants.

MATERIALS:

Samples of bean plants
Samples of mushrooms
Diagram of a green plant

PROCEDURE:

1. Label the five main parts of a green plant.

2. Green plants are able to make their own food through a process called _____.

3. a. What chemical substance gives the green plant its color? 3a._____

   b. What are the raw materials needed by the plant to make food? b._____

   c. Where are these raw materials found? c._____

   d. How do the raw materials enter the plant? d._____

   e. What part of the plant acts like a factory, changing these raw materials into food for the plant? e._____

4. Each factory of the plant works only during what hours? Why?

4. _____

5. Examine the mushroom, our example of a non-green plant. How is it different from green plants?

5. _____

6. Without chlorophyll, can non-green plants make their own food? If not, how are they able to live?

6. _____

7. In the woods, you can find many fungi (non-green plants) on dead trees and logs.
   a. What are these fungi doing to the dead things?
   b. Why is this function so important in maintaining a balance in nature?

7.a. _____

b. _____

RESULTS:

1. How are green plants used by other living things?

1. _____

2. What is the function of non-green plants in the environment?

2. _____

STUDENT WORKSHEET

To Accompany: Concept 2, Activity

ECOLOGY

TASK:

Show that most foods are the products of green plants.

MATERIALS:

Samples of foods (pictures of food, canned goods, fresh fruits, and vegetables)

PROCEDURE:

1. Make observations of food samples on display.
2. Indicate how each food sample is derived from green plants. (Use chart; see example.)

FOOD SAMPLE	SOURCE	GREEN PLANTS
1. *Milk*	*Cow*	*Grass*
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

RESULTS:

What can you conclude about most food products?

CONCEPT 3:

Living things that depend on other living things for their food are called *consumers* (animals and non-green plants).

OBJECTIVES:

1. Using a food item consumed at a recent meal, the student will construct a food chain and will correctly indicate the producer and all consumers in this food chain.

2. Provided with pictures of component parts of food chains, the students will construct five food chains and correctly identify the producers and consumers in each.

ACTIVITIES:

1. Students will construct a food chain using a food item consumed at a recent meal and will point out the producer and all consumers in the food chain.

2. Students will construct five food chains with pictures of component parts and correctly identify the producers and consumers in each.

CONCEPT 4:

Non-green plants, unable to make their own food, are dependent upon living things in their environment for survival, and in turn act as *decomposers*.

OBJECTIVES:

1. The students will take a field trip to a wooded area and will collect non-green plants and the living things being decomposed for observation. Then, they will record on the chart provided the decomposer (non-green plant) and the living thing being decomposed. Each student will collect and identify at least three decomposers and the living things being decomposed.

2. Provided with four saucers or petri dishes and items such as bread, fruit, and leather, the students will conduct an experiment to determine how non-green plants cause living things to decompose. Performance level to be determined by the teacher.

3. Upon completion of the preceeding objectives, the students will write at least one paragraph in which they will correctly relate the importance of non-green plants to their environment.

ACTIVITIES:

1. Students will take a field trip to a wooded area in order to collect and observe non-green plants (decomposers) and living things being decomposed. They will record this information on a chart provided by the teacher. (A chart similar to the one below may be illustrated on the chalkboard.)

DECOMPOSER	LIVING THING BEING DECOMPOSED
1.	
2.	
3.	
4.	
5.	

2. Students will conduct an experiment to determine how non-green plants cause dead organisms or things derived from them to decompose.
(See Student Worksheet.)

3. Students will write at least one paragraph in which they will relate the importance of non-green plants to their environment.

STUDENT WORKSHEET

To Accompany: Concept 4, Activity 2

ECOLOGY

TASK:

Determine how non-green plants cause dead organisms or things derived from them to decompose.

MATERIALS:

4 containers (saucer, petri dish, or jar lid)
Water
Bread, fruit, juices, leather

PROCEDURE:

1. Moisten dry items. (Do not soak.)
2. Place items in containers.
3. Place containers in a dark, warm place.
4. Let items set for several days.
5. Observe daily and record any changes on chart below.

ITEM	DAILY OBSERVATIONS				
	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
1. *Bread*					
2. *Fruit*					
3. *Juice*					
4. *Leather*					

RESULTS:

1. What happened to the food items? Why?

1. _____

_____

_____

2. What happened to the leather? Why?

2. _____

_____

_____

3. What happened to the fungi? Why?

3. _____

_____

_____

CONCEPT 5:

Man is the chief agent in altering the ecology of various environments.

OBJECTIVES:

1. Provided with encyclopedias and other research materials, the students will conduct research on the Imperial Valley of California to determine how its ecology was changed by vast irrigation projects. Performance level to be determined by the teacher.

2. Provided with maps, bulletins, pamphlets, and news articles by the U. S. Army Corps of Engineers, the Wildlife and Fisheries Commission and Environmental groups on the Atchafalaya Basin, the students will assess how deepening of the Atchafalaya River channel might affect the ecology of the basin. Performance level to be determined by the teacher.

ACTIVITIES:

1. Students will conduct research on the Imperial Valley of California to determine how its ecology was changed by vast irrigation projects.

2. Students will assess how deepening of the Atchafalaya River channel might affect the ecology of the basin.

SUGGESTED QUESTIONS TO ACCOMPANY: UNIT 1, ECOLOGY

1. What is the primary source of food for most life?
2. What is the interrelationship of living things in their environment called?
3. What is the food-making process of green plants which takes place in the presence of sunlight called?
4. What is the main source of all energy?
5. What chemical substance do green plants have that non-green plants do not have?
6. List the raw materials used by plants to manufacture food.
7. List the main parts of a plant.
8. List three non-green plants.
9. What is the term used to describe the food makers in a food chain?
10. What are the three component parts of a food chain? Identify each as either animal, green plant, or non-green plants.
11. What is the area in which an animal or plant lives called?
12. What is the relationship between living and non-living forces called?

RESOURCE MATERIAL

FILMS:

How Green Plants Make Food, b/w, 11 min.--Regional Film Library, Lafayette

Plant-Animal Communities: The Growing Balance in Nature, color, 11 minutes--St. Martin Parish Instruction Center, Breaux Bridge

The Meaning of Conservation, b/w, 11 min.--Regional Film Library, Lafayette

FILMSTRIPS:

Living Things Need Each Other--St. Martin Parish Instructional Center, Breaux Bridge

SLIDES:

Ecology series--St. Martin Parish Instructional Center

BOOKS, BOOKLETS, AND PAMPHLETS:

Applications of Media for Environmental Education in the School. Bellingham, Washington: Huxley College, Environmental Education Center, 1971.

Brennan, Mathew J. *People and Their Environment* (Biology). Chicago, Illinois: J. G. Ferguson Publishing Company, 1969.

_____. *People and Their Environment* (Grades 4,5,6). *Ibid.*

_____. *People and Their Environment* (Outdoor Laboratory). *Ibid.*

"Conservation Tools for Educators." USDA, 1968.

Intermediate Science Curriculum Study. *Environmental Science.* Morristown, NJ: Silver Burdett General Learning Corp., 1972.

Mallinson, George C., Jacqueline Mallinson, Douglas Brown and William Smallwood. *Science--Understanding Your Environment* (Level 6). Morristown, NJ: Silver Burdett Co., 1972.

Schneider, Herman and Nina. *Science for Today and Tomorrow* (Grade 6). Lexington, Massachusetts: D. C. Heath Co., 1968.

Turk, Amos, Jonathan Turk and Janet Wittes. *Ecology Pollution Environment*. Philadelphia, Pennsylvania: W. B. Saunders Co., 1972.

VOCABULARY
UNIT 1 ECOLOGY

ABIOTIC COMMUNITY

BIOTIC COMMUNITY

BY-PRODUCT

CARBON DIOXIDE

CHLOROPHYLL

CONSUMERS

DECOMPOSERS

ECOLOGY

ECOSYSTEM

ENERGY

ENVIRONMENT

EXTERMINATED

FOOD CHAIN

INTERDEPENDENCE

ORGANISM

OXYGEN

PHOTOSYNTHESIS

PRODUCERS

UNIT 2
SOIL

UNIT 2 SOIL

"No one lives alone; everyone lives as part of the world." This statement briefly clarifies the meaning and importance of soil conservation to everyone. Whether one lives in the country or in the city; whether he plans to be a farmer or a businessman, a country store owner or the operator of a chain of department stores; one's life will ultimately be affected by the problems of soil conservation.

Soil is our most valuable natural resource. It is a vital substance which builds up very slowly over the centuries. It is composed of tiny rocks,particles, air, water, decaying organic matter, and living plants and animals which inhabit it. There are four major types of soils: clay, loam, sand, and sandy loam. These soils differ in their characteristics. Soil is an extremely valuable resource which we cannot afford to lose, yet, daily it is being carried away by various forces.

The soil is constantly affected by the forces of ercsion. Erosion is the wearing away of the soil, and it may occur in a variety of forms. The major eroding factor is running water. All forms of running water, from the tiny raindrops splashing on the ground, to the mighty rivers steadily cutting through the earth's crust, are constantly removing the valuable topsoil.

Water erosion is usually divided into various types according to its affects on the soil. Two of the types work together in their efforts to wear away the soil. One of the two, sheet erosion, is the uniform removal of soil from an area in thin layers. Generally, it does not occur alone because in order to erode it requires a smooth surface. Since there are very few smooth surfaced areas, the sheet erosion usually occurs with rill erosion, since the rill erosion keeps the surface fairly uniform. Rill erosion results from water flowing over the surface and forming extremely small shallow trenches, or rills. Together these forms of erosion manage to carry off tons of valuable topsoil each year.

Unlike sheet erosion, which may go unnoticed until it is almost too late, is a third type of erosion, gully erosion. Gully erosion is one of the most noticeable forms of erosion since the enlarging cracks in the earth can hardly go unobserved. As the erosion wears away more and more, soil, the gullies get progressively larger, some reaching depths beyond fifteen feet. The causes of gully erosion are varied. Gullies may be cut out by waterfall erosion, channel erosion or by alternate freezing and thawing. No matter what the cause, it is always the result of runoff. Some authorities will group gully erosion with rill erosion and stream erosion and refer to it as channel erosion. But, no matter how these are grouped, there are no sharp distinctions when changing from one type to another. There is, however, a common bond in that they cause erosion by the energy of moving water.

Of course rivers and streams do their share of damage to the land. A prime example of river erosion is the Grand Canyon in Arizona. It was cut out by the action of the Colorado River over thousands of years. The amount of erosion by running water, whether it be the Colorado River or a daily rain, is determined by three factors: the nature of the earth's surface over which it flows; the speed of the flowing water; and, the depth of the stream.

There are also types of water eorions other than running water. One of these is splash erosion caused by raindrops. The force with which the raindrops hit the ground causes them to break up small mounds of soil and soil granules. This then makes the soil easier to move by other forces of erosion. It has been shown that a raindrop's impact may splash particles to a height of over two feet and may move a soil particle more than five feet horizontally. The size of the raindrop, the speech at which it is falling and the amount which falls are all factors which will determine the amount of harm the raindrop can do.

In addition to water erosion, the soil is also affected by the action of the wind. Wind erosion affects all unprotected soil and soil only partially protected by vegetation. It does most of its damage in the arid and semi-arid regions. But it also will affect any area which is under cultivation. Soil blowing is most noticeable when the land is being prepared for planting, before young plants are large enough to protect soil from the wind, and when the land is left to lie fallow. The effects of wind erosion are not only that it strips the soil of its fertile top layer, but it also damages the crops either by bruising them with soil particles, uprooting them, or by covering them with soil. Soil blowing also damages property by eating through fences, and marring bulidings and highways.

Through proper use and management, this erosion of soils can be retarded, if not completely stopped. All measures which help to keep the land productive are tools of the conservationist. Since conservation is the wise use of all our natural resources, and since soil is one of our basic renewable resources, then soil must be conserved wisely. Such conservation means proper use and care of the land. Of the numerous means which can be used to make the land more productive are: terracing, contour plowing, strip cropping, cover crops, grass planting, fertilizing, and proper drainage. These practices help us to use our land to its fullest, producing the greatest amounts of the plant products most needed; while at the same time protecting the soil against all forms of deterioration. Every field, large or small, must be used for that which it is best suited, as well as being protected according to its needs. This is what soil conservation includes, along with the rebuilding and restoring of eroded and depleted soils.

Soil conservation does much more than protect the existing soils. It also helps to improve the nutritional value of the foods we eat, the foods which are grown in these soils protected by the conservationist. Therefore, if soils are treated properly and used correctly, they will not deteriorate, but rather they will produce indefinitely for all.

CONCEPT 1:

Soil is our basic natural resource; all life depends either directly or indirectly on the soil.

OBJECTIVES:

1. Through the use of audio-visual material, the students will be able to describe the soil as a natural resource. Performance level to be determined by the teacher.

2. After viewing a variety of audio-visual materials the students will be able to compose a short essay on "how life depends on the soil" or some related topic as designated by the teacher. Performance level to be determined by the teacher.

ACTIVITIES:

1. Have the students view the following transparencies: *Cultivation, Soil Cover, Animals in the Soil, Plants and the Soil,* and *Soil Bacteria* from the Elementary Science Series 2000 - Soil 2010, and *Major Land Resources of Louisiana* from Louisiana Social Studies Conservation resources. Allow class discussion to begin, then ask each student to describe the soil as a natural resource. Source for materials in the St. Martin Parish Instructional Center.

2. Have the students view the film *The Story of Soil* and the filmstrip *Soil: The Earth's Greatest Treasure* for the purpose of reinforcing the concept. A culminating activity for the two may be designed by the teacher. Sources of the above are: Regional Film Library, USL, Lafayette, and St. Martin Parish Instructional Center, respectively.

3. After having viewed the above audio-visual materials, assign the students the composition of a short essay on "how life depends on the soil" or some related topic designated by the teacher.

CONCEPT 2:

Soil type is determined by a combination of characteristics.

OBJECTIVES:

1. Through examination of a soil sample, the student will be able to list correctly six of its characteristics: structure, color, texture, moisture, plant, and animal content.

2. Given a variety of soil samples (vegetable garden, woodland, lawn, clay bank, park, and beach) the student will run the test for the pH of the soil and correctly identify each sample as being either acidic, basic, or neutral.

3. Given four different soil types (loam, clay, sand, and sandy loam) and eight lima bean seeds, the students will plant two bean seeds in each different soil types and determine which type is best suited for growing plants. Performance level is to be determined by the teacher.

4. Given a list of the characteristics of the following soil samples: loam, clay and sand, and an unknown type of soil, the student will correctly identify the soil as one of the three listed above.

5. The transparency *Kinds of Soils* may be used by the teacher to further the concept. Culminating activity to be designed by the teacher.

ACTIVITIES:

1. Have the students examine a handful of soil to discover some of its characteristics (structure, color, texture, moisture, plant and animal content).
   (See Student Worksheet.)

2. Have the students test a variety of soil samples (vegetable garden, woodland, lawn, clay bank, park and beach) to determine whether the soil is acidic, basic, or neutral.
   (See Student Worksheet.)

3. Given four soil types (loam, clay, sand, and sandy loam) and eight lima bean seeds, the student will plant two beans in the different soil types and determine which is the best suited for growing plants.
   (See Student Worksheet.)

4. Given a list of the characteristics of each of the following soil types: loam, clay, sand, and an unknown sample of soil, the students will identify the unknown type as one of the three types listed.
(See Student Worksheet.)

5. The transparency *Kinds of Soil* from the Elementary Science 2000 - Soil 2010, may be used by the teacher to enhance the concept in an activity designed by the teacher. Source for the transparency is the St. Martin Parish Instructional Center. May be used as an introductory exercise.

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 1

SOIL

TASK:

Study some of the characteristics of soil.

MATERIALS:

Soil samples
Magnifying glass
Newspaper

PROCEDURE:

1. Spread the newspaper on your working area.

2. Put a handful of soil on the paper.

3. Look at the soil sample, observing the structure; record. (small or large grains) 3._____

4. Notice and record the color of the soil. 4._____

5. Rub the soil between your fingers.

6. Record the texture you feel. 6._____

7. Are there any particles present? If so, list them. 7._____

8. Were these particles always this size or have they changed? If you think they have changed, how did this change occur? 8._____

9. When you roll the soil between your fingers, does it form a rope? Why?

9. _____

_____

_____

10. When you press a large piece of soil in your hand, does it squash or does it break up easily, or does it require more pressure?

10. _____

_____

_____

11. Does your soil sample come from a place that is too dry for corn plants; moist and good for corn plant growth; or extremely wet and not suited for corn plants?

11. _____

_____

_____

12. Examine your soil sample for parts of plants or animals. Use a magnifying glass for your observation. Record below what you see.

NAME OF PLANT OR ANIMAL	QUANTITY	IMPORTANCE TO THE SOIL

13. Smell your soil sample; does it have any odor(s)?

13. _____

_____

14. What do you think causes odors in soil?

14. _____

_____

RESULTS:

1. From where did the soil material come? Has it always been there?

1. _____

_____

_____

2. What uses could people make from your soil sample? Is it better suited for a garden, road construction, housing, or farming?

2. _____

_____

_____

3. What might it take to make plants grow in your soil sample or to make them grow better?

3. _____

_____

_____

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 2

SOIL

TASK:

Determine whether various soil samples are acidic, basic or neutral.

MATERIALS:

Soil samples from vegetable garden, clay bank, woodland, park, lawn, and beach
Containers for samples
Litmus paper (blue and pink)
Water (distilled)
2 Petri dishes per group

PROCEDURE:

1. Put two tablespoons of garden soil in each petri dish.
2. Dampen the soil in each dish with distilled water only.
3. Place a strip of pink litmus in one dish and a strip of blue litmus in the other.
4. Record the results on the chart given.
5. Empty the petri dishes and wipe clean.
6. Repeat steps 1 through 5 for each of the remaining soil samples.

RESULTS:

1. Place a check in the appropriate column on the chart.
2. If soil sample is found to be acid, how might it be made neutral?

2. _____

_____

3. If the soil sample is found to be basic, how might it be made neutral?

3. _____

_____

4. When comparing your results with other groups, were there any conflicting results? Which samples? Explain.

4. _____

_____

_____

SOIL SAMPLE	ACID	BASIC	NEUTRAL
Vegetable Garden			
Woodland			
Lawn			
Clay Bank			
Park			
Beach			

NOTE: Acid soil -- if blue litmus paper turns pink.

Basic soil -- if pink litmus paper turns blue.

Neutral soil -- if neither pink nor blue litmus paper changes.

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 3

SOIL

TASK:

Determine the best type of soil for growing plants.

MATERIALS:

4 plastic cups
8 lima bean seeds
Soil samples (loam, clay, sand, sandy loam)
Water

PROCEDURE:

1. Label each cup with the name of the soil that it will contain.
2. Fill each cup three-fourths full with the type of soil for which it is labeled.
3. Make a hole about one inch deep in each soil sample and place two beans in each hole.
4. Cover the seeds with soil.
5. Place the cups where they will get ample sunlight daily.
6. Water the plants daily until two weeks after they sprout.
7. Watch the plant growth; record the date that each plant sprouts, and observe sprouted plant for two weeks.
8. Record your observation on the chart provided.

RESULTS:

1. Record your observations on the chart provided.

TYPE OF SOIL	DATE SPROUTED	DESCRIPTION OF PLANT AFTER TWO WEEKS
LOAM		
CLAY		
SAND		
SANDY LOAM		

2. At the end of the two weeks, sketch a picture illustrating how each plant grew. Label each picture.

3. Which of the plants showed the least growth? 3._____

4. Why do you think the plant did not grow well? 4._____

5. Which plant showed the best growth? 5._____

6. Explain what caused improved growth. 6._____

7. Why are the plants of different sizes? 7._____

8. Which of the plants do you think might have received the most: a. water? b. minerals? Explain your answer. 8a._____ b._____

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 4

SOIL

TASK:

Determine the soil type of an unknown sample.

MATERIALS:

Old newspaper
Soil sample
List of characteristics of the following soil types: clay, sand, loam
Plastic cup with holes punched in the bottom
Water

PROCEDURE:

1. Spread the old newspaper over the surface of your working area.
2. Place a handful of the unknown sample on your paper.
3. Using the senses of sight and touch, note the color, texture, and content of the sample. Record your observations on the chart provided.
4. Check the plastic paper cup, making sure there are holes punched in the bottom; if not, punch five holes (⁘) in the bottom with your pencil.
5. Fill the cup half full with the soil sample; pack it lightly.
6. Pour water over the soil and see if it allows the water to penetrate; if so, does it penetrate readily or not? Record.

RESULTS:

1. From the information on the chart, would you say the sample was clay, sand, or loam?

1. _____

2. Would you use your soil sample to plant crops? Explain. 2._____

3. Where would you find your sample in abundance? 3._____

4. What could you do to your sample to improve it? 4._____

CHART

1. Place a check in the blank next to the term that best describes your sample.
2. After all the characteristics have been observed, the column with the most checks will be the soil type of your sample.

CHARACTERISTIC	SAND	CLAY	LOAM
COLOR	Light ___	Medium ___	Dark ___
GRAIN SIZE	Large ___	Tiny (microscopic) ___	Medium ___
HUMUS CONTENT	Slight (if any) ___	Moderate ___	Rich ___
WHEN ROLLED THROUGH YOUR FINGERS, IT FEELS	Rocky ___	Dry: Hard and Plastic Wet: Stiff and Sticky ___	Gritty ___
SPEED OF WATER FLOW ALLOWED BY THE SAMPLE	Straight Through ___	Allows very little, if any ___	Moderate to slow ___

CONCEPT 3:

An important characteristic of the soil is its ability to hold water.

OBJECTIVES:

1. Given three types of soil (loam, clay, and sand), the students will determine which soil sample holds the most water.

2. Through research and reporting, the students will be able to note the differences in the practices used in farming different types of soil (loam, sand, clay). Performance level to be determined by the teacher.

ACTIVITIES:

1. Through a laboratory experiment, have the students determine which type of soil holds the most water (loam, sand or clay). (See Student Worksheet.)

2. Have the students conduct library research on farming in different regions, such as arid, semi-arid, and humid areas, where the different soil types (clay, sand, and loam) are prevalent. Through their research, the students should note the differences in the farming practices for different regions.

STUDENT WORKSHEET

To Accompany: Concept 3, Activity 1

SOIL

TASK:

Determine which kind of soil holds the most water.

MATERIALS:

3 large juice cans (all the same size)
Soil samples: clay, sand, loam
3 clear plastic drinking glasses
Paper towels
Hammer and nail, or some similar device to punch holes in cans
1 measuring cup

PROCEDURE:

1. Punch about seven nail holes in the bottom of the juice cans. Make sure the holes are in the center of the can and that they are not wider than the mouths of the glasses.

2. Fill one of the cans with the clay sample and label it *Clay*. Repeat with the sand and the loam samples; label each can accordingly.

3. Place the cans over the drinking glasses, making sure that the holes are over the mouths of the glasses.

4. Slowly pour one cup of water into each can. Wait one-half hour.

5. Record what you see in each drinking glass.

6. Pour the soil onto paper toweling. Feel each sample and record.

RESULTS:

1. Which drinking glass had the most water?

1. _____

2. Which soil sample held the most water?

2. _____

3. How did each soil sample feel?

3. *Clay* _____

_____

Sand _____

_____

Loam _____

_____

4. From what you have seen, which kind of soil would be best suited for growing plants? Why?

4. _____

_____

_____

_____

STUDENT WORKSHEET

To Accompany: Concept 4, Activity 1

SOIL

TASK:

Compare plants grown in topsoil to those grown in subsoil.

MATERIALS:

Topsoil sample
Subsoil sample
20 radish seeds
2 containers (small milk cartons) per group
Newspaper
Water

PROCEDURE:

1. Place the newspaper where you will be working.
2. Put topsoil in container and label it *A*.
3. Put subsoil in the other container and label it *B*.
4. Plant ten radish seeds in each container, about ½ inch deep.
5. Moisten soil in each container.
6. Place both containers in a well lighted, warm area.
7. Water daily so that each container stays moist.
8. Continue until both plants have sprouted for about five days.

RESULTS:

1. Compare each plant sprout for about five days by sketches and/or description on the chart provided.

2. Which type of soil produced the best plant? 2._____

3. In which type of soil do most plants grow? 3._____

4. Which type of soil seems to be of more importance to man? 4._____

CHART TO ACCOMPANY: STUDENT WORKSHEET, CONCEPT 4, ACTIVITY 1

DAY	CONTAINER *A* (Topsoil)	CONTAINER *B* (Subsoil)
1		
2		
3		
4		
5		

CHART TO ACCOMPANY: CONCEPT 4, ACTIVITY 2

CHARACTERISTICS OF SOIL	TOPSOIL		SUBSOIL	
	DRY	WET	DRY	WET
STRUCTURE				
COLOR				
TEXTURE				
EVIDENCE of PLANT LIFE				
EVIDENCE of ANIMAL LIFE				

CONCEPT 5:

Man uses fertilizers to keep soils fertile.

OBJECTIVES:

1. Supplied with two soil samples of clay, loam, and sand (on sample fertilized and the other not), twelve lima bean seeds, and six flower pots, the students will plant two lima bean seeds in each sample (two in each of the fertilized soil samples, and two in each of the unfertilized soil samples). The students will then be able to determine whether or not the fertilizer was an aid in the growth of the plants. Performance level to be determined by the teacher.

2. Through research and reporting, the students will conduct a survey on the different types of ingredients found in fertilizers. From this information, the students will determine which ingredient is found to be the most common; then through research, they will determine why this is so. Performance level to be determined by the teacher.

ACTIVITIES:

1. Given two soil samples of clay, sand, and loam (one fertilized and one unfertilized) and twelve lima bean seeds, the students will plant two bean seeds in each of the samples. The students will determine whether or not the fertilizer was an aid in plant growth.

   NOTE: The teacher might wish to use soil samples from severly leached areas so that the differences between the fertilized and unfertilized be more pronounced.

2. The students will conduct a survey on the different types of ingredients found in commercial fertilizers. From the information attained, the students will determine the most common ingredient(s) found in fertilizers. They will conduct research to determine why the ingredient(s) is so important.

3. The teacher might use the transparency *Enriching the Soil* from Elementary Science 2000 - Soil 2010, to further enhance the concept.

STUDENT WORKSHEET
To Accompany: Concept 5, Activity 1

SOIL

TASK:

Determine how soil can be made to grow plants better.

MATERIALS:

6 flower pots
12 lima bean seeds
Fertilizer
Soil samples of clay, sand, and loam
Poster board
Crayon or felt pen
Yardstick or ruler
Teaspoon

PROCEDURE:

1. Prepare measuring chart to mark off one inch at a time. (See sample chart included.)

2. Fill two of the flower pots with clay. In one of these, put in one teaspoon of fertilizer and mix. Label the pot with the fertilizer.

3. Repeat the procedure in No. 2.for the sand sample and the loam sample.

4. Plant two bean seeds in each pot about one inch deep.

5. Place the flower pots on a sunny windowsill and water daily.

6. When all the plants have sprouted, place the chart behind the plants and color the squares pertaining to the height of each plant. Compare.

RESULTS:

1. Which of the plants sprouted first? 1. _____

2. Which plant(s) grew best? 2. _____

3. What can you conclude from this? 3. _____

4. What was the difference in growth between the fertilized and the unfertilized plant in each pair? 4. _____

CHART TO ACCOMPANY: CONCEPT 5, ACTIVITY 1

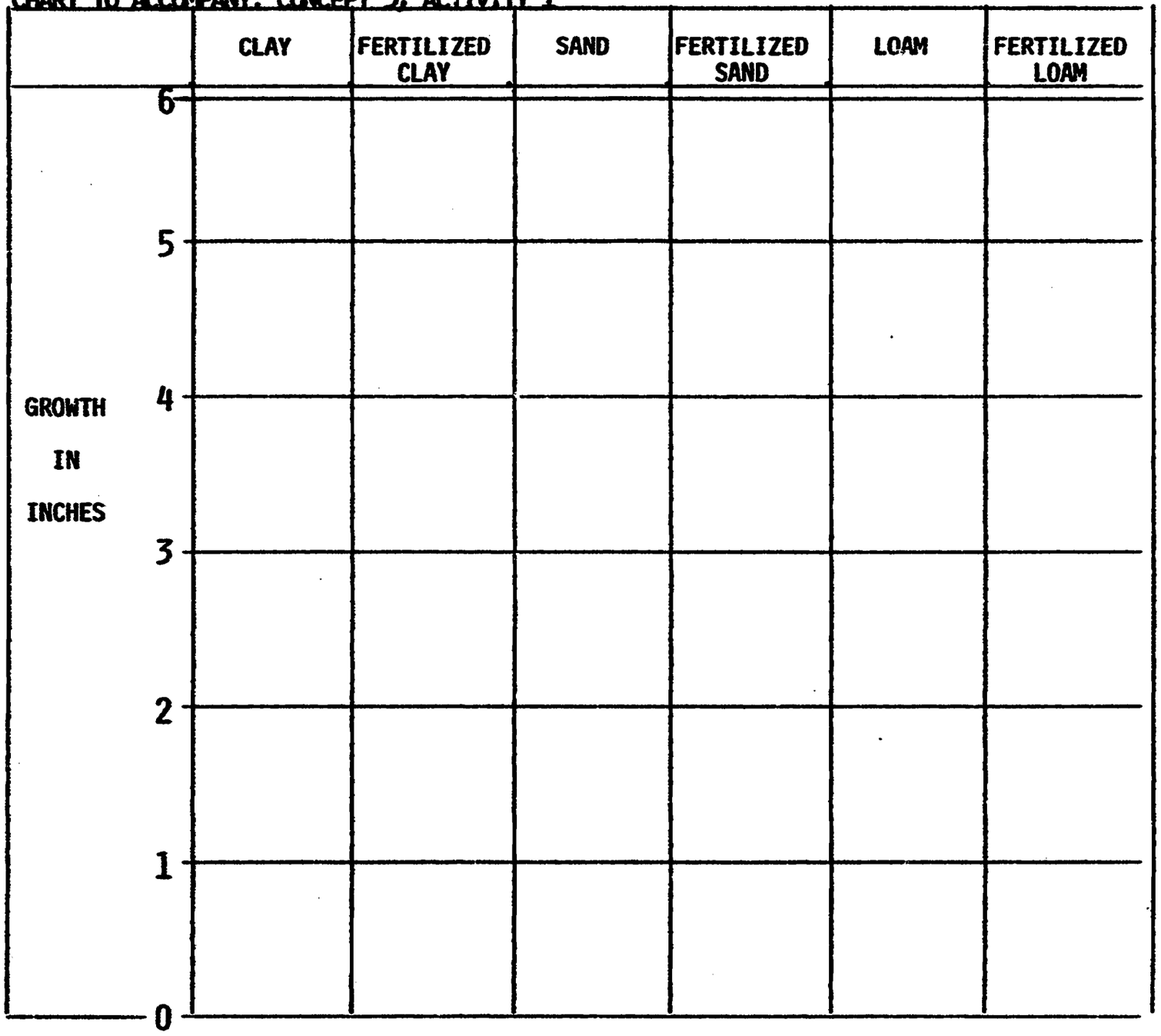


CHART TO ACCOMPANY: CONCEPT 5, ACTIVITY 2

1. Have each student check at home and at hardware, feed, and grocery stores for different types of fertilizers.

2. On the chart, list the name of the fertilizer in the column provided.

3. Check the ingredients given on the label of the fertilizer, then look at the ingredients listed on the chart, and place a check in the column of the ingredients contained. Include percent amounts if given.

4. If an ingredient is given that is not on the list, write it in the blank columns provided.

5. After the survey has been conducted, determine which ingredient was the one most common to the fertilizers.

6. Conduct research on the ingredient in No. 5 to find out why it is such an important ingredient to the soil.

BRAND NAME	= INGREDIENTS =							
	CALCIUM	COBALT	IODINE	MAGNESIUM	NITROGEN*	PHOSPHEROUS**	POTASSIUM	

*May be referred to as *Nitrate*
**May be referred to as *Phosphate*

CONCEPT 6:

Erosion is the wearing away of the soil. The most common type of erosion is that caused by water.

OBJECTIVES:

1. Through research and reporting the students will determine the causes and effects of the seven types of water erosion: sheet, rill, gully, waterfall, channel, stream and splash. As a culminating activity to the research, the students will locate locally at least two examples of each type.

2. Through laboratory experimentation, the students will illustrate the fact that water carries soil. To do this the students will obtain samples of water from ditches, puddles, waterways, etc., and allow the water to settle overnight and check for sedimentation. Performance level to be determined by the teacher.

3. Given a box of bare soil and a box of soil covered with hay, and a water sprinkler filled with water, the students will demonstrate the effects of runoff on protected and unprotected sloping surfaces. Performance level to be determined by the teacher.

4. Given a box of bare soil, a few coins, and a water sprinkler filled with water, the students will demonstrate the effects of splash erosion on the soil. Performance level to be determined by the teacher.

ACTIVITIES:

1. Through library research the students will determine the causes and effects of the seven types of water erosion: sheet, rill, gully, waterfall, channel, stream and splash. As a culminating activity, the students will locate at least two local examples of each type of erosion.

2. Through laboratory experiment the students will illustrate the fact that water carries away the soil.
(See Student Worksheet.)

3. Through laboratory experiment the students will demonstrate the effects of runoff on protected and unprotected sloping surfaces.
(See Student Worksheet.)

4. With a box of bare soil, a few coins and a sprinkler of water, the students will show the effects of splash erosion on the soil. (See Student Worksheet.)

STUDENT WORKSHEET

To Accompany: Concept 6, Activity 2

SOIL

TASK:

Determine whether or not water carries away soil.

MATERIALS:

4 mason jars (quart size)
Water samples from: bayou, canal, runoff from a field after a rain, puddle, ditch, or any other source of water which has passed over the surface of the land

PROCEDURE:

1. Either as a group or individually, have the students go out with the jars to the places listed, preferably after a heavy rain.

2. Fill each jar three-quarters full of water from the source, and label each.

3. Return to the classroom and place the jars on a table where they will not be disturbed. Leave them overnight.

4. At the next class session look at the jars; check for sedimentation.

5. Record your results.

RESULTS:

1. Give the source of water and if there was sediment in the jar, write *yes* beside the source; if not, write *no* for each of the four jars.

1a. _____

b. _____

c. _____

d. _____

2. From your results, would you say that water carries away the soil?

2. _____

3. Which of the sources carried away the most soil?

3. _____

_____

4. What could be done to check some of the runoff?

4. _____

_____

STUDENT WORKSHEET

To Accompany: Concept 6, Activity 3

SOIL

TASK:

Determine how runoff affects sloping surfaces.

MATERIALS:

2 boxes with sides about 2" high and an opening on one end
Dirt (enough to cover the bottom of each box, about 1")
Hay or starw (enough to cover the surface of one box)
Water sprinkler (2 if available)
Water
2 500ml. beakers or wide mouth quart jars

PROCEDURE:

1. Fill both boxes with dirt, so that the dirt is about one inch thick. Pack loosely.

2. In one box, cover the surface of the dirt with the hay or straw; cover it well so the dirt is not visible.

3. With the boxes side by side, tilt each box either by having students hold them up, or by resting one end of the box on books.

4. Place the beakers or jars on a stool below the openings of the two boxes to catch the runoff.

5. Have two students, holding the sprinklers filled with water, stand at the raised end of the boxes; then have them pour the water over the top half of the soil samples. If only one sprinkler is available, have one student pour water over one sample then over the other.

6. Observe the runoff from the two samples which is collecting in the beakers.

7. Record your results.

RESULTS:

1. Describe the runoff from the unprotected soil.

1. _____

2. Describe the runoff from the protected soil.

2. _____

3. Which of the two illustrated the best conservation method for the soil? Explain.

3. _____

4. What does this indicate to you about open fields which are left bare and not under cultivation?

4. _____

5. Do you think water will have the same effect on the level land as it did on the sloping surface? Explain.

5. _____

6. What are some measures which could be taken to protect a field which is going to be left fallow?

6. _____

STUDENT WORKSHEET

To Accompany: Concept 6, Activity 4

SOIL

TASK:

Determine how splash erosion affects the soil.

MATERIALS:

Empty box (about 2" high)
Soil (enough to cover the box bottom about 1" thick)
12 small coins (pennies or dimes)
Water sprinkler
Water

PROCEDURE:

1. Put the soil in the bottom of the box evenly spread about 1" deep, and loosely packed.

2. Lay the coins flat on the surface of the soil; spread them out so the sides are about 1" apart. It may not be necessary to use all the coins; this depends on the size of the box.

3. Leave the box lying flat.

4. Have one student hold the water sprinkler over the box and pour the water over the surface of the box. Have the student vary the height of the sprinkler so that the force of the water will vary.

5. Observe and record your observations.

RESULTS:

1. What happened to the soil beneath the coins?

1. _____

_____

_____

2. What happened to the soil around the coins? 2. _____

3. When was the water more forceful, high above the surface of the soil or closer to the soil? Explain. 3. _____

4. Out-of-doors, what would the coins be representing? 4. _____

5. What does this experiment tell you about soil cover? 5. _____

6. In your opinion, is cover crops the only kind of protection for the soil against the action of raindrops? Explain. 6. _____

CONCEPT 7:

The soil is also affected by the action of the wind.

OBJECTIVES:

1. With the use of the visual aid *Wind Erosion* from the Elementary Science Series 2000 - Soil 2010, the students will discuss the effects of the wind on the soil. Performance level to be determined by the teacher.

2. Given a box of bare soil and a source of wind (electric fan or cardboard) the students will demonstrate the effects of the wind on the soil. Performance level to be determined by the teacher.

3. Through library research and research of the local area, the students will determine four areas affected by the action of the wind on the soil; information to be presented in essay form.

ACTIVITIES:

1. With the aid of the visual aid *Wind Erosion*, from the Elementary Science Series 2000 - Soil 2010, the students will hold a class discusson on the effects of the wind on the soil.

2. Through laboratory experiment the students will demonstrate how wind affects the bare soil.
(See Student Worksheet)

3. Through library research and the research of the local area, the students will list and discuss four areas affected by the action of the wind on the soil. Discussion to be made in a short essay.

STUDENT WORKSHEET

To Accompany: Concept 7, Activity 2

SOIL

TASK:

Determine how the wind affects the bare soil.

MATERIALS:

2 boxes with sides about 2" high
Dirt (enough to cover the bottom of each box about 1")
Hay or straw (enough to cover the surface of one box)
Small electric oscillating fan, if available, or a few cardboard squares held by students
Old newspapers

PROCEDURE:

1. Spread the newspapers on the table or surface where each box is going to be placed. Cover the area for about two feet on all sides of the boxes.

2. Place the boxes in the center of the spread paper.

3. Fill the box bottoms with soil so that it is about an inch deep, loosely pack.

4. Place the hay in one of the boxes so that it thoroughly covers the surface of the soil. Pack down lightly.

5. If the electric oscillating fan is available, turn it on so that it oscillates over the surfaces of both boxes. If the fan is not available, give two students cardboard squares and have them stand in front of each box and wave the "fan" back and forth with even rhythm.

6. Observe and record observations.

NOTE: Make sure to keep at a safe distance so the blowing soil will not get into the eyes.

RESULTS:

1. Describe what happened to the unprotected soil.

1. _____

_____

2. Describe what happened to the protected soil.

2. _____

_____

3. Which of the two illustrated the best method of soil conservation? Explain.

3. _____

_____

_____

4. What does this indicate to you about fields left to lie fallow with no cover crops to protect them? Explain.

4. _____

_____

_____

5. What are some measures which can be taken to protect a field from the action of the wind? Explain.

5. _____

_____

_____

CONCEPT 8:

Soil can and must be saved through proper use and management.

OBJECTIVES:

1. Through the use of a resource person--local county agent--the students will be exposed to the different methods of cultivation used by area farmers to help prevent soil erosion. From this the students will discuss the various practices and each student will illustrate these practices on a chart.

2. Given two pans with mounds of soil (one an example of straight row plowing, the other an example of contour plowing), the students will demonstrate that contour plowing is a method of soil erosion prevention.

3. The students will work a crossword puzzle using terms and vocabulary words from this unit, and will achieve at least 85% mastery.

ACTIVITIES:

1. Obtain the services of the local county agent to expose the students to the different methods of soil cultivation used by area farmers to help prevent soil erosion. Then hold a class discussion on the various practices. As a culminating activity have each student prepare a chart illustrating these practices.

2. In a laboratory experiment, the students will demonstrate the effectiveness of contour plowing over straight row plowing as a method of soil erosion prevention on sloping surfaces. (See Student Worksheet.)

3. The following audio visual material might be used by the teacher to further expand the concept: *Conserving Our Soil Today* (film), *To Save Our Land* (slide talk), *Soils and Soil Conservation* (sound filmstrip).

4. Have the students work the corssword puzzle on soil. (See Crossword Puzzle.)

STUDENT WORKSHEET

To Accompany: Concept 8, Activity 2

SOIL

TASK:

Demonstrate contour plowing as a method of preventing soil erosion.

MATERIALS:

2 large round dishpans
Sharpened pencil
2 sprinklers
Soil

PROCEDURE:

1. Place a mound of soil in the middle of each large dishpan.
2. With the sharpened pencil, make furrows up and down on the mound in one dishpan. Label this pan *A*.
3. With the sharpened pencil, make furrows circling the other mound. Label this pan *B*.
4. Sprinkle an equal amount of water over both mounds and observe.

RESULTS:

Compare your results by filling the chart provided.

METHOD	FLOW OF WATER AS IT WAS POURED ON MOUND	APPEARANCE OF MOUND AS WATER WAS POURED	APPEARANCE & CONTENTS OF EACH PAN
Straight Row Plowing			
Contour Plowing			

2. What can you conclude about the effects of each type of plowing on the soil?

2a. *Straight Row Plowing:*_____

b. *Contour Plowing:*_____

3. Which type of plowing should a farmer use?

3._____

4. Why did you make the choice you made in No. 3?

4._____

CROSSWORD PUZZLE

To Accompany: Concept 8, Activity 4

SOIL

ACROSS

1. Soil which is rich is said to be _____.
2. On a slope it is advised to use the _____ plowing technique.
5. The erosion of river banks and beds by the action of a moving river is referred to as _____ erosion.
7. If a soil is acidic, it will turn litmus paper this color in a soil pH test.
8. Soil with varying proportions of clay, silt, and sand.
9. An important characteristic of soil is its ability to _____ water.
10. This term refers to a soil which has been stripped of its fertility.
13. A type of erosion characterized by small rills in the ground.
15. This is used to hold soil together.
18. An erosive agent which blows away valuable topsoil.

DOWN

1. Cultivated land allowed to lie idle during the growing season.
2. Erosion by soil concentrated in a drainage area.
3. The fertile upper layer of the soil. (plural)
4. A major type of soil characterized by large particle size.
6. To cultivate the land is to _____.
11. Water from precipitation which flows over the surface of the land.
12. If soil is basic it will turn litmus _____ in a soil pH test.
14. An indicator which is used to test acidity and alkalinity.
16. A small particle
17. The removal of soil by water flowing over a soil bank.
18. The wearing away of rock by factors of weather.

19. This type of erosion results in the uniform removal of soil from an area in thin layers.

21. We use _____ plants inside our homes and classrooms

25. That soil type whose particles are smallest inside.

27. A term which refers to the preparation of soil for planting.

28. The major eroding factor.

29. The layer of soil below the topsoil.

30. The wearing away of soil.

19. Loam is a combination of sand, clay, and _____.

20. Three factors determine the amount of erosion caused by running water: nature of the earth's surface, the speed, and the _____ of the stream.

22. Alternating of crops in a field.

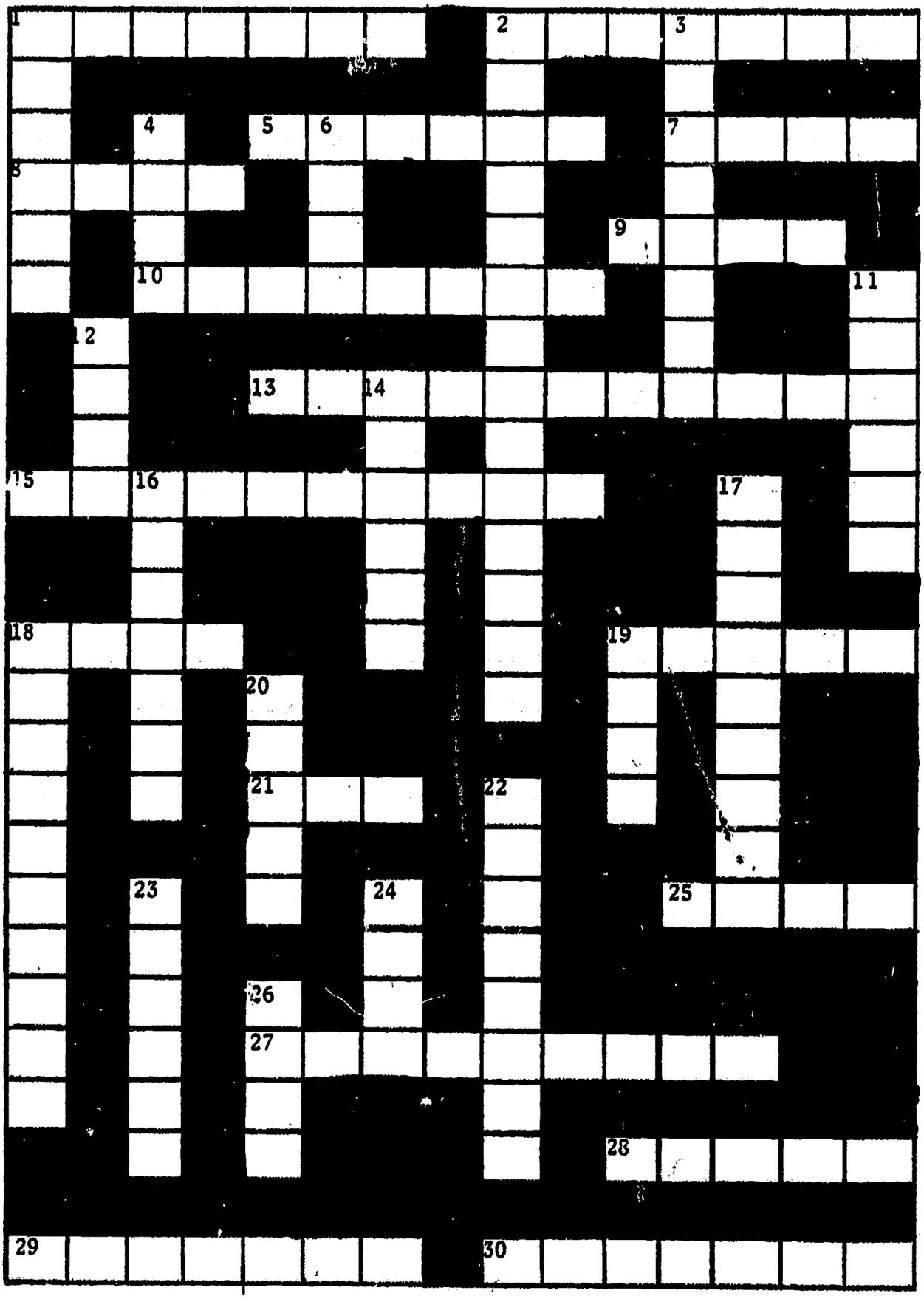
23. Erosion caused by raindrops.

24. The outer layer of the earth's crust.

26. In farming, the land is measured in arpents and _____.(singular)

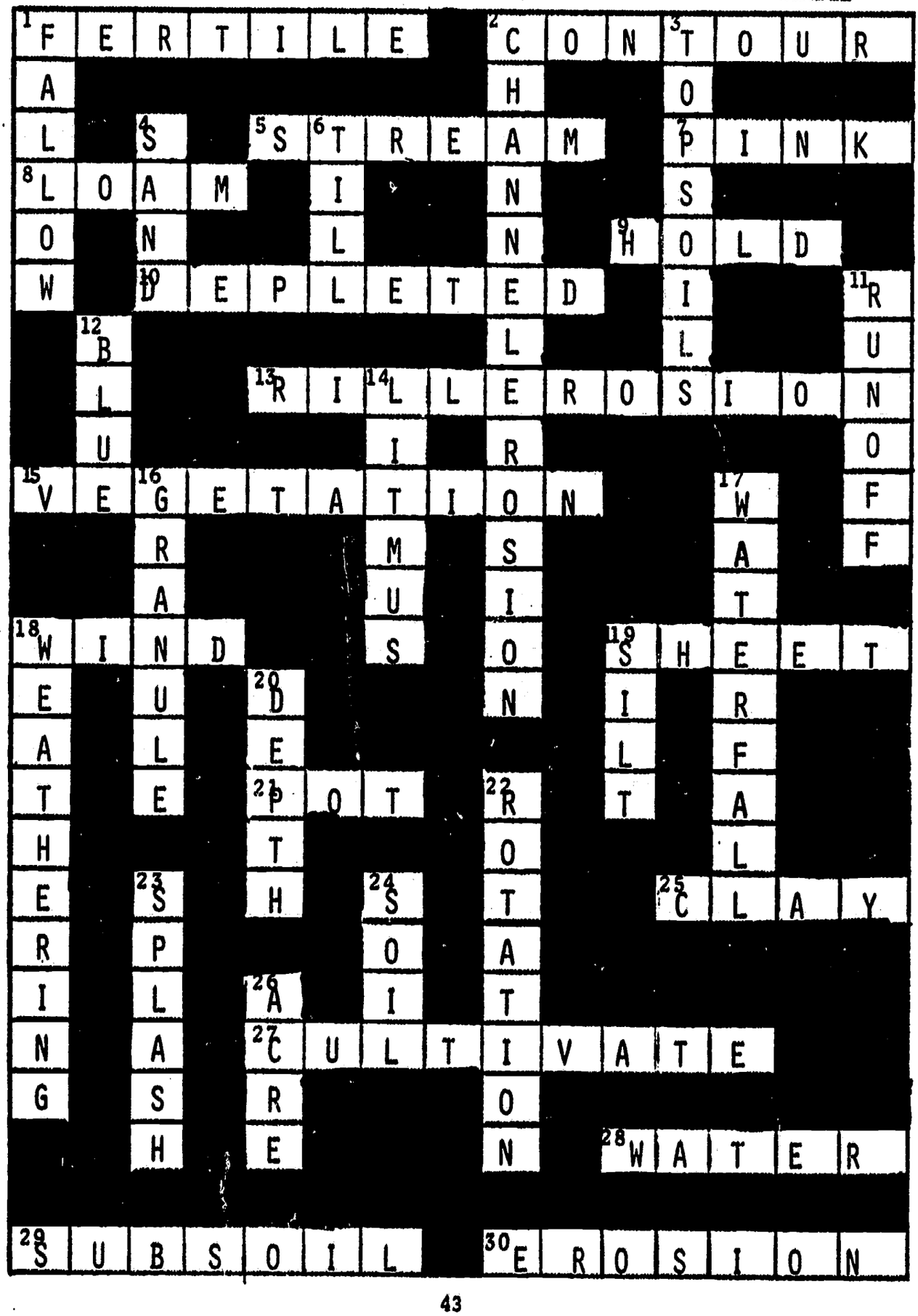
CROSSWORD PUZZLE

To Accompany: Concept 8, Activity 4



CROSSWORD PUZZLE

To Accompany: Concept 8, Activity 4



CONCEPT 9:

Soil conservation and water conservation cannot be separated as two individual practices; they go hand-in-hand.

OBJECTIVES:

1. With the aid of the filmstrip *Soil and Water Conservation*, the students will discuss why soil and water conservation practices are so closely related. Performance level to be determined by the teacher.

2. Given two samples of each of the following: fresh unpolluted water, polluted water, good soil, and poor leached soil, the students will plant seeds in six different conditions--good soil and fresh water; good soil and polluted water; good soil and no water; leached soil and fresh water; leached soil and polluted water; and leached soil and no water. This will help the students to illustrate that for the best plant growth, good soil and fresh unpolluted water are both determining factors. Performance level to be determined by the teacher.

3. Through the above, and further research, the students will compose a paragraph on the relationship between soil and water conservation. Performance level to be determined by the teacher.

4. After all research and activities have been performed, the students will construct a model farm using clay, paper, cardboard, etc. to illustrate the practices of soil and water conservation he has learned. Performance level to be determined by the teacher.

ACTIVITIES:

1. Show the filmstrip *Soil and Water Conservation* to the class; then have the students hold a class discussion on why soil and water conservation practices are so closely related.

2. In a laboratory experiment, the students will demonstrate the fact that for the best plant growth, good soil and fresh unpolluted water are both determining factors.
(See Student Worksheet.)

3. Through the above activities and further research, the students will compose a paragraph on the relationship between soil and water conservation.

4. After all research and activities have been performed, the students as a group will construct a model farm to illustrate the practices of soil and water conservation they have learned. Directions for the construction may be found in the pamphlet Teaching Soil and Water Conservation, Pages 28-29, U. S. Department of Agriculture.

5. As a culminating activity for the unit, the students will participate in a game, "The Farm."

   (See "The Farm" game and rules.)

STUDENT WORKSHEET

To Accompany: Concept 9, Activity 2

SOIL

TASK:

Determine whether or not soil and water are determing factors in good plant growth.

MATERIALS:

Soil sample of good, fertile soil
Soil sample of poor, leached soil
Water sample of clean, fresh water
Water sample of polluted water
6 flower pots
12 lima bean seeds

PROCEDURE:

1. Label three of the flower pots *A*, *B*, and *C*. In these pots, put some of the good soil.

2. Label the remaining three flower pots *D*, *E*, and *F*. In these pots, put the poor, leached soil.

3. Plant two bean seeds in each of the pots about one inch below the surface of the soil.

4. Water plant *A* with fresh, clean water. Do the same to plant *D*.

5. Water plant *B* with the polluted water. Do the same to plant *E*.

6. Do not water plants *C* and *F*.

7. Allow the seeds to germinate by placing them in a nice warm place where they can get plenty of sunshine.

8. Water plants *A* and *D* with fresh clean water daily.

9. Water plants *B* and *E* with polluted water daily.

10. Never water plants *C* and *F*.

11. Observe the plant growth daily and record.

NOTE: You may wish to replace the bean seeds with already gorwing young plants. Simply transplant them into the different situations.

RESULTS:

1. Did all of the plants grow? If not, which ones? 1._____

2. Which of the soil and water combinations produced the best plant? Explain. 2._____

3. In your own words, what effect does polluted water have on plant growth? 3._____

4. In your opinion, what effect does poor soil have on plant growth? 4._____

5. From your observations, would you conclude that plants need water in order to grow properly? 5._____

6. Is there such a thing as soil-less gardening? If so, what is it called, and how does it work? 6._____

7. If you were a farmer and wanted to insure a good crop, what would you do to help your crop?

7. _____

_____

_____

_____

_____

RULES

"THE FARM"

To Accompany: Concept 9, Activity 5

SOIL

1. Each player chooses a marker (red, blue, green, or yellow). Each player places his marker on the appropriate START block for his color. If markers are not readily available, players might make their own in the color they have chosen.

2. To determine who is to play first, each participant will choose a card from the deck, and the player with the highest ADVANCE number will be first. Second, third and fourth players will be those players who sit, in order, clockwise from the first player.

3. A referee shall be appointed, and his duties are to choose and read cards for each player.

4. To begin play, the referee chooses a card for the first player, reads the practice or problem and asks the player if he should ADVANCE or BACK UP . (If the situation is a practice of conservative value, the player should indicate ADVANCE. If the situation is a problem or a poor practice, the player should indicate BACK UP.)

5. Movement of a player's marker will be as follows:

   a. If the referee pulls a card indicating ADVANCE and the player makes the correct response, he then moves his marker forward the indicated number of spaces.

   b. If the player makes an incorrect response for an ADVANCE card, he is not allowed to move his marker.

   c. If the referee pulls a card indicating BACK UP, and the player makes a correct response, his marker remains in place.

   d. If the player makes an incorrect response for a BACK UP card, he moves his marker backwards the indicated number of spaces.

   NOTE: ADVANCE movement is indicated by the arrows on the playing board.

6. If, in moving, a player lands on the same block with another player, the first player on the block must return to his START.

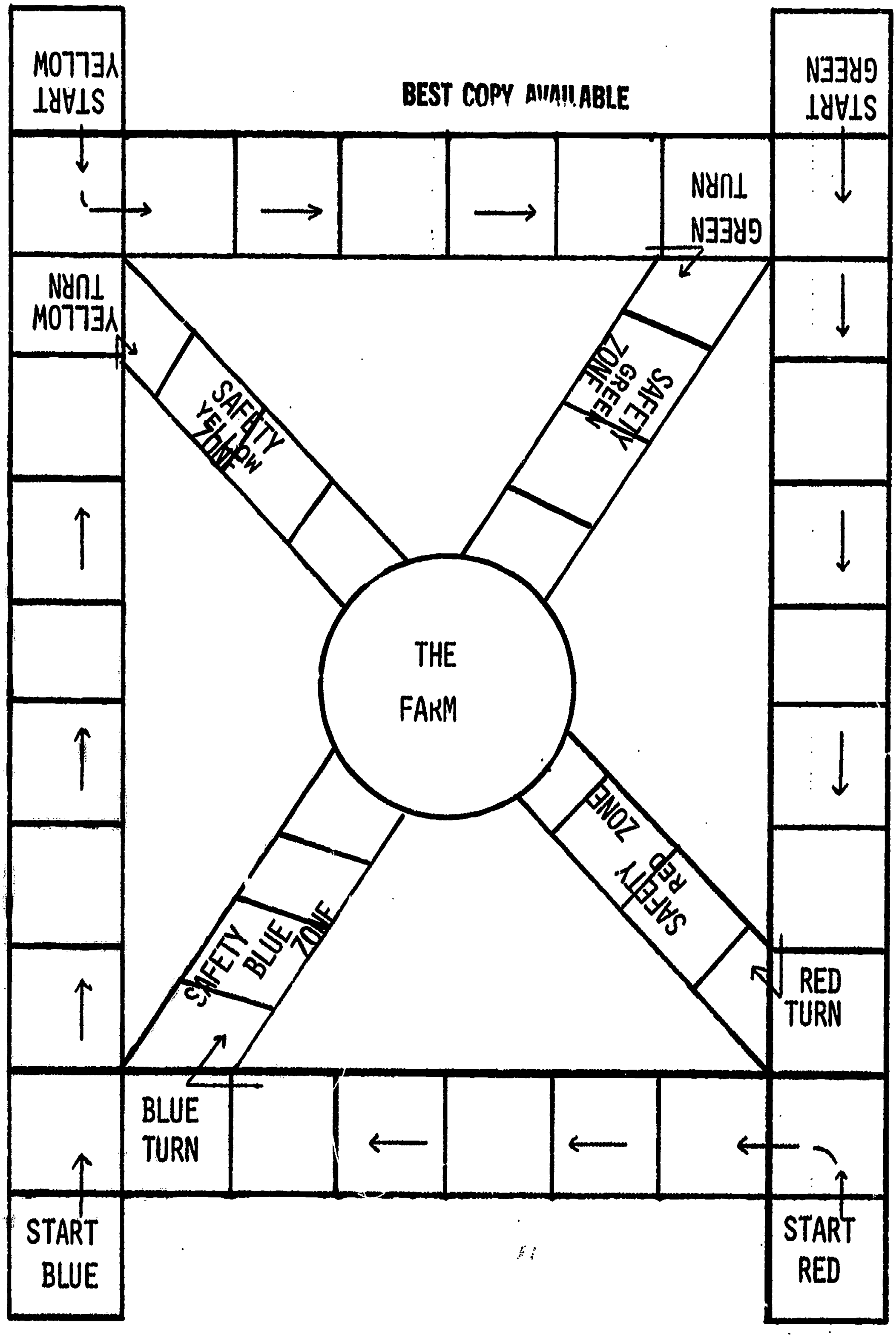
7. The object of the game is to move completely around the playing board into the player's respective SAFETY ZONE and to THE FARM. A player enters his SAFETY ZONE from his TURN block. In order to get into THE FARM, the ADVANCE movement must be of the exact number of spaces necessary for a player to enter. If the ADVANCE number is too large, the player simply forfeits his turn.

8. As long as a player is in his SAFETY ZONE, he cannot be sent back to his START. However, if a player makes an incorrect response to a BACK UP card, he must move back the indicated number of spaces even if this moves him out of the SAFETY ZONE.

9. The first player to reach THE FARM is the winner, and the game is complete when all players reach THE FARM.

10. If additional games are to be played, the winner becomes the referee for the following game and the referee becomes a player.

NOTE: After the players have become familiar with and/or have mastered the correct responses, the referee may be eliminated, and each player will draw his own card and follow the directions as indicated.



FARMER USES CONTOUR PLOWING ON SLOPES. ADVANCE 5	FARMER USES STRAIGHT-ROW PLOWING ON SLOPES. BACK UP 5	SOIL TEST IS REQUIRED BEFORE PLANTING. SKIP YOUR NEXT TURN	WIND BLOWS AWAY VALUABLE TOPSOIL. GO BACK 3
STREAM OVERFLOWS, SOIL IS BADLY ERODED. BACK UP 2	UNCHECKED SHEET EROSION IN THE FIELDS. GO BACK 4	RILLS ARE NOT CHECKED, THEY DEVELOP INTO GULLIES. GO BACK 6	SOIL CONSERVATION IS PRACTICED ON THE FARM. ADVANCE 6
SWIFT FLOWING STREAM CAUSES EXTENSIVE EROSION. GO BACK 1	VEGETATION IS PLANTED ALONG EDGE OF CANAL TO STOP EROSION. ADVANCE 4	AN EXTENSIVE RAINFALL CAUSES SPLASH EROSION DAMAGE TO A TILLED FILED. GO BACK 2	FARMER PLANTS A HEDGE ROW. WIND EROSION IS RETARDED. ADVANCE 3
COVER CROPS ARE PLANTED IN OPEN FIELD TO SLOW FORCES OF EROSION. ADVANCE 2	FIELD FLOODS DUE TO IMPROPER DRAINAGE. GO BACK 1	NO CROP ROTATION. SOIL IS DEPLETED. GO BACK 3	SOIL HAS TOO MUCH CLAY, WILL NOT HOLD WATER. GO BACK 4

TOPSOIL IS STRIPPED BY STRONG WINDS; LAND IS UN-FERTILE. GO BACK 5	GOOD SOIL AND WATER CONSER-VATION PRACTICES ARE USED. ADVANCE 6	IRRIGATION IS USED WHERE THERE IS LITTLE RAIN. ADVANCE 5	DROUGHT COMES, AND NO IRRIGATION IS USED. GO BACK 6
SOIL IS TOO ACID. NOTHING IS DONE; CROPS ARE RUINED. GO BACK 3	SOIL IS TOO ACID; LIME IS ADDED. ADVANCE 4	SOIL IS TESTED; PROPER FERTILIZ-ERS ARE USED. ADVANCE 2 DRAW ANOTHER CARD.	TERRACING IS USED ON LAND WITH STEEP SLOPES. ADVANCE 3
FARMERS MEET WITH COUNTY AGENT TO LEARN SOIL CONSERVA-TION TECHNIQUES. ADVANCE 3	CROP ROTATION IS USED TO KEEP THE SOIL FERTILE. ADVANCE 1	PROPER DRAINAGE KEEPS FIELD FROM FLOODING DURING HEAVY RAINS. ADVANCE 2	NO VEGETATION ALLOWS RILLS TO DEVELOP AFTER HEAVY RAINS. GO BACK 2
TOPSOIL WASHES INTO STREAM; CAUSES SEDIMENT BUILD-UP. GO BACK 1	SOIL HAS PROPER AMOUNTS OF CLAY, SILT & SAND FOR WATER HOLDING & AERATION. ADVANCE 1	SOIL IS TESTED, PROPER FERTILIZ-ERS ARE USED. ADVANCE 2 DRAW ANOTHER CARD	SOIL TEST IS REQUIRED BEFORE PLANTING. SKIP YOUR NEXT TURN

STUDENTS QUESTIONS

To Accompany: Unit 2, Soil

1. What is meant by the term *soil conservation*?
2. Why is soil conservation important in your area?
3. Why should conservation practices in other parts of the country be of any concern to you and people in your area?
4. What is meant by the term *erosion*?
5. What are some of the forces of erosion?
6. What are the types of soil erosion caused by water?
7. What are methods used to combat this type of erosion?
8. What is the common bond which holds the types of water erosion together?
9. How does wind erosion affect the environment?
10. How does wind erosion affect man?
11. How might the land be protected against the forces of wind erosion?
12. Who is a *conservationist*?
13. List some of the practices which can be used to make the land more productive.
14. List some of the characteristics of soil.
15. What are some ways in which one might test soil to determine whether it is acid, basic or neutral?
16. Which layer of soil is the best suited for plant growth?
17. What determines the amount of water the soil can hold?
18. What color of topsoil is most common in your area?
19. What does fertilizer do for the soil?
20. What is the most common method of farming in your area? Does it serve to restrict soil depletion?

21. Is irrigation used extensively in your area? Explain.

22. How does the population explosion affect land usage?

23. What type of soil holds the most water?

VOCABULARY
UNIT 2, SOIL

CHANNEL EROSION

CONSERVATIONIST

CONTOUR PLOWING

CROP ROTATION

CULTIVATION

DEPLETED

EROSION

FALLOW

GRANULES

GULLY EROSION

LOAM

NUTRITIONAL VALUE

RILL EROSION

RUNOFF

SHEET EROSION

SOIL BLOWING

SOIL CONSERVATION

SPLASH EROSION

STREAM EROSION

STRIP CORPPING

SUBSOIL

TERRACING

TOPSOIL

VEGETATION

WATERFALL EROSION

WEATHERING

WIND EROSION

RESOURCE MATERIALS

FILMS:

Conserving Our Soil Today, b/w, 11 min.--St. Martin Parish Instructional Center, Breaux Bridge

The Story of Soil, color, 11 min.--University of Southwestern Louisiana, Lafayette

FILMSTRIPS:

Soil and Water Conservation, Science Filmstrips Set 5-A--St. Martin Parish Instructional Center, Breaux Bridge

Soil for Us, Science Filmstrips Set 7-A--St. Martin Parish Instructional Center

Soils and Soil Conservation, Parts I & II, Louisiana Social Studies (Sound Filmstrip)--St. Martin Parish Instructional Center

SLIDES:

To Save Our Land, Slide Talk--St. Martin Parish Instructional Center

The Story of Our Land, Slide Talk--St. Martin Parish Instructional Center

TRANSPARENCIES:

Elementary Science - 2000: A Total Involvement Program. Soil 2010--St. Martin Parish Instructional Center

Major Land Resource Areas of Louisiana, Louisiana Social Studies--Conservation Resources--St. Martin Parish Instructional Center

Soil Conservation, Earth Science for Middle Grades--St. Martin Parish Instructional Center

BOOKS, BOOKLETS AND PAMPHLETS:

"A B C's of Soil, The". Alexandria: U.S.D.A. Soil Conservation Service, March 1971.

Brennan, Mathew J. *People and Their Enviornment* (Grades 4, 5, 6). Chicago: J. G. Ferguson Publishing Co., 1968.

_____. *People and Their Environment* (Outdoor Laboratory 1-12). Chicago: J. G. Ferguson Publishing Co., 1968.

"Free and Inexpensive Materials for Teaching Conservation: Soils and Water". Alexandria: USDA Soil Conservation Service.

Mallinson, George, J. B. Mallinson, D. G. Brown, and W. L. Smallwood. *Science--Understanding Your Environment* (Level Six). Morristown, New Jersey: Silver Burdett Co., 1972.

"Outdoor Classrooms on School Sites". Alexandria: USDA Soil Conservation Service, January 1972.

Schneider, Herman and Nina. *Science for Today and Tomorrow* (Grade 6). Lexington, Mass.: D. C. Heath and Co., 1968.

"Soil Conservation at Home". Alexandria: USDA Soil Conservation Service, 1963.

"Soil and Water Conservation in Louisiana". Alexandria: USDA Soil Conservation Service, April 1971.

"Soil That Went to Town, The." Alexandria: USDA Soil Conservation Service, 1966.

"Teaching Soil and Water Conservation". Alexandria: USDA Soil Conservation Service, 1964.

UNIT 3
AIR

UNIT 3 AIR

Since earliest times, man has been polluting the air. Each time that he kindles a fire to cook, to light a cigarette or to provide energy or heat, or even when he breathes, he is adding pollutants to the air. Not long ago, a smoking factory chimney was a symbol of growing prosperity. Today, not only does it indicate progress, it is also a dangerous source of air pollution. The same wheels which keep civilization on the move are threatening it by pouring millions of tons of pollutants into the air daily. Man, with his increased population and technology, has come close to destroying the air so essential to his life.

Air is necessary for all plant and animal existence. Man might live as long as a month without food, more than a week without water, but without air he could survive only a matter of minutes. The blanket of air surrounding the earth and supporting life is in danger. If man is not careful, he may alter it beyond repair.

Pure clean air is a mixture of the odorless, tasteless, and colorless gases nitrogen, oxygen, argon, and carbon dioxide. Nitrogen, which composes approximately 78 percent of the air, was once thought to be foul air. Later scientists learned that it was needed for plant, as well as animal, growth. Oxygen, though it makes up a little more than 20 percent of the air, is needed by man and other animals in order to survive. Unlike nitrogen, oxygen is an active element, readily combining with other elements to form such compounds as water, rust, carbon dioxide, and stainless steel. This decrease in oxygen, because of its many uses, presents a problem. If oxygen is not replaced as it is used, it could become nonexistent within a thousand years. Argon, also present in the air, makes up less than one percent of it. It is very inactive and is used to fill light bulbs since it will not react with hot wires. The gas of the smallest proportion in the air, less than one-tenth of one percent, is carbon dioxide. In spite of this, it ranks with oxygen in importance because it is used by green plants for photosynthesis, which in turn helps to support life. However, carbon dioxide in the air also presents a problem. Not only does man add carbon dioxide to the air by exhaling it; factories and industries which use coal, oil or gas release tons of it annually. When the carbon dioxide content in the air is high, it acts like a blanket, absorbing the heat from the ground. This causes the atmosphere to become warmer. If the average temperature is increased even very slightly, the effect might be disastrous; thick glaciers of the polar regions could begin to melt, thus causing the ocean level to rise. This, in turn, might flood entire cities and even states along the coastline of the earth.

Unfortuantely, the four permanent gases are not the only components of the air. Today air often has impurities, many of which are harmful to life on earth. It is this air to which we refer as *polluted*. Usually the amounts of these impurities, or pollutants, are small, but most of them are unwanted. The air can, to some degree, purify itself of dirt, dust, and smoke. Once we release more pollutants than the air can handle, we are no longer safe.

The problem of air pollution began when man learned to use fire. As time progressed, and man with it, so did pollution. The greatest cause of air pollution is exhaust from unburned fuel. At present 60.6 percent of air pollution comes from automobiles. The automatic heating systems which burn coal, oil, or gas also release poison gases into the air. Incineration and backyard trash burning have thrust millions of tons of waste material into the atmosphere. Industry, so important to progress, steadily emits soot and smoke into the air making it almost unbreatheable. Jet planes, which can encircle the world in a matter of hours, issue poisonous odor from jet fuel. Many chemical pesticides used by man to overcome plant and animal pests are also overcoming man himself. In addition to all of these sources of air pollution, and those not mentioned, there is one source which is probably the most dangerous and deadliest of all--*radiation*. Man knows very little about radiation, except that it causes genetic changes in all forms of life. Man knows that as the use of atomic energy increases, so will radioactive wastes. Man also realizes that these sources must be controlled if he is to continue in existence.

Air pollution is extremely harmful to all forms of life. It is also a corrosive factor to non-organic substances. People are aware of the visual effects of air pollution. These are seen daily in smoke, in our soot-soiled surroundings, in leaf damage, and in the rust and corrosion of metals. It is imperative, however, that mankind also become aware of the long term effects of this pollution. Air pollution makes breathing more difficult for people with asthma or certain types of allergies. It raises the incidence of lung cancer, emphysema, asthma, bronchitis, common colds, and tuberculosis. Foul air irritates the eyes and contributes to eye disease. Furthermore, smog obstructs visibility and increases traffic delays and accidents on our crowded city streets.

Air pollution can and must be greatly reduced; this can only be done by a concerned population. The knowledge of the causes and effects of air pollution lags years behind other sources of pollution because atmospheric research is relatively young. But something is being done; in 1967 Congress, seeing the dangers involved with air pollution, authorized $428 million to be spent for the study and control of this problem. Air pollution is not only a menace to health and safety, but it also indicates that man is wasting valuable non-renewable resources. It will take long and careful planning to repair the damage. It might take longer to devise ways to use the environment so that it will not be degraded, and so that life will continue to exist. Everyone contributes to air pollution; everyone suffers from its effects; and, only with the cooperation of everyone can it be combatted.

CONCEPT 1:

The earth is surrounded by a gaseous envelope called the *atmosphere*.

OBJECTIVE:

Provided with research materials, the students will identify the five layers of the atmosphere by constructing a scale model of the atmospheric layers. Upon completion of this activity, they shall have at least eighty percent mastery.

ACTIVITY:

The students will do research on the five layers of the atmosphere and construct a scale model of the atmospheric layers.

CONCEPT 2:

Air is composed of water vapor and about eighty percent nitrogen, twenty percent oxygen and traces of other gases such as argon and carbon dioxide.

OBJECTIVES:

1. Provided with research materials, the students will identify the permanent gases in the earth's atmosphere and will devise a bar graph to illustrate their findings. One hundred percent mastery shall be required in this activity.

2. Making use of an experiment, the students will demonstrate that there is less carbon dioxide found in the atmosphere than is found in exhaled air. Performance level to be determined by the teacher.

ACTIVITIES:

1. The students will do research on the permanent gases in the earth's atmosphere and will devise a bar graph to illustrate their findings.

2. Students will perform an experiment to demonstrate that there is less carbon dioxide found in the atmosphere than is found in exhaled air.
(See Student Worksheet.)

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 2

AIR

TASK:

Determine which contains less carbon dioxide: your breath or the atmosphere.

MATERIALS:

Limewater (200 ml)
Flask with two-hole stopper (500ml)
2 glass tubes (one 7½" long, the other 2½" long)

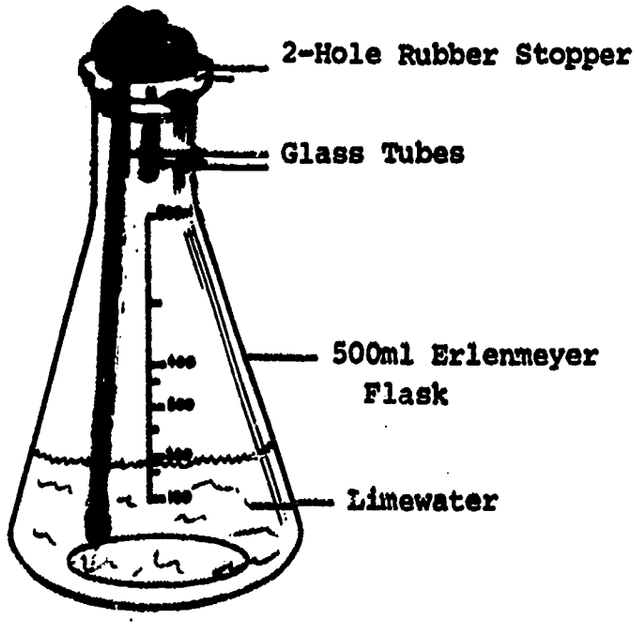
PROCEDURE: (See Illustration)

1. Put the glass tubes snuggly through the stopper, allowing 1" of the tubes to extend above the stopper.

2. Pour 200 ml of limewater into the flask (observe and record color). Put the stopper snuggly into the top of the flask.

3. Put your mouth on the short tube and suck air from the flask until approximately 25 bubbles of air pass through the limewater. Observe and record the color.

4. Put your mouth on the long tube and blow approximately 25 bubbles through the limewater. Observe and record the color.



CONCEPT 3:

Oxygen is an active element; it readily combines with other elements and it supports burning.

OBJECTIVES:

1. In an experiment, the students will demonstrate one of the ways in which oxygen combines with a mineral element in the presence of moisture. Performance level to be determined by the teacher.

2. Given a beaker in which the students will prepare oxygen and one in which they will prepare carbon dioxide, the students will determine which of the two supports burning.

3. Given four lighted candles, three of which will be in controlled amounts of air, the students will determine if air is necessary for burning.

ACTIVITIES:

1. In a laboratory experiment, the students will demonstrate one of the ways in which oxygen combines with a mineral element in the presence of moisture.
(See Student Worksheet.)

2. Through laboratory experiment, the students will determine whether a solution which yields oxygen or one which yields carbon dioxide will support burning.
(See Student Worksheet.)

3. The students will demonstrate whether or not air is necessary for burning in a laboratory experiment.
(See Student Worksheet.)

RESULTS:

1. What was the color of the limewater in Step 2? 1._____

2. What was the color of the limewater in Step 3? 2._____

3. What was the color of the limewater in Step 4? 3._____

4. Which caused the greater change in the color of lime-water: air in your breath or air in the flask (atmosphere)?

4. _____

5. Which contains less carbon dioxide: your breath or the atmosphere?

5. _____

6. In your own words, tell how the balance of nature is maintained even though there are unequal amounts of carbon dioxide in the atmosphere and in your breath.

_____

_____

_____

_____

_____

NOTE: The more limewater changes in color, the more carbon dioxide is present.

STUDENT WORKSHEET

To Accompany: Concept 3, Activity 1

AIR

TASK:

Determine what happens when oxygen in the air combines with iron in the presence of moisture.

MATERIALS:

2 clear quart size bottles (suggest use of wine bottles)
Iron filings (2 teaspoons)
2 medium-size balloons
Water at room temperature (if experiment is conducted during winter, warm water to appropriate temperature.)

Thermometer
Teaspoon and measuring cup

PROCEDURE:

1. Using the thermometer, check air temperature, adjust water temperature to equal air temperature.

2. Pour two cups of water into each of the bottles and swirl the water around in the bottles. When the inside of each bottle is damp, pour out excess water.

3. Drop two teaspoons of iron filings into one bottle and shake it to spread the filings throughout the inside of the bottle. Stretch the mouth of a balloon over the mouth of this bottle and label this bottle *A*.

4. Stretch the mouth of the other balloon over the mouth of the second bottle and label this bottle *B*.

5. Observe the balloons and iron filings on the next day and record your observations.

RESULTS:

1. What happened to balloon *A*? 1. _____

2. What happened to balloon *B*? 2. _____

3. Explain in your own words why this happened? 3. _____

4. What happened to the iron filings in bottle *A*? 4. _____

5. What might have happened if moisture had not been present? 5. _____

6. In your own words, explain how this experiment relates to the air pollution problem.

_____

_____

_____

_____

STUDENT WORKSHEET

To Accompany: Concept 3, Activity 2

AIR

TASK:

Determine which gas is important for supporting combustion, oxygen or carbon dioxide.

MATERIALS:

2 clean 50 ml beakers (or baby food jars)
Medicine dropper
4 wooden splints (relatively long)
Matches
Tablespoon
3% hydrogen peroxide
Liquid chlorine bleach
Baking soda
Vinegar

PROCEDURE:

1. Prepare the oxygen by filling the beaker 1/4 full with the hydrogen peroxide; add a dropper full of chlorine bleach.

2. Light a wooden splint, then blow out the flame.

3. Hold the glowing splint in the beaker. Be careful not to touch the splint to the solution.

4. Observe what happens to the splint, then remove it.

5. Add another dropper full of chlorine bleach to the solution.

6. Repeat the splint procedure once again. Observe.

7. Prepare the carbon dioxide by placing a tablespoonful of baking soda into the remaining beaker and adding three tablespoonsful of vinegar.

RESULTS:

1. What happened when you dropped the glowing splint into the prepared oxygen? 1. _____

2. What would you conclude about oxygen and burning? 2. _____

3. What happened when you dropped the glowing splint into the prepared carbon dioxide? 3. _____

4. What would you conclude about carbon dioxide and burning? 4. _____

5. Is oxygen an active or inactive gas? 5. _____

6. Is carbon dioxide an active or inactive gas? 6. _____

7. For what purpose would you use carbon dioxide that you would not use oxygen? 7. _____

STUDENT WORKSHEET

To Accompany: Concept 3, Activity 3

AIR

TASK:

Determine if air is necessary for burning.

MATERIALS:

4 candles
Matches
Stop watch (or watch with a second hand)
3 jars (1 gallon jar; 1 quart jar; 1 pint jar) or 3 beakers (500 ml, 250 ml, and 100 ml)

PROCEDURE:

1. Label the four candles *A*, *B*, *C*, and *D*.
2. Light all four candles.
3. At the same time, place the largest jar over candle *B*, the medium size jar over candle *C*, and the smallest jar over candle *D*. This will require three students.
   NOTE: Candle *A* will not be covered.
4. As soon as all the jars are in place, begin timing.
5. Record the amount of time lapsed as each candle stops flaming.

RESULTS:

1. How much time lapsed before:
   a. Candle *A* went out? 1a._____
   b. Candle *B* went out? b._____
   c. Candle *C* went out? c._____
   d. Candle *D* went out? d._____

2. Considering the candles which were coverd, in what order did they go out?

2. _____

_____

_____

3. Why do you think they went out in this order?

3. _____

_____

4. How long did the uncovered candle burn? Explain.

4. _____

_____

5. What is in the air that allows the candles as well as other materials to burn?

5. _____

_____

CONCEPT 4:

Air is necessary for life.

OBJECTIVES:

1. Given two live green plants, one exposed to the air, and the other unexposed, the students will demonstrate whether or not air is necessary component of life on land.

2. Given two live aquatic plants, one exposed to air and the other unexposed, the students will demonstrate whether or not air is a necessary component of life in the sea.

3. Through research and reporting, the students will determine whether the lack of an atmosphere and the lack of life on the other planets of the solar system are coexistant. Performance level to be determined by the teacher.

ACTIVITIES:

1. In a laboratory experiment, the student will set up two live green potted plants having all conditions comparable, except the presence of air in the experimental plant. From this, they will determine what effect air has on life on land. Suggest experiment be set up on Thursday or Friday.
(See Student Worksheet.)

2. The students will set up two live aquatic plants, Elodea, having all conditions comparable, except the presence of air in the experimental plant, in a laboratory experiment. From the results of this experiment, they will demonstrate the effect air has on life in the sea. Suggest the experiment be set up on Thursday.
(See Student Worksheet.)

3. Through library research, the students will determine whether or not the lack of an atmosphere and the lack of life on other planets in our solar system are coexistant. The students may be divided into eight groups, each group making a report on a different planet.

STUDENT WORKSHEET

To Accompany: Concept 4, Activity 1

AIR

TASK:

Determine if air is necessary for life on land.

MATERIALS:

2 live potted plants (small)
Large jar or beaker (large enough to cover the plant)
Water

PROCEDURE:

1. Place the two potted plants on a window sill or a table where they will be exposed to sufficient sunlight.
2. Water both plants. Do not water again during the experiment.
3. Cover one of the plants with the jar so that no air can get inside.
4. Let the plants set for three days.
5. Observe and record your observations.

RESULTS:

1. After a three-day waiting period, describe the appearance of the covered (experimental) plant.

1. _____
_____
_____

2. What did the uncovered (control) plant look like at the end of the three-day waiting period?

2. _____
_____
_____

3. What would you conclude about the relationship between air and life on land?

3. _____

_____

_____

4. Why is it safe to assume that if all the green plants should die due to lack of carbon dioxide all life would be endangered?

4. _____

_____

_____

STUDENT WORKSHEET

To Accompany: Concept 4, Activity 2

AIR

TASK:

Determine if air is necessary for life in the sea.

MATERIALS:

2 live aquatic plants (Elodea)
2 test tubes
Test tube rack
Water
1 rubber test tube stopper

PROCEDURE:

1. Place the two live aquatic plants in the test tubes.
2. Fill the test tubes with water so that it covers the plant.
3. Place the test tubes in the test tube rack and put the rack on a table or window sill where it can get sufficient light to maintain plant growth.
4. Put the stopper in one of the test tubes; make sure it is on securely so that no air can get into the tube.
5. Let the plants set for three to five days.
6. Observe and record your observations.

RESULTS:

1. What did the stoppered (experimental) plant look like at the end of the waiting period?

1._____

_____

2. What did the unstoppered (control) plant look like at the end of the waiting period?

2. _____

_____

3. What would you conclude about the relationship between the air and life in the sea?

3. _____

_____

_____

4. What would happen to life in the oceans if we did not have air?

4. _____

_____

_____

5. What gas in the air does the aquatic plant need in order to survive?

5. _____

6. What effect do you think pollution might have on the availability of good clean air if it is not brought under control?

6. _____

_____

_____

CONCEPT 5:

The air contains many impurities (pollutants) as well as the permanent gases.

OBJECTIVES:

1. Through research and reporting, and in a laboratory experiment, the students will determine some of the impurities in the air, and how they affect the environment.

2. The students will view a film on air pollution and will be able to correctly identify by listing five sources of air pollution they viewed in the film.

ACTIVITIES:

1. Students, working in groups, will report on such concepts connected with air pollution as smog, greenhouse effect, thermal inversion, Cottrell process, and any other terms which may have been suggested by the teacher, students and/or audio visual aids.

2. In a laboratory experiment, the students will construct a particle collector. From this, they will be able to determine what some of the impurities in the air are and will indicate the possible sources of these impurities and the effects they might have on the environment.
(See Student Worksheet.)

3. Have the students view the film *Problems of Conservation -- Air.* As a culminating activity, a quiz might be given asking the students to identify at least five sources of air pollution viewed in the film; discuss effects of this pollution and suggest how it might be controlled.

STUDENT WORKSHEET

To Accompany: Concept 5, Activity 2

AIR

TASK:

Determine what kinds of pollutants might be found in the air in your area.

MATERIALS:

Masking tape or bumper sticker
1 Gallon jar

PROCEDURE:

1. Wrap the masking tape or bumper sticker, sticky side out, around the jar.

2. Place the jar out-of-doors in an open area.

3. Let the jar set in the area for several days, examining it each day. (Suggest the jar be prepared on Monday and set out; then on Tuesday, the first examination can be conducted, followed by similar examinations on Wednesday, Thursday, and Friday, culminating the investigation with the Friday examination.)

4. During the daily examinations, note the following: types of pollutants, the direction of the pollutants are coming from, the possible source(s) for the pollution.

5. Record the results of your daily examinations on the chart provided.

RESULTS:

1. What types of pollutants did you find on your particle collector?

1._____

_____

2. On which day was the heaviest pollution recorded? Is there an explanation for this?

2. _____

3. Were there more particles collected on one side of the collector than on any other side? If so, which direction was the side facing?

3. _____

4. What do you suspect as being the major source of the pollutants on your particle collector?

4. _____

5. Do you believe that this is a dangerous source of pollution?

5. _____

6. If the answer to No. 5 was *yes*, how might you, as a citizen, fight this source? If the answer was *no*, why is it not dangerous?

6. _____

7. During your daily examinations did you notice any other types of pollutants in the air that your collector did not catch? List.

7. _____

CHART FOR PARTICLE COLLECTOR

DAY	TYPES OF POLLUTANTS	DIRECTION FROM WHICH POLLUTANTS ARE COMING	POSSIBLE SOURCE(S) OF POLLUTANTS
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			

CONCEPT 6:

Air pollution is a part of man's total effect on his environment.

OBJECTIVES:

1. Given the following terms: *no noticeable pollution, medium pollution,* and *heavy pollution,* the students will rate the air quality daily for a period of three weeks. Performance level to be determined by the teacher.

2. Given a daily air pollution index from the radio or newspaper, the students will plot the daily figures on a graph for a period of three weeks. If an overall indication of various pollutants is available, construct a graph for the various types as well. Include the danger level of each pollutant on the graph.

ACTIVITIES:

1. If the school is in a city, let the students try to evaluate the daily air quality. Rate the air as follows: *No Noticeable Pollution, Medium Pollution,* or *Heavy Pollution.* Record the results on a chart for a period of several weeks.

2. If there is an air pollution index available, or if the local newspaper gives air pollution figures, have the students plot the daily figures for a period of three weeks. If both are available, make two graphs. On the graph for the various pollutants include the danger level for each pollutant, if available.

CONCEPT 7:

Factories and motor vehicles are two main causes of air pollution.

OBJECTIVES:

1. Given the following material to burn: cotton, cotton soaked in turpentine, wool cloth, and styrofoam, the student will describe the products of the burning of each according to color, odor, state of matter, and what remains after burning. Performance level to be determined by the teacher.

2. Given the number of registered automobiles in the years 1930, 1940, 1950, 1960 and 1970, the student will construct a bar graph illustrating how the number of automobiles has increased over the years (in millions). From this, the student will write a short essay on how the increase in the number of automobiles and the increase in air pollution might be related.

ACTIVITITES:

1. The teacher will demonstrate the burning of cotton, cotton soaked in turpentine, wool cloth, and styrofoam and the students will demonstrate the products of burning as to color, odor, state of matter, and what remains after burning. (See Student Worksheet.)

2. Have the students look up the number of registered automobiles for the years 1930, 1940, 1950, 1960, and 1970. Have them construct a bar graph to illustrate the increase, in millions, over the years. From this information, have the students compose a short essay on how the increase in the number of automobiles and increase in pollution might be related.

STUDENT WORKSHEET

To Accompany: Concept 7, Activity 1

AIR

TASK:

To study the burning of flammable materials.

MATERIALS:

1 book of safety matches
1 600 ml beaker or large jar
4 small lids (from a baby food jar)
2 small wads of cotton
1 small piece of wool cloth
1 small piece of styrofoam
2 sheets of notebook paper, each cut in half
1 dropper bottle of turpentine

PROCEDURE:

1. Place a small wad of cotton in the center of a lid. Place the lid on a clean sheet of notebook paper. Label the paper *cotton*. Light the cotton and invert the 600 ml beaker or jar over the lid.

2. If the flame begins to die before the cotton is burned, lift the beaker slightly to let more air into the beaker. Then replace the beaker. Observe the beaker and its contents for two minutes after the flame goes out.

3. Record your observations on the chart provided. (See No. 1 in RESULTS.

4. Put two drops of turpentine on a fresh wad of cotton in the center of a lid. Place the lid on a clean sheet of notebook paper and label it *turpentine*. Repeat the procedure, following Steps 1, 2 and 3 above.

5. Following Steps 1, 2 and 3, repeat the procedure for wool cloth and for styrofoam.

RESULTS:

1. When describing the products of burning, include the following: color, odor, state of matter, and appearance of whatever remains after burning.

MATERIALS BURNED	CHARACTERISTICS OF BURNED MATERIAL
Cotton	a. b. c. d.
Turpentine	a. b. c. d.
Wool Cloth	a. b. c. d.
Styrofoam	a. b. c. d.

2. On the basis of your observations, which materials do you think would produce the most air pollution when burned? Explain. 2._____

3. Which emitted the worst odor? 3._____

4. Which of the above melted? 4._____

5. Which of the above burned fastest? 5._____

CONCEPT 8:

Air pollution can and must be reduced.

OBJECTIVES:

1. Having viewed the film *To Clear the Air*, the students will be able to identify correctly three causes of air pollution and at least four ways in which man is attempting to overcome it.

2. Through library research and reporting on acts governing the attempted control of air pollution, students will be able to list and explain at least three of these acts.

3. Through class discussion on anti-pollution devices for automotive vehicles, home and industry, the students will be able to write a paragraph according to criteria established in class, on the use of these devices and their importance to the future and welfare of their city, state and nation.

ACTIVITIES:

1. The students will view the film *To Clear the Air*. This film explains the causes of air pollution and what is being done about it. As a culminating activity to the film viewing, the students will be asked to list, from memory, three of the causes and at least four of the attempts of control illustrated by the film.

2. The students will conduct library research on the present acts governing the attempted control of air pollution. From this research, they will be able to list and explain at least three of these acts.

3. The class will hold a discussion on the different anti-pollution devices available today for home, automotive vehicle, and industry. The teacher may assign research prior to the discussion. From the discussion the students will write a paragraph on the use of these devices and their importance to the future and welfare of the city, state and nation.

Suggested Questions To Accompany: UNIT 3, AIR

1. List the main sources of air pollution.
2. What is the term which refers to materials that can be burned?
3. Which of the following types of environment contributes most to air pollution: *suburban community, urban community, rural community*?
4. List the natural forces that reduce air pollution.
5. What are some harmful effects of air pollution?
6. Which of the respiratory diseases are related to air pollution?
7. How might you as a citizen help reduce air pollution?
8. List the different forms of air pollution in your area.
9. What steps have been taken by the automobile industry to reduce air pollution?
10. What are the major pollutants of air?
11. List the elements in air necessary for animal and plant survival.
12. List the four permanent gases found in the air.
13. Which of the four permanent gases found in the air support burning?
14. What do we call the gaseous envelope which surrounds the earth?
15. Which contains more carbon dioxide, the air or your breath?'
16. What effect would a lack of air have on life on the land?
17. What effect would the lack of air have on life in the sea?
18. What are some of the acts attempting to control air pollution which have been passed by our government?
19. What are some of the anti-pollution devices now available?
20. Of what use and importance are these anti-pollution devices to your city, state and nation?

VOCABULARY

UNIT 3, AIR

ACTIVE ELEMENT

AIR POLLUTION

ATMOSPHERE

ATOMIC ENERGY

COMPOUNDS

CORROSIVE

ENVIRONMENT

EXHAUST

FLAMMABLE

IMPURITIES

INCINERATION

NON-RENEWABLE RESOURCES

PESTICIDES

PHOTOSYNTHESIS

POLLUTANTS

PROSPERITY

RADIATION

RADIOACTIVE WASTE

RENEWABLE NATURAL RESOURCE

SMOG

SOOT

TECHNOLOGY

URBAN ENVIRONMENT

RESOURCE MATERIALS

FILMS:

How Air Helps Us, color, 11 min.--St. Martin Parish Instructional Center, Breaux Bridge

Problems of Conservation -- Air, color, 15 min.--St. Martin Parish Instructional Center

Simple Demonstrations with Air, color, 11 min.--USL Film Library, Lafayette

To Clear the Air, color, 22 min.--Mid-Continent Oil and Gas Company, 519 Fidelity National Bank Building, Baton Rouge, LA 70801. Available free of charge.

TRANSPARENCIES:

The Air We Breathe--St. Martin Parish Instructional Center

BOOKS, BOOKLETS AND PAMPHLETS:

Brennan, Matthew J. *People and Their Environment* (Grades 4,5,6). Chicago: J. G. Ferguson Publishing Co., 1968.

_____. *People and Their Environment* (1-12 Outdoor Laboratory), Chicago: J. G. Ferguson Publishing Co., 1968.

Mallinson, George, J. B. Mallinson, D. G. Brown and W. L. Smallwood. *Science--Understanding Your Environment* (Level 6). Morristown, New Jersey: Silver Burdett Co., 1972.

Schneider, Herman and Nina. *Science for Today and Tomorrow* (Grade 6). Lexington, Mass.: D. C. Heath and Co., 1968.

UNIT 4
WATER

UNIT 4 WATER

Three-quarters of the earth's surface is covered by water. This liquid part of the earth is called the *hydrosphere*. The earth's hydrosphere is composed of lakes, rivers, streams, groundwater, and the oceans. Although precipitation is the primary source of all water found on or under the earth, sea water and water found on land are strikingly different. Sea water is salty, or saline. As a result, though most water is found in the oceans, it is not fit to drink as it is.

Since there are no natural divisions, all of the oceans are part of one gigantic sea. This sea harbors many valuable resources. Among these resources are a vast amount of minerals, plants, and animals useful to man in many ways. Plants living in the oceans depend on chemicals present for life. Animals found in these same waters are dependent upon plants and other animals for their existence. Microscopic plants, *phytoplankton*, also need light penetration for growth. The *zooplankton*, or microscopic animals, use the tiny plants for food, while they in turn are the food of larger animals.

These many forms of sea life, however, may be in danger from pollution. Sewage and industrial waste are being poured into our waterways and move out to sea. This will begin to hamper the plant growth, which will decrease the amount of food available for all animals, large and small.

As the sea is a source of foods and other valuable products, the inland waterways are a source of fresh water suitable for man's use and consumption. There are a variety of fresh water sources, such as: lakes, rivers, streams, and underground reserves. However, there are also a number of problems involved, including: not enough water for long periods of time--*drought*; too much water at one time--*floods*; and pollution of water.

Surface water, water from lakes, rivers and streams, may be kept in check by dams. This holds back flood waters, and keeps the water for a time of need. Man also uses dammed-up water as a source of electric power. In addition to dams, levees also help in times of high water. Levees may be either natural or manmade. They are simply river banks built high above the surface of the river to check overflow.

Though there are many areas of surface water, a major source of drinking water is ground water. Underground reservoirs are formed when rain seeps in the porous rock of land area and settles above the nonporous rock layer. As the water builds up, the topmost layer of water is called the *water table*. Depending on the area, the water table will be anywhere from high, sometimes very close to the surface as in a swamp, to extremely low, such as in a desert. In areas where the soil has a good combination of clay, sand and gravel, and the rainfall is plentiful, man has a good source of fresh water.

Before man can use ground water, he must first get it to the surface, then purify it. In order to get the water to the surface, man uses wells. A *water well* is simply a hole dug down into the ground until the water table is reached. There is another type of well, an *Artesian well*.

Artesian wells do not have to be dug. These are deep wells where water is forced upward by underground pressure. Once the water is brought to the surface, it can be made safe through filtering. Most filters for fresh water use sand and gravel.

All water sources are naturally polluted by animals and chemicals already in the ground. However, man is overpolluting areas, making it almost impossible for organisms to clean up waterways. There are four main sources of water pollution. These are: seepage from homes to underground water; sewage pipes carrying germ filled wastes into waterways; factories pouring wastes and chemicals into streams and rivers; and, people polluting by swimming and boating. In order to guarantee our supply of fresh water for the future, we must find ways to control these polluting factors.

CONCEPT 1:

Sea water has definite properties.

OBJECTIVES:

1. Given clean Pyrex beaker of sea water containing salt, plant life, animal life, and sand particles from which the water has been evaporated, the students will correctly identify three of the four components.

2. Given two pyrex beakers, one containing residue from evaporated sea water and the other containing residue from evaporated distilled water, through taste, smell, and sight, the students will identify three of the physical properties that differentiate sea water from distilled water.

ACTIVITIES:

1. Students will boil and evaporate sea water for the purpose of identifying its components.
(See Student Worksheet.)

2. The physical properties of distilled water and sea water will be compared by the students using the senses of taste, touch and smell.
(See Student Worksheet.)

STUDENT WORKSHEET

To Accompany: Concept 1, Activity 1

TASK:

Determine what happens when sea water is boiled?

MATERIALS:

Glass container (suggest pyrex beakers)
Sample of sea water
Bunsen burner or other heating device
Ringstand and matches, if necessary

PROCEDURE:

1. Set up heating device
2. Fill beaker one-third full with sea water.
3. Boil sea water sample until all water is evaporated.
4. Turn off heating element and examine what remains in beaker.

RESULTS:

1. Is there anything left in the beaker? 1._____
2. If answer is *yes*, use your senses to describe what remains. 2._____
3. List four elements found in sea water. 3._____

STUDENT WORKSHEET

To Accompany: Concept 1, Activity 2

WATER

TASK:

Compare residue properties of evaporated distilled water and evaporated sea water.

MATERIALS:

2 glass containers (suggest pyrex)
Bunsen burners, hot plate or other heating device
Samples of sea water and distilled water
Ringstands and matches, if necessary

PROCEDURE:

1. Set up the heating device (pre-heat if necessary)
2. Put about one inch of each water sample in separate beakers and label each beaker accordingly.
3. Boil water in both containers until it is gone.
4. Turn off heating device and observe residue in each of the containers noting the similarities and differences of the properties in the remaining residue.

RESULTS:

1. What happened to the water in each sample?

1._____

_____

2. Is there anything left in either beaker? If *yes*, which one? Describe the residue.

2._____

_____

_____

3. With the remaining residue, record your observations from taste, touch, smell.

3. *Taste:* _____

Touch: _____

Smell: _____

CONCEPT 2:

Life on land is dependent upon the sea.

OBJECTIVES:

1. Through research and reporting, the students will be able to correctly identify five ways in which man benefits directly from the sea.

2. Through research and reporting, the students will be able to correctly identify two ways in which life on land, other than man, benefits directly from the sea.

3. Given charts and/or transparencies of the water cycle, the students will correctly determine the role of the sea in the water cycle and write a paragraph telling of this role.

4. Given a glass container of water and an aquatic plant (Elodea), the students will experiment and correctly state, in a written paragraph, how oxygen is produced in the sea by aquatic plants comparable to Elodea.

5. After viewing a series of transparencies on ocean phytoplankton and zooplankton, the students will be able to illustrate the differences between the two.

ACTIVITIES:

1. Using either charts or transparencies, the students will draw and label the water cycle involving the ocean, and they will define its purpose in the cycle.

2. Students will demonstrate how oxygen is produced in water by aquatic plants.
(See Student Worksheet.)

3. Working in groups, the students will do research, for the purpose of reporting to the class, on one of the following suggested topics, or one assigned by the teacher.

Animals of the Ocean
Plants of the Ocean
Man's Interest in the Ocean
Food Chains in the Ocean
Producers in the Ocean
Consumers in the Ocean

4. After viewing transparencies of sea water phytoplankton and zooplankton, the students will sketch one of each showing the distinguishing characteristics.

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 3

WATER

TASK:

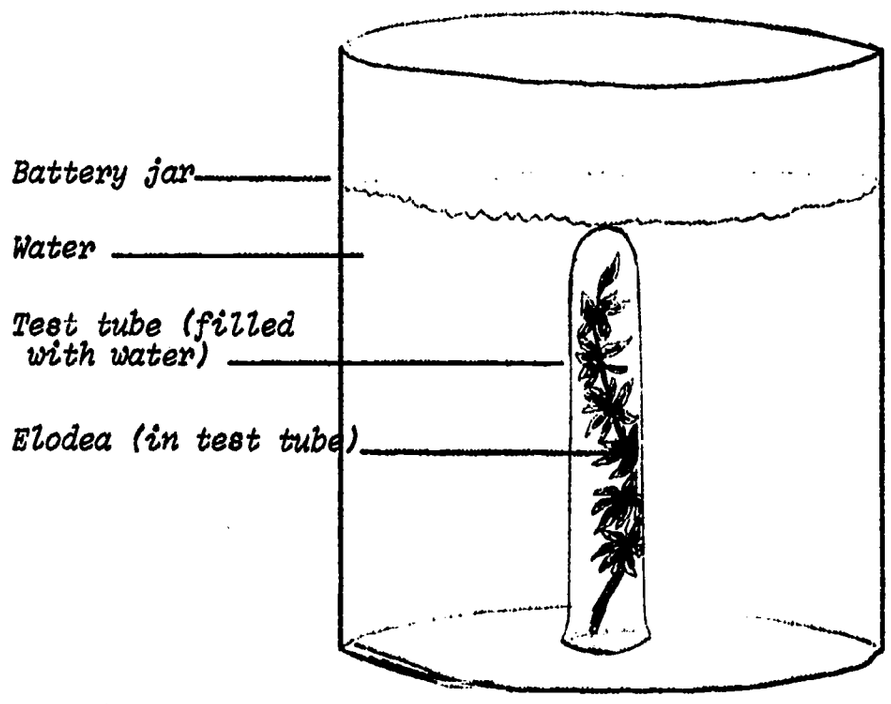
What are the by-products of phytosynthesis?

MATERIALS:

Battery jar
Test tube
Green aquatic plant (Elodea or algae)
Water

PROCEDURE:

1. Put water in the jar until it is three-fourths full.
2. Put your aquatic plant in an inverted test tube in the jar (see diagram below).
3. Place jar in a well lighted area. Observe and record results.



RESULTS:

1. What happened to the water in the test tube?

1. _____

_____

2. From these results would you say that a by-product was given off?

2. _____

3. If there was a by-product given off, what would you say it was?

3. _____

4. What would you expect your results to be if you conducted this experiment in the dark?

4. _____

_____

_____

5. What process has caused these results to occur?

5. _____

_____

CONCEPT 3:

Louisiana is bordered by several bodies of sea water.

OBJECTIVES:

1. Using a Louisianastate map and a measuring device (ruler), the students will be able to measure correctly to the nearest five miles, the road distance and the air distance from his town to Vermilion Bay, Terrebonne Bay, Atchafalaya Bay and Barataria Bay.

2. After determining the road distance and the air distance from his town to Vermilion Bay, Terrebonne Bay, Atachafalaya Bay, and Barataria Bay, the students will correctly compute the differences in the air and the road distances for each of the Bays.

3. After viewing a Louisiana state map for the purpose of locating all Louisiana bays, the students will be able to correctly locate ten of the fourteen bays on an outline map of the state.

4. After viewing a series of 35mm slides, transparencies, and/or pictures depecting man's use of the bays, the students will correctly identify six reasons why the bays are important to man.

5. Through research and reporting, the students will be able to correctly explain in essay form how the Gulf of Mexico ultimately becomes useful to crop growth in Louisiana.

6. Using visual aids only, the students will give a two-minute oral presentation on fishing in Louisiana.

ACTIVITIES:

1. Using a Louisiana state map, the students will measure the distances from his town to Vermilion Bay, Terrebonne Bay, Atchafalaya Bay and Barataria Bay.
(See Student Worksheet.)

2. Using an outline map of Louisiana, the students will label the fourteen bays. Suggest that students be given ample time to view a complete map of the state before being asked to fill in the outline map.

3. A series of 35mm slides, transparencies, and/or cut-out pictures depicting man's use of bays will be shown to the students; the students will then identify each and give six reasons why the bays are important to man.

4. The students will write an essay explaining how water from the Gulf of Mexico ultimately becomes useful to crop growth in Louisiana.

5. Using visual aids, the students will give an oral presentation on fishing in Louisiana.

STUDENT WORKSHEET

To Accompany: Concept 3, Activity 1

WATER

TASK:

Determine distances and travel times to various bays along the Louisiana coast.

MATERIALS:

Road maps of Louisiana
Measuring instruments (rulers--one for each student)

PROCEDURE:

1. Pair off students, furnishing each pair with a Louisiana road map.

2. Examine the map carefully. Pay special attention to the scale of miles used.

3. Using the measuring instrument, determine the distance both by air (as the crow files) and by road to the following bays.

    a. Vermilion Bay
    b. Terrebonne Bay
    c. Atchafalaya Bay
    d. Barataria Bay

RESULTS:

1. Distances by air to the following: (a) Vermilion Bay, (b) Terrebonne Bay, (c) Atchafalaya Bay, and (d) Barataria Bay.

1a._____

b._____

c._____

d._____

2. Distances by road to the following: (a) Vermilion Bay, (b) Terrebonne Bay, (c) Atchafalaya Bay, and (c) Barataria Bay.

2a. _____

b. _____

c. _____

d. _____

3. How long would it take a car to drive from your town to Vermilion Bay? Barataria Bay? (NOTE: First determine a safe and reasonable speed.)

3a. _____

b. _____

4. A Coast Guard helicopter takes off from Lafayette Airport. How long will it take to reach Terrebonne Bay if it travels at 80MPH?

4. _____

5. If a man could drive safely at a constant speed of 80MPH to Terrebonne Bay, how long would it take him to reach the Bay by road?

5. _____

6. Is there a difference in the time it takes the helicopter in No. 4 and the car in No. 5? If so, why? If not, why not?

6. _____

_____

_____

CONCEPT 4:

Pollution occurs in Louisiana Bays.

OBJECTIVES:

1. Given a Louisiana state map, the students will trace a possible path of raw sewage dumped into Bayou Teche and brought to the Atchafalaya Bay as a possible pollution source.

2. Through library research and reporting, the students will be able to explain two types of pollution prevention which they can perform.

3. Through a class discussion of pollution effects on seafood, the students will write a paragraph concerning how serious pollution of Louisiana bays might affect seafood prices.

ACTIVITIES:

1. Given a Louisiana state map, the students will trace the possible path of raw sewage dumped into the Bayou Teche and brought to the Atchafalaya Bay.

2. Each student, or a randomly selected few, will describe verbally to the class what steps he can take to help prevent pollution in Louisiana bays. Individual library research is suggested before oral presentation.

3. The class will hold a discussion on how pollution affects seafood in Louisiana bays. After sufficient discussion, the students will write a paragraph on how this pollution might affect prices of seafood.

CONCEPT 5:

There are a variety of fresh water sources, such as: lakes, rivers, streams, and underground reserves.

OBJECTIVES:

1. Through group discussion on local fresh water sources, the students will report on three sources in their areas.

2. Through group discussion on sources of fresh water in different climatic regions, the students will be able to identify two sources of fresh water in a certain climatic region.

ACTIVITIES:

1. Divide the class into groups and have each group discuss possible sources of fresh water locally. After ample time has been given to have the subject thoroughly discussed, each group will report on their discussion. A class discussion may ensue.

2. With the class working in groups, assign each group a climatic region. Have the groups conduct research on their respective regions for information on sources of fresh water. Have each group appoint a spokesman to report the group findings; or have the group turn in a written report on their findings.

3. Have the students view the film *Ground Water*.

CONCEPT 6:

Surface water is kept in check through use of dams and levees.

OBJECTIVES:

1. Through research, the students will be able to identify the significance of five major dams in the United States.

2. Through group research, the students will be able to determine two types of dams and the purposes of each.

3. By means of a field trip, the students will recognize the purpose of levees, both natural and manmade, and conduct a class discussion on the subject upon returning.

ACTIVITIES:

1. Have the students conduct research on the major dams in the United States for the purpose of investigating the significance. Group work may be used with each group reporting on a specific dam, with emphasis on location, size, function, etc.

2. Have the students build a homemade dam to see a simple demonstration of how a dam operates.
(See Student Worksheet.)

3. With students working in groups, give each group a certain type of dam to research. Have them gather information concerning structure, purpose, usefulness, and location of each.

4. Take a field trip to a nearby levee (either natural or manmade), if one is within a suitable distance. Have the students note the structure and usefulness. As a culminating activity upon returning to class, discuss how the levee might have been built up, its usefulness, and its effect on the surrounding environment.

5. If a field trip cannot be arranged, the teacher may wish to use the transparency *Profile of A Natural Levee*. Following the presentation, the class may hold their discussion on the structure and usefulness. The teacher may also wish to use the transparency in conjunction with the field trip.

STUDENT WORKSHEET

To Accompany: Concept 6, Activity 2

WATER

TASK:

Understand the operation of a dam.

MATERIALS:

Clean empty milk carton
Staples and stapler
Sink or pan to catch water
Water
Scissors
Ruler

PROCEDURE:

1. Cut out one side of a milk carton.
2. From the cut out side, cut two strips, each one inch wide and two inches long.
3. Cut a third strip, one inch wide and four inches long.
4. On one end of the carton, cut out a square one-half inch high and one-half inch wide.
5. Fasten the two short strips inside the carton, one on each side of the square, with the inner sides one inch apart.
6. Place the long strip snuggly behind the two pieces; slide it down so that it entirely covers the square.
7. Fill the carton with water.
8. Pull the long strip (gate) up. Observe.
9. Push the gate down. Observe.
10. Repeat No. 8 and No. 9. Observe.

RESULTS:

1. What happened when you opened the gates?

1. _____

_____

2. What happened when you closed the gate?

2. _____

_____

3. When the gates are closed, for what purpose could the water be used?

3. _____

_____

4. When the gates are opened, for what purpose could the water be used?

4. _____

_____

5. List some purposes your dam might serve.

5. _____

_____

_____

_____

CONCEPT 7:

Water pollution is a serious problem.

OBJECTIVES:

1. Given samples of distilled water and polluted water, the students will be able to differentiate between the two by listing at least three macroscopic and three microscopic differences.

2. Through class discussion, the students will be able to identify at least four sources of water pollution in their areas.

ACTIVITIES:

1. The student, through a laboratory exercise, will note both macroscopic and microscopic differences between polluted water and pure water.
   (See Student Worksheet.)

2. Through discussion, the students will bring out the sources of water pollution in their areas. Also include methods of control and improvement.

3. Have the class view the film *Problems of Conservation--Water*. As a culminating activity to the film presentation, hold a class discussion on the problems viewed and possible solutions.

STUDENT WORKSHEET

To Accompany: Concept 7, Activity 1

WATER

TASK:

Determine the differences between *polluted* water and *pure* water.

MATERIALS:

Sample of polluted water
Samples of distilled water
Microscope
2 glass slides
2 cover slips
2 medicine droppers
2 200ml beakers

PROCEDURE:

1. Put a 100ml sample of polluted water in a beaker and a 100ml sample of distilled water in the other beaker.

2. Observe the color, smell, and absence or presence of particles and/or living organisms in each sample.

3. Prepare a wet mount of each water sample by placing one drop of water from the sample onto the slide and placing the cover slip over it.

4. Examine each sample carefully under the microscope. Note the differences in the content of each sample.

RESULTS:

1. Did you notice any differences in the color of the distilled water as compred to the color of the polluted water?

1. _____

_____

2. Did you notice any differences in the smell of the two samples?

2. _____

_____

3. Did you notice any other differences between the two samples?

3. _____

_____

4. Were there any microscopic organisms present in either of the samples? If so, which one? How do you think this would affect the water?

4. _____

_____

_____

_____

CONCEPT 8:

Water may be purified with chemicals.

OBJECTIVES:

1. Through classroom experiments with chlorine bleach and Halozone pills, the students will investigate the effectiveness of the purifying agents, and they will correctly state the results of these experiments.

2. Through a field trip to the local water treatment plant, the students will identify at least two methods of water purification.

ACTIVITIES:

1. An experiment will be conducted by the students to determine the amount of chlorine bleach needed to purify a water sample. (See Student Worksheet.)

2. The students will investigate by means of laboratory experiment, the effectiveness of Halozone pills. (See Student Worksheet.)

3. The class will visit the local water treatment plant in order to investigate the method(s) of water purification used. As a culminating activity to the field trip, the students will hold a class discussion on the method(s) used, their effectiveness, and other possible methods which could be employed.

STUDENT WORKSHEET

To Accompany: Concept 8, Activity 1

WATER

TASK:

Determine how much chlorine bleach is needed to purify a water sample.

MATERIALS:

4 pint jars of pond water
1 hard boiled egg
Chlorine bleach
4 medicine droppers
4 microscope slides
4 microscopes

PROCEDURE:

1. Get four pint jars of pond water (each from a different source).
2. Peel the hard boiled egg and remove the yolk. Crumble the yolk into pieces about the size of a grain of corn.
3. Place one piece of yolk into each of the pint jars.
4. Place the jars in a warm, dark place--suggest the storage closet if one is available--for a week and observe daily.
5. Use the medicine droppers to obtain a sample from each jar. Place these on the four microscope slides. NOTE: Use a different dropper for each sample.
6. Place a slide on each of the four microscopes. Examine each until you find the one with the most living organisms.
7. Observe this slide under the microscope while adding chlorine bleach. Add the bleach until all of the organisms are dead.

RESULTS:

1. How long does it take for the chlorine bleach to kill all of the organisms? 1._____

2. How much chlorine bleach was necessary to kill the micro-organisms? 2._____

3. List places where chlorine is used as a purifying agent. 3._____

_____

_____

_____

STUDENT WORKSHEET

To Accompany: Concept 8, Activity 2

WATER

TASK:

Determine effectiveness of Halozone pills in purifying water.

MATERIALS:

1 pint of pond water
1 Halozone pill (may be obtained from local pharmacy)
2 medicine droppers
2 microscope slides
2 microscopes
2 one-half pint jars

PROCEDURE:

1. Pour equal amounts of pond water into the 2 one-half pint jars. Label one jar *A* and the other jar *B*. Agitate slowly before pouring.

2. Put the Halozone pill in sample *A*. Let it set for thirty minutes.

3. Using one of the medicine droppers, place a drop of water from sample *B* on a microscope slide and observe under the microscope.

4. After sample *A* has set for the required amount of time, use the other medicine dropper to place a drop of water from it on the other microscope slide.

5. Observe sample *A* under the microscope, observe sample *B* once more.

6. Record your observations.

RESULTS:

1. Were any living micro-organisms present in sample *B*? 1._____

2. Were any living micro-organisms present in sample *A*?

2. _____

3. How effective was the Halozone pill in purifying the water sample?

3. _____

_____

4. What are the ingredients in a Halozone pill?

4. _____

_____

SUGGESTED QUESTIONS TO ACCOMPANY: UNIT 4, WATER

1. What factors are necessary for plants and animals to survive in water?
2. Where is most of the life that exists in oceans found? Why?
3. What two types of plankton are located in the oceans?
4. What are the physical characteristics of sea water?
5. What are the physical characteristics of fresh water?
6. List five of the most abundant elements found in sea water.
7. What part does the ocean play in the water cycle?
8. List five ways in which man benefits directly from the ocean.
9. What is the major producer of oxygen in the ocean?
10. What compound is found in greatest abundance in sea water?
11. If Bayou Teche were found to be contaminated with a poisonous pesticide, what term would we use when referring to it?
12. How would you as a consumer be affected by extensive pollution in the Gulf of Mexico?
13. List ways in which you as a citizen might help to curb or reduce water pollution?
14. What are the four sources of fresh water?
15. In what way will the source of fresh water differ from one climatic region to another?
16. What is the purpose of dams? Of levees?
17. List three ways in which water may be made safe for man's use and consumption, and describe each.
18. What is a major source of drinking water?
19. What are two ways in which man can get water from the ground to the surface?
20. What are the four main sources of water pollution?

VOCABULARY
UNIT 4, WATER

ARTESIAN WELL

BAY

COAST

CONSUMPTION

CONTAMINATED

DAM

DISTILLED WATER

DROUGHT

FILTERING

FRESH WATER

GROUND WATER

GULF

HYDROSPHERE

LEVEE

MACROSCOPIC

MICROSCOPIC

NON-POROUS

PHYTOPLANKTON

POLLUTION

POROUS

PRECIPITATION

PURIFY

SALINE

SEA WATER

SEWAGE

SURFACE WATER

WATER TABLE

WATER WELL

ZOOPLANKTON

RESOURCE MATERIALS

FILMS:

Ground Water, b/w, 11 min.--Regional Film Library, USL, Lafayette

Problems of Conservation--Water, color, 14 min.--St. Martin Parish Instructional Center, Breaux Bridge

FILMSTRIPS:

The Oceans--St. Martin Parish Instructional Center

Water and Life--St. Martin Parish Instructional Center

Water and Us--St. Martin Parish Instructional Center

SLIDES:

Slide Series No. _____ (demonstrates man's use of Louisiana bays)--EECD Nature Trail, St. Martinville

TRANSPARENCIES:

Animal Life of the Oceans (Shallow Water)--St. Martin Parish Instructional Center

Plant Life of the Oceans (Deep Water)--St. Martin Parish Instructional Center

Profiles of Natural Levees--St. Martin Parish Instructional Center

BOOKS, BOOKLETS, AND PAMPHLETS:

"Guide for Teaching Conservation Education." Natchitoches, La.: North Louisiana Supplementary Education Center, 1969.

Louisiana Stream Control Commission. "Water Quality Criteria and Plan for Implementation." Baton Rouge, La., Louisiana Wildlife and Fisheries Commission, 1968.

UNIT 5
WILDLIFE

UNIT 5 WILDLIFE

What ever happened to the abundant forests filled with wildlife which were so prevalent as recently as one hundred years ago? What has man done to destroy them? Where are the swamps and marshes that were along the coastlines in such vast stretches teeming with wildlife? What is happening to our dry deserts? What can man do to preserve what remains? Why is it important that he do so? These are questions man must begin to answer. In a day and age when man resorts to the outdoors "to get away from it all," if he is not careful, the only outdoors he will have will be the concrete jungles of the big cities.

A few major habitats of wildlife are the forests, swamps and marshes, and the deserts. The forest is a community of different kinds of plants. The most obvious of the plants, of course, are the trees because they are the tallest. But once within the forest, other types of plant life are evident. On the ground, one will find the mosses and the liverworts. Then, moving upward, are the grasses, ferns, wildflowers, briers, shrubs and vines, all growing in the shade of the dominant trees. These plants of the forests serve as shelter, protection and a source of food for the many and varied types of wild animal life which inhabit it. The species of wildlife found in the forest, both plant and animal, depends on the forest type and the water supply. But, no matter what the type, in every forest, the plants and animals depend on one another--the plants provide the food and shelter and the animals provide fertile ground for the plants. Man finds many hours of recreation fishing in the forest streams, hunting the various types of game animals, and simply enjoying the sights and sounds of the clean, uncluttered, uncemented outdoors. But in man's careless desire for recreation he has destroyed millions of acres of forests by fire. He has endangered many forest species by killing too many of them at one time. Furthermore, he has polluted its streams and waterways with the trash he throws into them, thereby destroying fish populations. Man has also destroyed the forest by cutting down the trees to make room for more cities. He has also cut them down to get the wood for the manufacture of different things, not bothering to replace the cut trees with young saplings. While doing all these things, man has succeeded in destroying the wildlife by destroying the habitat.

Swamps and marshes are another source of man's remaining wildlife supply. Here air, land and water are mixed in such a way as to make animal adaptations fascinating--long legged birds, swimming mammals and scoop-billed birds. These areas are overwhelming with their varied forms of wildlife. The varieties of the area include aquatic animals such as fish, shrimp, crabs; birds, such as pelicans, herons, and egrets; small mammals such as mink, muskrat, and otter; reptiles, such as alligators and snakes; and insects, too numerous to mention. But man again, either in his awe

of the beauty of nature or his unconcern for it, is destroying it. He is polluting the waters of the marshes and swamps with litter and refuse and overflowing oil wells. He has drained the areas to construct airports and housing developments. The state of Connecticut alone has lost nearly 50% of its tidelands to these developers. Man has allowed dangerous chemicals such as DDT to flow into the waterways which feed the swamps. In this manner, he has forced many animals to face possible extinction of future populations, as is the case of the brown pelican.

A third habitat of wildlife, the desert, is also open to the destructive interference of man. The plant life of the desert consists mainly of cacti and other water storing plants. These serve as homes for a variety of desert animals, which include birds like the elf owl, roadrunner, gila woodpecker, and red tailed hawks; reptiles such as snakes and gila monsters; mammals, such as kangaroo rats, and other rodents; and other animals which have been able to adapt themselves to the extremes in temperature and lack of water of the desert. But again man has interrupted nature, no so much for recreation, but in the name of progress. He has built roads through the deserts, forcing many of the animals to find new homes. But most of his damage has been done through irrigation. In this way man has changed the entire ecology of the area. With the aid of water, man has turned some deserts into crop-producing farm lands.

But man has begun to realize his errors. In many places he is trying to restore areas to their natural habitat. He has begun forest and wildlife conservation services. He has devised a variety of commissions such as the Louisiana Wildlife and Fisheries Commission to protect the remaining wildlife resources. Through government legislation, National Parks and Wildlife Reserves have been set aside to save some of nature's beauty for posterity. He has put controls on air and water pollutants which endanger wildlife. Man has finally realized that he does not want to convert this entire continent into a concrete jungle. He wants to preserve some of its natural beauty in areas where he can "get away from it all."

CONCEPT 1:

Forests are communities of different kinds of plants which serve as shelter, protection, and food sources for many types of animals.

OBJECTIVES:

1. The students will take a field trip to an area Nature Trail, where they will note the interrelationships among the plants and animals. Following the trip, each students will list and explain five different situations where the plants and animals are dependent on one another.

2. The students will view the following filmstrips: *Animals of the Forests: Woodland Friends, Woodland Neighbors,* and *In the Forest.* From the information obtained through these, the student will compose a short paragraph on wildlife of the forests or some related topic designated by the teacher. Performance level to be determined by the teacher.

3. Given a series of slides of ten of the most commonly occurring plants native to the area, and ten most commonly occurring native animals, the students will be able to identify eight out of each group of ten correctly.

4. After collecting pictures, photographs and/or sketches of wildlife in native forest areas, each student will construct a poster of wildlife. The teacher might wish to have a classroom diorama made rather than individual posters. Performance level to be determined by the teacher.

ACTIVITIES:

1. The students will take a field trip to a Nature Trail for the purpose of noting the interrelationships among the plants and animals. As a culminating activity, each student will list and explain five situations where plants and animals are dependent on one another.

2. After viewing the following filmstrips: *Animals of the Forests: Woodland Friends, Woodland Neighbors* and *In The Forest,* the students will compose a short paragraph on wildlife of the forests.

3. After viewing a series of ten slides of the most commonly occurring plants and ten of the most commonly occurring animals native to this area, the students will be shown them again and will be asked to identify each.

4. The students will collect pictures, photographs, and/or sketches of wildlife in native forests areas. With these, either each student will construct a poster of wildlife, or the class will prepare a diorama of a wildlife scene.

CONCEPT 2:

Forests are being destroyed by carelessness and waste. Proper conservation methods can restore and save many of them.

OBJECTIVES:

1. The students will view the films: *Problems of Conservation: Forest and Range* and *Science Conserves the Forest*. After viewing they will be able to correctly list five problems of conserving our forests and a solution for each.

2. Working in groups, the students will research the effects on our forests and their wildlife populations of forest fires; overkilling animal species, pollution in streams and waterways; and cutting down too many trees without replacing them. In the report, the students will also include ways and means of overcoming these problems or reducing them so that they no longer pose a threat to our forests.

3. The students will view the filmstrips *Forests and Forest Conservation, Parts I and II* in order to further the concept. Culminating activity and performance level to be determined by the teacher.

ACTIVITIES:

1. Have the students view the two films: *Problems of Conservation: Forest and Range* and *Range and Science Conserves the Forest*. After viewing the films, have the students list five of the problems of conserving our forests and a solution for each.

2. Working in groups, have the students research the following as to their effects on our forests and their wildlife populations: forest fires; overkilling animal species; pollution in forest streams and waterways; cutting down too many trees without replacing them. The report is to include ways and means of overcoming these problems or reducing them in such a way that they no longer pose a threat to our forests.

3. Have the students view the filmstrips *Forests and Forest Conservation, Parts I and II*. Culminating activity to be designed by the teacher.

CONCEPT 3:

Swamps and marshes are another source of man's remaining wildlife supply, but they too must be protected from various forces tending to destroy them.

OBJECTIVES:

1. The students will view these films for the purpose of noting life of the marshes: *The Marsh Community*, *Wetlands*, and *Birds of the Marshes*. Following the presentation, each student will list correctly ten plants and ten animals which can be found in the swamp and marsh lands.

2. Using a transparency and/or an opague projection of the southern part of Louisiana, the class will correctly trace the path of solid or liquid refuse which is dumped into the Bayou Teche from a local site to the swamps and marshes along the coast. Following this each student will write a short essay on the effects this pollution might have on the wildlife of the area.

CONCEPT 4:

The desert is the refuge for a variety of plants and animals.

OBJECTIVES:

1. The students will view the following films for the purpose of determining the various adaptations plants and animals have undergone in order to survive in this desolate wilderness: *The Desert Community, Wonders in the Desert,* and *Life in the Desert.* Following the presentation, each student will choose one plant or one animal and conduct research on it to determine its adaptations for desert life.

2. The class will hold a discussion on how man has interferred with desert life. After the discussion, each student will be responsible for a short essay on the same. Performance level to be determined by the teacher.

ACTIVITIES:

1. The students will view the films: *The Desert Community, Wonders of the Desert,* and *Life in the Desert.* As a culminating activity to the films, each student will choose one desert plant or animal and conduct research on how the animal has adapted to desert life.

2. The class will hold an open discussion on how man has interferred with the life of the desert; then each student will compose a short essay on the topic.

CONCEPT 5:

Wildlife habitats are varied due to conditions imposed either by man or nature.

OBJECTIVES:

1. The films *The Zoo* and *Why Animals Live Where They Do* will be shown to the students for the purpose of exposing them to various habitats of wildlife resulting from man's activities or natural conditions. Following the presentation, the students will be able to identify correctly the habitat of at least eight of ten plants or animals chosen from the film by the teacher.

2. Given a series of slides of the most commonly occurring wild plants and animals of his area, the student will be able to identify correctly 80% of the organisms on a second showing.

3. Given transparencies of a prairie food web and a prairie food chain, the students will hold a discussion on the effects of the introduction of pollutants into food webs and food chains. Performance level to be determined by the teacher.

ACTIVITIES:

1. The students will be shown the films: *The Zoo* and *Why Animals Live Where They Do*. They will identify correctly the habitats of ten plantsand/or animals chosen by the teacher.

2. After several viewings of a series of slides of the most commonly occurring plants and animals native to the area, the students will be shown them again and will be asked to identify each.

3. Given transparencies of a prairie food web and a prairie food chain, the students will discuss the effects of the introduction of a pollutant into food chains and food webs.
(See Student Worksheet.)

STUDENT WORKSHEET

To Accompany: Concept 5, Activity 3

WILDLIFE

TASK:

Determine what affect(s) the introduction of pollutants have on food chains and food webs.

MATERIALS:

Diagram of a prairie community food chain (transparency)
Diagram of a prairie community food web (transparency)

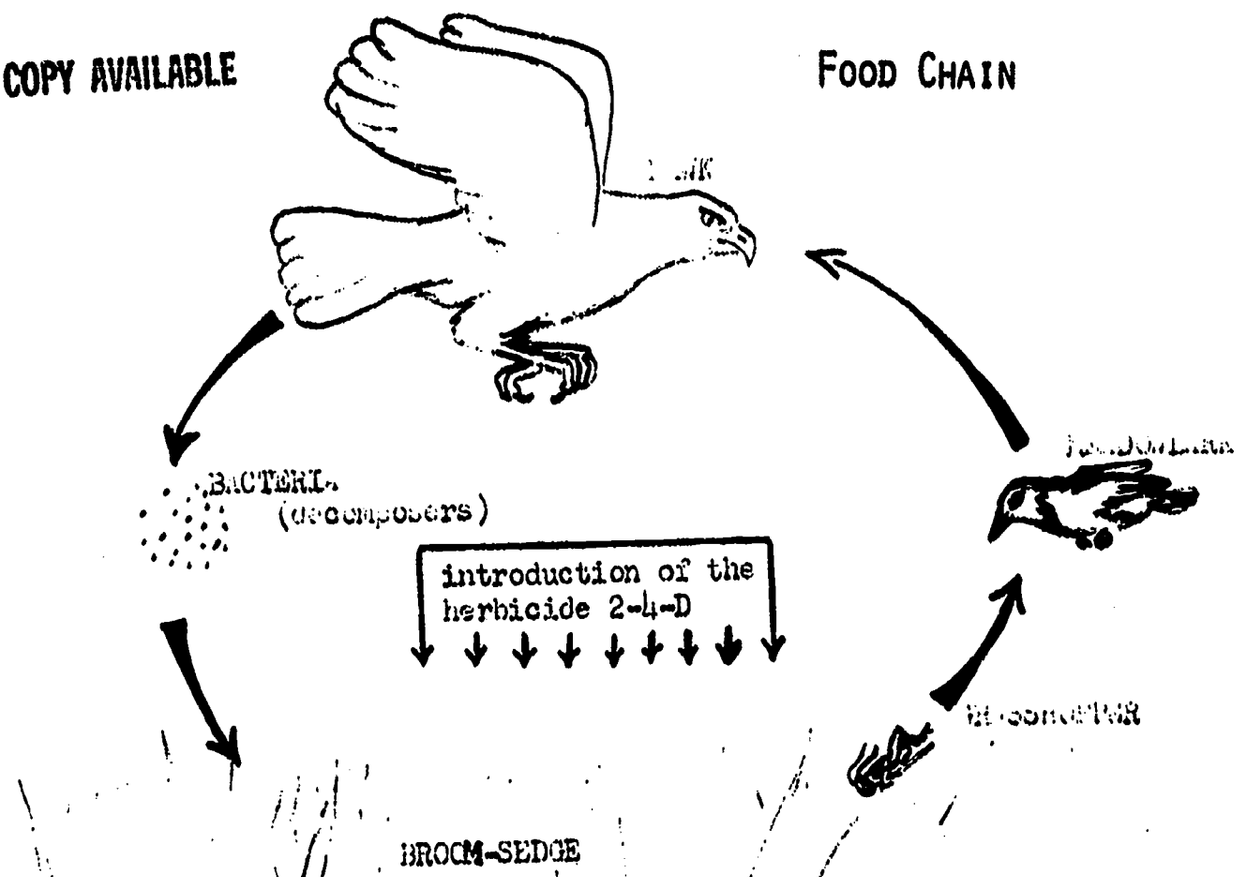
PROCEDURE:

1. Use overhead transparencies of a food chain and a food web.
2. Have students list possible affects of the introduction of several types of pollutants.
3. Discuss the answers listed.
4. Record results.

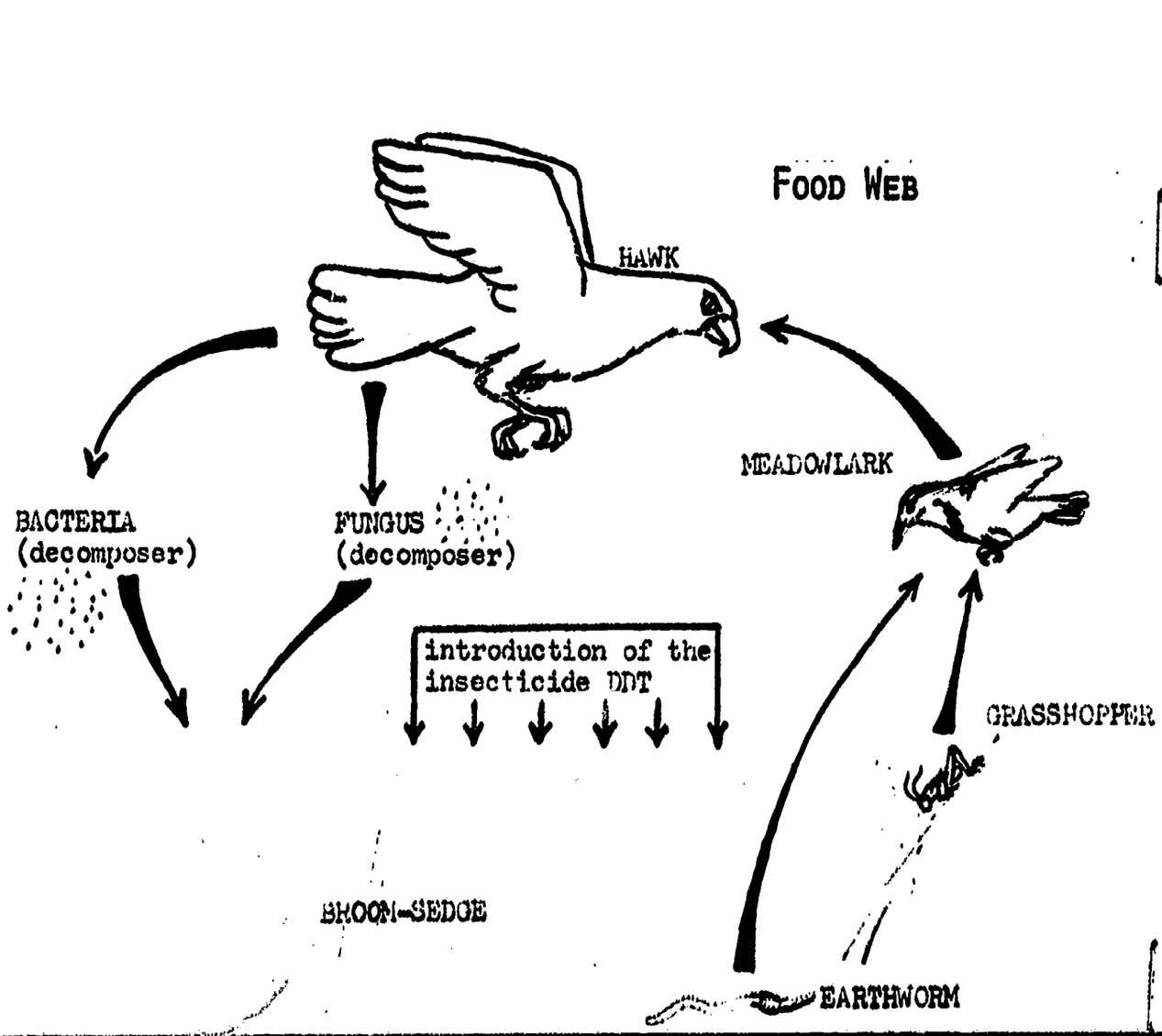
RESULTS:

After discussion of effects of pollutants, list the best answers discussed as the results.

FOOD CHAIN



FOOD WEB



CONCEPT 6:

Man has devised several ways to protect and conserve the wildlife which now remains.

OBJECTIVES:

1. The film *Conserving A Heritage* will be shown to the class for the purpose of demonstrating how the petroleum industry has helped to preserve wildlife. Following the film a class discussion might take place and/or some other activity designated by the teacher. Performance level to be determined by the teacher.

2. The students will conduct research on different wildlife refuges both in Louisiana and other states. Each student will report on his findings to show how man has helped to save various species--both the endangered and those that were not. Also, the student will include game laws for these areas. Performance level to be determined by the teacher.

3. The filmstrip *Wildlife and Fisheries* will be shown to the class either as an introduction to a lecture by a Wildlife and Fisheries personnel, if one is available (preferably a person from the area), or as an activity in itself. Culminating activity and performance level to be determined by the teacher.

ACTIVITIES:

1. Show the film *Conserving A Heritage* to the class. After the presentation a class discussion or other culminating activity designated by the teacher might take place.

2. Have each student conduct research on a wildlife refuge either in Louisiana or in other states. The report should include how man has helped to save both the endangered and other species, and game laws and restrictions for that particular area. Some of the wildlife refuges include: Rockefeller Refuge, Breton National Wildlife Refuge, Russell Sage Refuge, Paul J. Rainey Refuge, State Refuge, Lacassine National Refuge, Sabine National Refuge, White River National Refuge, and Arkansas Refuge in Louisiana, Arkansas, Mississippi and Texas. National Forests and Wildlife Management Areas may also be used for research.

3. Show the filmstrip *Wildlife and Fisheries* as an introduction to a lecture by a wildlife and fisheries specialist if one is available. Teacher will design culminating activity.

SUGGESTED QUESTIONS TO ACCOMPANY: UNIT 5, WILDLIFE

1. Name six wildlife refuges located in Louisiana.
2. List four endangered species of animals found in Louisiana.
3. How would the elimination of a predator, sich as a hawk, in a prairie food chain affect the prairie community?
4. What is a chemical compound specifically designed to kill plants called?
5. How might extensive use of the compound described in No. 4 affect wildlife in our area?
6. What is a chemical compound specifically designed to kill insect pests called?
7. How might extensive use of the compound described in No. 6 affect the balance of nature in our area?
8. List ways in which pollution of the Atchafalaya Basin might affect residents in our area.
9. In what ways are game laws beneficial to man?
10. In what ways are game laws beneficial to animals?
11. Which agencies provide protection for wildlife?
12. Of what importance is wildlife to our area?
13. How might you, as a citizen, provide for adequate protection of our wildlife?
14. List ten types of game wildlife found in our area, including the bag and possession limits for each.
15. Why should our inland waters be protected from "walking catfish?"

VOCABULARY
UNIT 5, WILDLIFE

ADAPTATION

CHLOROPHYLL

CHLOROPLAST

COMMUNITY

CONSUMER

DECOMPOSER

EXTINCTION

FOOD CHAIN

FOOD WEB

HABITAT

HERBICIDE

INSECTICIDE

NATIVE

PESTICIDE

PHOTOSYNTHESIS

POLLUTANTS

POLLUTION

PRODUCER

RESOURCE MATERIALS

FILMS:

Problems of Conservation: Forest and Range, color, 14 minutes--St. Martin Parish Instructional Center, Breaux Bridge

Science Conserves the Forest, color, 15 minutes--St. Martin Parish Instructional Center, Breaux Bridge

The Zoo, 11 minutes, color--St. Martin Parish Instructional Center

Why Animals Live Where They Do, color, 11 minutes--St. Martin Parish Instructional Center

The Desert Community, color, 18 minutes--University of Southwestern Louisiana Film Library, Lafayette

Wonders in the Desert, color, 10 minutes--USL Film Library

Life in the Desert, b/w, 11 minutes--USL Film Library

The Marsh Community, color, 14 minutes--USL Film Library

Wetlands, b/w, 11 minutes--USL Film Library

Birds of the Marshes, b/w, 10 minutes--USL Film Library

FILMSTRIPS:

Animals of the Forest: Woodland Friends, Woodland Neighbors--St. Martin Parish Instructional Center

In the Forest, Set No. 5 (sound filmstrip)--St. Martin Parish Instructional Center

Louisiana's Physical Features (sound filmstrip)--St. Martin Parish Instructional Center

Over in the Meadow, Set. No. 14 (sound filmstrip)--St. Martin Parish Instructional Center

Forests and Forest Conservation, Parts I and II--St. Martin Parish Instructional Center

The Desert, Part IX--St. Martin Parish Instructional Center

Where the Wild Things Are, Set No. 19 (sound filmstrip)--St. Martin Parish Instructional Center

Wildlife and Fisheries (sound filmstrip)--St. Martin Parish Instructional Center

SLIDES:

Slide Series No.___, depicting commonly occurring native plants in St. Martin Parish--EECD Science Center, St. Martinville

Slide Series No.___, depicting commonly occurring native animals in St. Martin Parish--EECD Science Center, St. Martinville

TRANSPARENCIES:

When You Are Camping--St. Martin Parish Instructional Center.

PICTURES:

"CONSERVATION: A PICTURE DISCUSSION KIT," Plate I--American Petroleum Institute, 1271 Avenue of the Americas, New York, NY 10020.

BOOKS, BOOKLETS, AND PAMPHLETS:

Brandwein, Paul, E. Cooper, P. Blackwood and E. Hone. *Concepts in Science*. New York: Harcourt, Brace and World, Inc. 1966.

Brainerd, John W. *Nature Study for Conservation*. New York: The MacMillan Company, 1971.

"Conservation Tools for Education." USDA, 1971.

"Forest Fire Prevention and Conservation Kit." Forest Service, USDA, 1971.

"Free and Inexpensive Materials for Teaching Conservation--Wildlife and Fish Section." Natchitoches, LA: North La. Supplementary Education Center, 1968.

Grossman, Shelly and Mary L. *The How and Why Wonder Book of Ecology.* New York: Grosset and Dunlap, 1971.

"Guide for Teaching Conservation and Resource--Use Education in the Schools of Louisiana, A." Natchitoches, Louisiana, North La. Supplementary Education Center, 1978.

"Guide for Teaching Conservation Education in the Schools of Louisiana, A." Forest Section. Natchitoches, La.: North La. Supplementary Education Center, 1968.

Mallinson, George G. and Jacqueline B., Douglas Brown, and William Smallwood. *Science: Understanding Your Environment.* Morristown, NJ: Silver Burdett Co., 1972.

Schneider, Herman and Nina. *Science for Today and Tomorrow.* Lexington, Mass.: D. C. Heath and Co., 1968.

UNIT 6
MINERALS

UNIT 6 MINERALS

Mineral resources play an important and integral part in our lives. These non-renewable resources include all inert material from the ground. Some minerals are derived from living things; others were formed as deposits within the rocky crust of the earth.

Fossil fuels, which include coal, gas, and oil, were formed from decayed plants and/or animals millions of years ago. The main difference between these minerals is in the way each was formed. Most petroleum and natural gas comes from the decayed remains of tiny plants and animals in the sea. Coal is derived from plants that lived on land. Of these fuels petroleum and natural gas are found in great proportions in Louisiana.

The petroleum industry is the third largest industry in the United States, preceded only by all phases of agriculture and public utilities. The United States is the leading oil producer in the world, followed by Russia, Venezuela, Kuwait and Saudia Arabia. The United States also leads in the refining of petroleum and in its consumption. Oil has been known to issue from the ground in small quantities since earliest times. It first won popularity as a source of kerosene, or *coal oil*. In the middle 1800's, it was considered a nuisance because it came up with salt water from brine wells. In 1857, Bissell thought it might be wise to drill an oil well similar to a brine well and pump out the *rock oil*. He contracted Colonel Edwin Drake to make such a well on a tract of land near Titusville, Pennsylvania. Finally, late in the summer of 1859, after drilling sixty-nine and one-half feet, Drake's well became the first oil well ever completed. From that day on, the petroleum industry has become ever increasing.

Generally found with petroleum deposits is natural gas. However, its presence has been known, and it has been used since early history. The Chinese were probably the first to use natural gas as a fuel, conducting it through bamboo pipes. The gas often escaped in water springs, and was many times set afire by lightening. This led to the worship of fire by ancient peoples. Today natural gas supplies about thirty percent of the energy needs of the United States.

Natural gas is an extremely useful product, both as a fuel and as raw material. Some fields produce *wet* gas, which contains natural gasoline. In processing this gas, we get gasoline used in many of our forms of transportation. *Butane* and *propane* are used for heating, cooking and as fuel for some engines; *ethane* is used in the manufacture of petrochemicals; *methane* is used both as a fuel and in chemical synthesis.

Natural gas may also be used to produce *carbon black*. This is the blackest substance known to man. It is used to make ink, paint, rubber, batteries, and radio tubes.

Natural gas is the cleanest fuel known. When it is burned with the proper mixture of air, it leaves no ash. It is also the most convenient fuel, because once it is ignited, it requires no further attention.

Non-metallics, such as salt and sulfur, found in Louisiana, are valuable resources and have a variety of uses. The earliest source of salt was sea water. Later it was found that salt occurred in underground salt domes and beds of rock salt which could be mined in much the same way as coal. The first salt mine in Louisiana opened at Avery Island in 1862. Since that time, salt has been mined in several areas in the state, including Jefferson Island, Belle Island, Weeks Island, Cote Blanche Island, and Anse La Butte. It is a known fact that salt taken from Louisiana mines is the purest salt found anywhere in the world, being over 99 percent pure. Salt may be recovered either by shaft mining to obtain it in solid form, or by drilling brine wells to obtain it in liquid form.

The majority of the salt mined in Louisiana, about 70 percent, is used in the chemical industry to manufacture chlorine, soda ash, sodium hydroxide, and other sodium compounds. Less than 5 percent of all salt produced is purchased as a household item. Salt is an important product, not only because man uses it to bring out the flavor in food, but also for our bodies, as salt is found in both the blood stream and in some digestive juices.

Sulfur is usually found in close association with a salt dome near Lake Charles, Louisiana. However, it was not until 1895 that Dr. Herman Frasch developed the first successful method for mining sulfur-- the *Frasch* process. The process includes the drilling of wells and pouring in of boiling water to acquire the sulfur in a liquid form. This method yielded the first pure sulfur mined in the United States.

Though sulfur has a variety of uses, it is usable in only two forms-- sulfuric acid and elemental non-acid sulfur. Approximately 87 percent of all sulfur is converted to sulfuric acid, with one-half of this being used as fertilizer. Of the remainder, about one-fifth is used to manufacture drugs, detergents, and other chemical products. Elemental non-acid sulfur (13 percent of the total sulfu. mined) is used largely for the manufacture of paper pulp.

All minerals, whether they be fossil fuels, metallic or non-metallic, have many uses. Many products which are used daily are made from minerals. Even the foods we eat contain minerals. Industry relies heavily on minerals in the processing of their various products.

CONCEPT 1:

Crude oil is processed into many forms and products.

OBJECTIVES:

1. After viewing many of the products made from petroleum, the students will conduct research to find out how the petroleum is separated into these products. From their findings, the students will compose a paragraph correctly explaining the process.

2. By means of a field trip to a nearby oil refining company, the students will be able to identify correctly at least three of the products that company produces and explain how each is produced.

ACTIVITIES:

1. The students will make a collection of various petroleum products found in the home or which can be purchased at a filling station or store. To supplement the collection, each student will choose one of theproducts to research. He will indicate in a written paragraph such information as: how the product is derived from the crude oil; the usefulness of the product; the cost to produce the product; the cost of the product to the retailer; the cost to the consumer; and, any possible substitutes for this product.

2. The students will take a field trip to an oil refining company, if one is within a reasonable distance. If this is not possible, the class may be able to get films, filmstrips or a resource person to give them information about oil resources. The students will note especially how the crude oil is processed into its most useful products. Following the field trip, the students will list at least three of the products and explain how each was produced.

CONCEPT 2:

Oil and natural gas are usually found in association with each other.

OBJECTIVES:

1. Given an outline resource map of the state of Louisiana, the students will correctly locate ten major oil well sites and ten major natural gas sites. From these they will list those found in association with each other.

2. The class will discuss the formation of oil and gas underground. According to the criteria established in class, the students will determine and indicate in written form why the two naturally occur together.

3. Through class discussion, the students will be able to correctly identify two of the effects of the oil and gas industry on the economy of the area found in its vicinity.

ACTIVITIES:

1. The students will be given an outline map of Louisiana on which they will locate ten major oil well sites and ten major natural gas sites. From these locations, the students will identify the number found in association with each other. (See Student Worksheet.)

2. Hold a class discussion on the formation of oil and gas underground. Pictures may be used to illustrate the process by which the formation occurs. As a culminating activity, the students will write a paragraph indicating why the two products are generally found together.

3. The class as a whole will discuss the effects of the oil and gas industry on the economy of the area in the vicinity of the plant. Following the discussion, each student will list two of these effects and explain each.

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 1

MINERALS

TASK:

Determine the location of oil well sites and natural gas sites in Louisiana.

MATERIALS:

Outline map of Louisiana
List of the locations of the major oil well sites and the major natural gas sites in Louisiana

PROCEDURE:

1. On the outline map of Louisiana given, mark an *O* over each area in which a major oil source is found.
2. On the same map, mark a *G* over each area which is a major natural gas site.
3. Observe the locations carefully.

RESULTS:

1. Of the major oil well sites located, how many were found associated with major natural gas sites? 1._____
2. How many oil wells were not near a natural gas site? 2._____
3. How many natural gas sites were not near oil well sites? 3._____

4. Were the majority of the sites found together?

4. _____

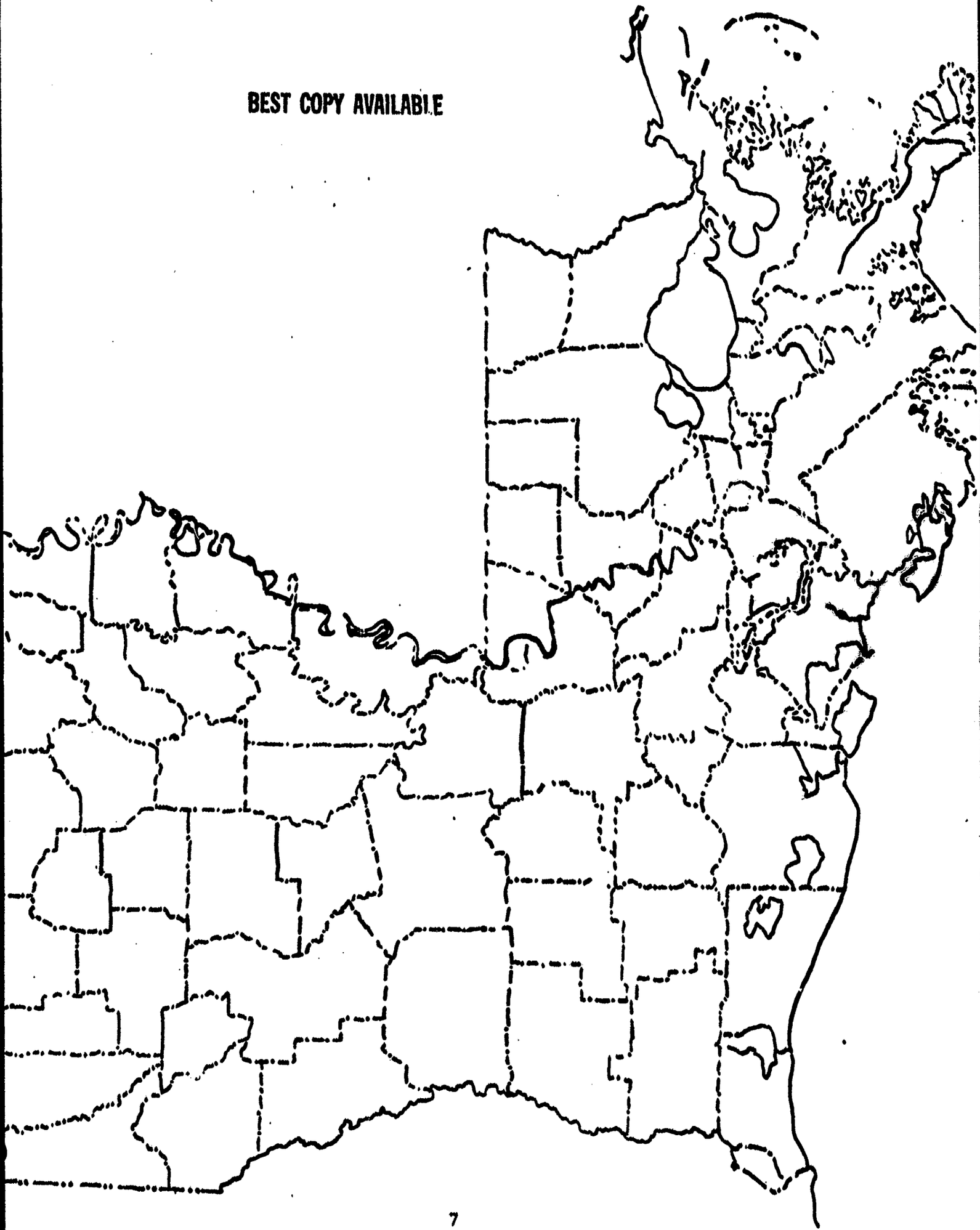
5. Explain in your own words why the two are found in association with each other.

5. _____

_____

_____

_____



CONCEPT 3:

Natural gas is an important and convenient resource for man.

OBJECTIVES:

1. Through a laboratory experiment, the students will be able to identify the amount of air necessary for the complete combustion of natural gas.

2. Through research and reporting, the students will be able to identify 5 different products which can be derived from natural gas and the value of each.

ACTIVITIES:

1. In a laboratory experiment, the students will work with a Bunsen burner to determine the correct mixture of air and natural gas needed for complete combustion. They will note what takes place during incomplete combustion.

2. Have the students conduct research on the different products which can be derived from natural gas and the apparent value of each. Then, the students may deliver their reports orally, and/or a quiz may be given asking the students to list five of the products and the value of each.

3. As a homework assignment, have the students identify all the appliances in their homes which use natural gas as fuel. After the lists are returned, have the students discuss why they think natural gas is used rather than other fuels, such as gasoline, kerosene, coal, etc.

STUDENT WORKSHEET

To Accompany: Concept 3, Activity 1

MINERALS

TASK:

Determine the correct mixture of air and natural gas needed for complete combustion of the natural gas.

MATERIALS:

Bunsen burner
Match or igniting tool
Porcelain dish

PROCEDURE:

1. Connect the Bunsen burner to the gas outlet.
2. Using either the match or the igniting tool, light the burner.
3. Adjust the air intake valve until the flame is blue.
4. Hold the procelain dish to the flame and observe.
5. Close the air intake valve so that a yellow flame appears.
6. Hold the procelain dish to the flame and observe.
7. Shut off gas and record results.

RESULTS:

1. Was there any evidence of ash on the porcelain dish when it was exposed to the blue blame? If so, describe.

1. _____

_____

_____

2. Was there any evidence of ash on the porcelain dish when it was exposed to the yellow flame? If so, describe.

2. _____

_____

_____

3. Which flame was the result of complete combustion? 3. _____

4. What did the other flame represent? 4. _____

5. How wide was the air intake valve opened for complete combustion to occur? 5. _____

6. This experiment illustrates one of the convenient properties of natural gas use, which one? 6. _____

CONCEPT 4:

Salt is a mineral resource and is obtained chiefly from deposits in the earth. There are many ways to obtain this mineral and it has a variety of uses.

OBJECTIVES:

1. In a laboratory exercise, the students will obtain salt from a salt water solution through a method known as distillation. Performance level to be determined by the teacher.

2. Through research and reporting, the students will correctly determine why salt domes are often an indication of oil deposits, and why salt is usually found in association with sulfur.

3. Through research and reporting, the students will list various methods used in the production of salt and the uses of salt, commercial and otherwise. After the list is compiled from all information, each student or group of students will research either one method of recovery and production or a use of salt.

ACTIVITIES:

1. Either the students, or the teacher in a demonstration, will perform an experiment to show that salt can be obtained from a method known as distillation.
(See Student Worksheet.)

2. The students will conduct library research to determine the answers to the following questions: (a) Why would one expect to find many salt domes in Louisiana? (b) Why are salt domes often an indication of oil deposits? (c) Why are sulfur and salt domes usually found in association?

3. The students will research to make a list of various methods used in recovery, production, and in the uses of salt . After a list is compiled from all the information, each student or a group of students will choose one method of recovery and production or a use of salt to research.

STUDENT WORKSHEET
To Accompany: Concept 4, Activity 1
MINERALS

TASK:

Illustrate how salt can be obtained from salt water.

MATERIALS:

Hot plate or other source of heat
2 Erlenmeyer flasks
2 rubber stoppers (with a hole through each one)
2 cornered glass tubings
Dish (large enough to hold the flask and ice)
Salt water
Ice

PROCEDURE: (See illustration)

1. Mix salt and water to form salt water in one of the flasks. Put 100 mls. of water and two tablespoonsful of salt in the beaker and stir.

2. Place one end of the glass tubing through one rubber stopper so that it extends about two inches below it. Place the other end similarly through the other stopper.

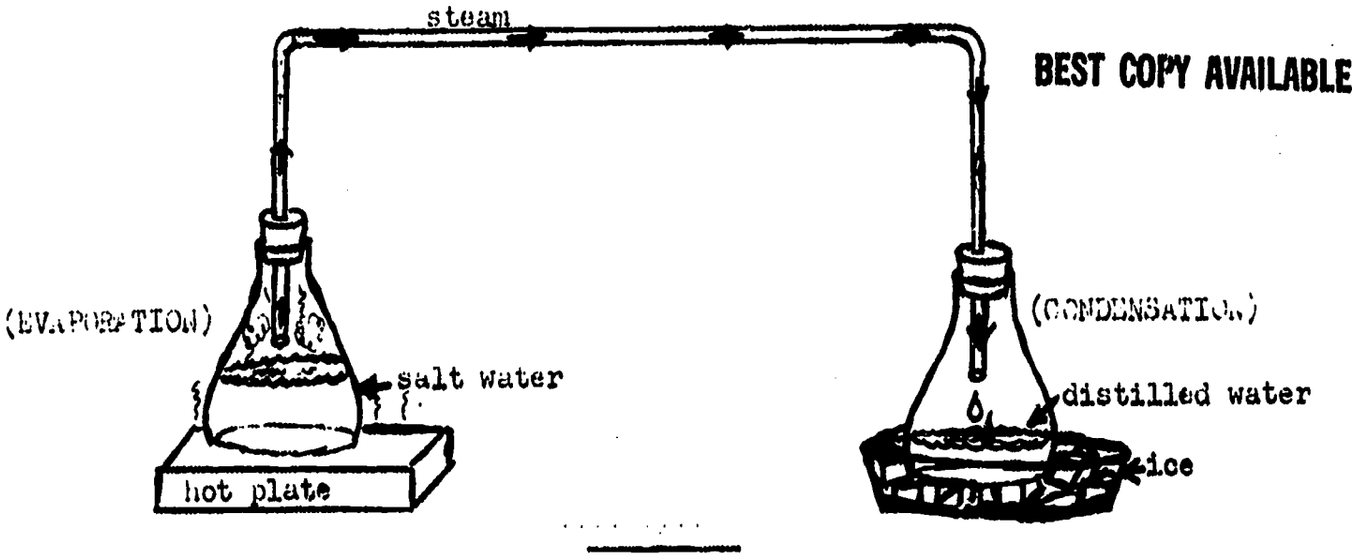
3. Place the salt water flask on the hot plate and heat.

4. Put the ice in the dish so that it covers the bottom.

5. Place the other flask in the dish on the ice and put a few more dubes around the sides of the flask.

6. Place the two beakers as far apart as the length of the glass tubing. Carefully stopper one flask and then the other.

7. Observe the salt water as it evaporates. Continue until all the water has evaporated.



RESULTS:

1. In this experiment, there were two physical changes which took place:
   a. In the evaporation process, explain the physical change.
   b. In the condensation process, explain the physical change.

   1.a. _____
   _____
   _____
   b. _____
   _____
   _____

2. After completely evaporating the salt water, what was left in the flask?

   2. _____
   _____

3. What was in the other flask?

   3. _____

4. What is the term applied to this process?

   4. _____
   _____

5. What do you think the purpose of the ice was?

   5. _____
   _____

6. Besides a process to obtain salt, for what else might this be used?

   6. _____
   _____

CONCEPT 5:

We need salt for our health and to make food taste better.

OBJECTIVES:

1. Provided with five different food samples (two of each type), the students will eat one of each sample without salt. Then, they will eat one of each of the five food samples with salt and compare. The students will perform the experiment to the satisfaction of the teacher.

2. Through research and reporting, the students will determine what part salt plays in the human body.

ACTIVITIES:

1. The students will conduct an experiment with five different foods samples (two of each sample) to compare the difference in taste with and without salt.
   (See Student Worksheet.)

2. The students will conduct research on the part salt plays in the human body, and report their findings to the class. The teacher may stress the fact that our tears, sweat and blood contain salt.

STUDENT WORKSHEET

To Accompany: Concept 5, Activity 1

MINERALS

TASK:

Determine if salt makes food taste better.

MATERIALS:

5 food samples (2 of each--1 unsalted, 1 salted)
The samples might include: cooked rice, cooked egg (boiled or fried), crackers (unsalted and saltines), peanuts, popcorn, cooked meat, or whatever else the teacher might think feasible.
10 petri dishes (1 for each salted sample and 1 for each unsalted sample)
Salt

PROCEDURE:

1. Place each of the five unsalted samples on five of the petri dishes.
2. Place each of the remaining samples on the remaining petri dishes, salt if necessary.
3. Place the like samples next to one another. (Example: Place the salted crackers to the unsalted ones.)
4. Taste the unsalted food sample; notice the flavor.
5. Taste the salted sample of the same food; notice the flavor.
6. Record your flavor preference on the chart by placing an *X* in the appropriate column next to the name of the food sample.
7. Repeat Nos. 4, 5, and 6 for the remainder of the food samples.

NOTE: Due to individual taste differences, the students may vary in their decisions as to which tastes better, salted or unsalted.

RESULTS:

Place the name of the food sample you tasted on the chart. Then, place an *X* in the column of your flavor preference.

FOOD SAMPLE	UNSALTED SAMPLE	SALTED SAMPLE
1.		
2.		
3.		
4.		
5.		

1. How many food samples did the salt improve? 1. _____

2. Was salt necessary to improve the flavor of all the food samples? 2. _____

3. Where on the tongue is salt tasted? 3. _____

4. Are there any substitutes for salt? 4. _____

5. How might we conserve our supply of salt? 5. _____

_____

_____

_____

CONCEPT 6:

Sulfur is a valuable non-metallic resource, and it has many industrial uses.

OBJECTIVES:

1. Using the film *Sulfur: From Brimstone to Bread*, an illustrated chart of the Frasch process, and a display of sulfur in various powder and solid forms, the students, working in groups, will prepare booklets.

2. With the class divided into four groups, each group will be responsible for a poster project concerning sulfur.

ACTIVITIES:

1. The students will view the film *Sulfur: From Brimstone to Bread*, an illustrated chart of the Frasch process, and a display of sulfur in various solid and powder forms. From this, the students will work in groups to prepare booklets illustrating the following:

    a. location in the earth;
    b. drilling process;
    c. transportation from drill site to refinery; and
    d. products from sulfur.

2. The students will be divided into four groups, and each group will be responsible for a project concerning one of the following about sulfur:

    a. location in the earth;
    b. drilling process;
    c. transportation from drill site to refinery; and
    d. products from sulfur.

CONCEPT 7:

Minerals are necessary for the production of many items.

OBJECTIVES:

1. Using all visible items in the classroom, each student will list at least five of these which are the products of minerals, and will also identify the mineral used in making each.

2. Through research on the following minerals: petroleum, salt, sulfur, natural gas, which are found in Louisiana, the students will determine the answers to the following questions:

    a. How are the different deposits formed?
    b. What methods are used for the recovery of each mineral?
    c. What are the commercial uses for each mineral and/or its by-product?
    d. What are some methods employed in the conservation of each mineral?

3. Using the information gathered during research, the students will construct posters with pictures or sketches of the products derived from minerals found in Louisiana. In order to ascertain the proficiency of the students, a game such as the following might be utilized. Have one pupil stand and name a mineral; he then calls on a second pupil to identify a product from this mineral. If this pupil answers correctly, he stands and follows the same procedure as the first. The game ends when at least every student has had a chance to contribute. Performance level to be determined by the teacher.

ACTIVITIES:

1. The students will list at least five items in the room which are products of minerals, and they will identify the mineral.

2. The students will conduct research on the four minerals founds in our area: petroleum, natural gas, salt and sulfur. They will record their findings on the chart provided.
(See Chart)

3. The students will construct posters with pictures and/or sketches of the products derived from the minerals found in Louisiana. As a culminating activity, they shall participate in a game such as the one outlined in Objective No. 3.

CHART TO ACCOMPANY: CONCEPT #7, ACTIVITY #2

MINERALS FOUND IN LOUISIANA	HOW DEPOSITS WERE FORMED	METHOD(S) FOR OBTAINING MINERALS	COMMERCIAL USES AND/OR BY-PRODUCTS	METHODS OF CONSERVING MINERAL RESOURCES
PETROLEUM				
SALT				
SULPHUR				
NATURAL GAS				

CONCEPT 8:

Minerals are present in the foods we eat, and they are necessary for proper body function.

OBJECTIVES:

1. Given a variety of food samples, the students will identify those samples which contain minerals by burning each to an ash and noting which turns to grey color.

2. Given labels from several vitamin jars and allowed to conduct research, the students will identify five minerals which the body needs and explain the function of each mineral in the body.

ACTIVITIES:

1. Given the following food samples: bread, cheese, ham, hardboiled egg, pickle, potato, onion, the students will burn these to detect the presence of minerals.
(See Student Worksheet.)

2. Have the students examine vitamin labels from any vitamin and mineral product, such as Myadec, Theragram-M, Paladec, etc. Have each student choose five of the minerals listed and conduct research to determine why each is necessary for proper body function.

STUDENT WORKSHEET

TO ACCOMPANY: CONCEPT 8, ACTIVITY 1

MINERALS

TASK:

Determine whether or not certain foods contain minerals.

MATERIALS:

Bunsen burner or candle
Wire gauze
Food samples: bread, cheese, ham, hard-boiled egg, pickle, potato, onion (each sample to be approximately 1 inch square, except the egg)

PROCEDURE:

1. Place the bread sample on a wire gauze over a flame from the Bunsen burner or the candle, so that it burns, observe and record results.

2. Repeat above procedure with each of the remaining food samples.

NOTE: Observe the color of the bread sample as it changes from black to light grey. This greyish-white ash indicates the presence of minerals.

RESULTS:

Use the chart below to record your observations; put a check in the appropriate column.

FOOD SAMPLE	MINERAL CONTENT	
	YES	NO
BREAD		
CHEESE		
HAM		
HARD-BOILED EGG		
PICKLE		
POTATO		
ONION		

1. Since the body needs minerals in order to sustain it, which of the above foods should be included in one's diet?

1. _____

_____

_____

2. Which of the food samples did not show evidence of mineral content?

2. _____

_____

CONCEPT 9:

Since mineral resources are non-renewable and exhaustible, their conservation should become the immediate concern for all people.

OBJECTIVES:

1. Through research and reporting, the students will write an essay concerning the methods of mineral conservation.

2. A resource person from a local mineral production company might be invited to present a talk to the students on the conservation practices used by his company. Culminating activity and performance level to be determined by the teacher.

3. Given a large fish bowl, plaster of Paris, three straws, oil, water, and gravel, the students will set up a mock oil pool and demonstrate two secondary recovery methods used by the petroleum industry to fully utilize petroleum resources. Performance level to be determined by the teacher.

4. Given new 25¢ pieces (ones in which copper is used for production), the students will examine them carefully and conduct research on their reproduction.

ACTIVITIES:

1. The students will conduct research and write an essay on the following methods of mineral conservation:

    a. mining and processing methods which result in the least waste;
    b. salvaging and reusing mineral products when possible;
    c. using renewable or plentiful substitutes for scarce or limited minerals; and,
    d. methods for using minerals as long as possible.

2. Ask a resource person from a local mineral production company to come and speak to the students on the conservation practices employed by his company.

3. Have the students perform an experiment to demonstrate two secondary recovery methods used by the petroleum industry to fully utilize petroleum resources.
(See Student Worksheet.)

4. Given new 25¢ pieces (ones in which copper was used in the production), the students will examine them carefully. The teacher may wish to show some old quarters (without copper) to illustrate the difference. The students will conduct research to answer the following questions:

    a. Of what materials are these new coins made?
    b. How much does the metal in the new quarters cost the government?
    c. How much did the metal in the old quarters cost?
    d. Why is silver no longer used in the production of quarters, dimes, half dollars, etc.?

STUDENT WORKSHEET

To Accompany: Concept 9, Activity 3

MINERALS

TASK:

Demonstrate two secondary recovery methods used by the petroleum industry to utilize fully petroleum resources.

MATERIALS:

Transparent jar (suggest use of a large goldfish bowl or container approximately that size)
Plaster of Paris (2 one-pound bags)
Gravel (approximately 1 gallon)
Used motor oil (approximately 1 quart)
Water (amount to be determined by teacher)
Old spoon
3 large soda straws (plastic preferred)
1 baking pan (in which to mix plaster of Paris)

PROCEDURE: (See illustration.)

1. Mix the plaster of Paris with water in the baking pan and stir with old spoon to make a paste.

2. Pour this into the jar to a depth of one inch. (Allow it to set for at least 24 hours.)

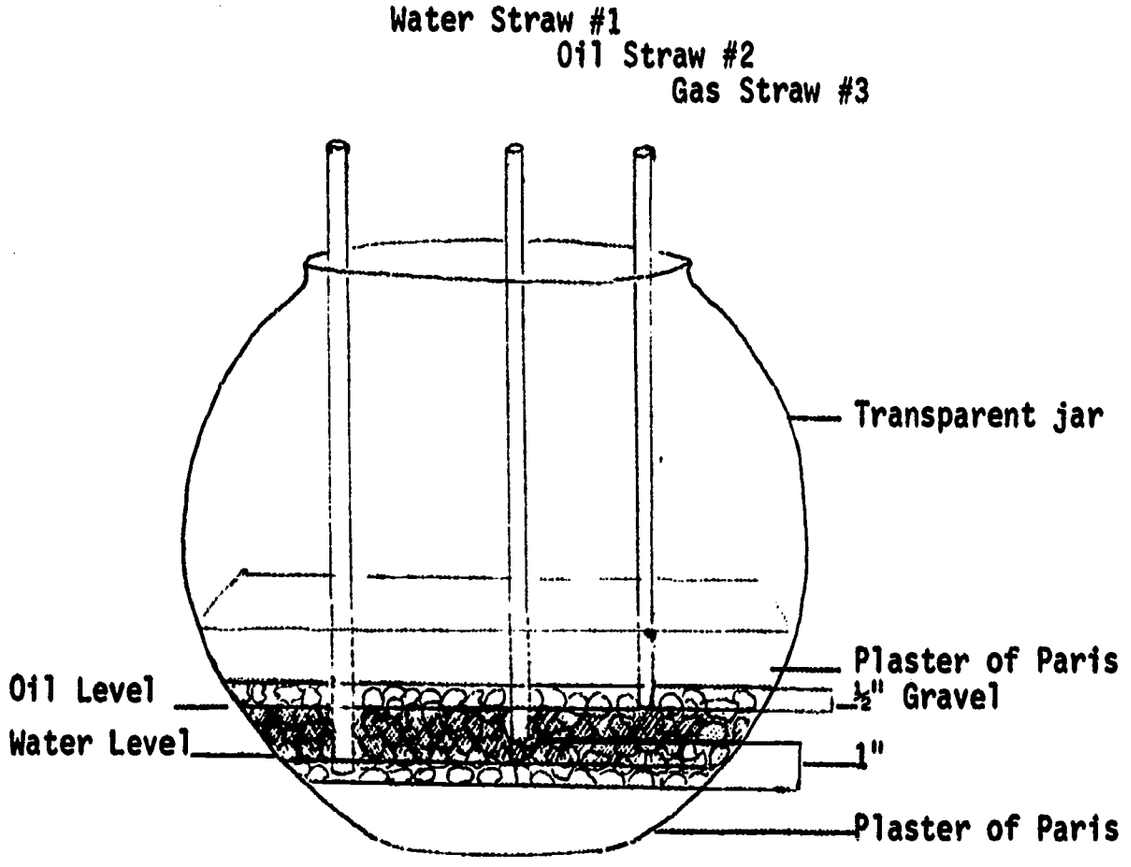
3. Pour the gravel into the jar to a depth of about two inches above the plaster.

4. Place straw No. 1 (the <u>water</u> straw) in the gravel and push it down until it reaches the plaster layer.

5. Place straw No. 2 (the <u>oil</u> straw) in the gravel and push it down until its bottom is one inch above the bottom of straw No. 1.

6. Place straw No. 3 (the <u>gas</u> straw) in the gravel and push it down until its bottom is about one-half inch deep in the gravel.

7. Hold the straws in place while you pour additional plaster-and-water mixture on top of the gravel about one inch thick. (Allow it to set at least 24 hours)



8. Pour water into the water straw until its level is just above the bottom of the water straw.

9. Pour oil into the oil straw until its level is just below the bottom of the gas straw.

RESULTS:

1. Hold your finger over the top of the water straw and blow gently into the gas straw. What happens?

1. _____

_____

2. Now close the top of the gas straw and pour water into the water straw. What happens?

2. _____

_____

_____

3. Compare what you have done with the actual oil field operations illustrated and described on Plate V of *Conservation: A Picture Discussion Kit* by the American Petroleum Institute.

3. _____

_____

_____

_____

CONCEPT 10:

In order to reduce the demand on our non-renewable resources, substitutes, such as solar energy and atomic energy may be used.

OBJECTIVES:

1. Through laboratory experience, the student will recognize the uses of sunlight as a source of heat and of electricity. Following the experiments, the students will write a paragraph explaining their findings and how they might be incorporated on a large scale.

2. Through library research, the student will determine the feasibility of using substitutes for our non-renewable resources, particularly atomic energy and electricity. The student, upon completion, will report his findings either in written form or in oral form or both.

ACTIVITIES:

1. Through laboratory experiment, the students will determine whether or not solar energy can be used to change water to steam, and, hence produce electricity.

2. Through laboratory experiment, the students will determine how solar energy might be used for heat production. (See Student Worksheet.)

3. Divide the class in half; assign one-half of the class to research atomic energy as a possible substitute for our non-renewable resources, and assign the other half to research electricity. In their written reports of their research, the students should include such information as: cost; efficiency; usefulness; plants in operation producing this type of energy for use; different ways of generating power from this source; and if this type of energy is generated in your area, how it is generated.

STUDENT WORKSHEET

To Accompany: Concept 10, Activity 1

MINERALS

TASK:

Determine how direct sunlight can be used to change water to steam.

MATERIALS:

Thermometer
Hand magnifying glass

PROCEDURE:

1. Place the thermometer in direct sunlight for five minutes.
2. Observe the highest temperature reached. Record results.
3. Place the same thermometer in the sunlight once again but this time focus the direct sunlight through the magnifying glass.

   NOTE: Watch the thermometer carefully; be sure to remove the magnifying glass before the thermometer breaks.
4. Observe the highest temperature reached. Record results.

RESULTS:

1. What was the highest temperature reached with the thermometer in direct sunlight? 1._____
2. Was this temperature high enough to boil water? 2._____
3. What effect did the magnifying glass have on the temperature? 3._____

4. Would the temperature reached with the aid of the magnifying glass have been able to change water to steam? 4. _____

5. What was the temperature reached? 5. _____

6. What is the temperature needed to change water to steam? 6. _____

7. What use could be made of water changed to steam in direct sunlight? 7. _____

STUDENT WORKSHEET

To Accompany: Concept 10, Activity 2

MINERALS

TASK:

Demonstrate how solar energy might be used for heat production.

MATERIALS:

2 thermometers
Black box (students may have to paint a box black)
Glass cover for the box
Gummed tape or string

PROCEDURE:

1. If a black box is not readily available, paint a box black.
2. Place one of the thermometers inside the box.
3. With the gummed tape or the string, attach the glass cover to the box.
4. Place the box outside the direct sunlight.
5. Place the other thermometer on the side of the box.
6. Let the box and the thermometer sit for about five to seven minutes.
7. Observe the temperatures reached by the two thermometers.
8. Record your findings.

RESULTS:

1. What was the greatest temperature reached by the thermometer inside the black box? 1._____

2. What was the greatest temperature reached by the other thermometer?

2. _____

3. Why do you think the box was painted black rather than another color, such as white?

3. _____

_____

4. Why do you think the box was covered with a glass? Could the temperature have been reached without the glass?

4. _____

_____

5. Do you think the temperature reached in the box was high enough to use to heat a home or other building? Explain your answer.

5. _____

_____

_____

6. What was the difference between the outside temperature and the temperature in the box?

6. _____

_____

7. During which season would you not want this type of heating? Why?

7. _____

_____

VOCABULARY

UNIT 6 MINERALS

ATOMIC ENERGY

BRINE

BUTANE

CARBON BLACK

COAL

COAL OIL

COMPLETE COMBUSTION

CONSUMPTION

DEPLETION

ETHANE

EXHAUSTIBLE

FOSSIL FUELS

FRASCH PROCESS

IGNITED

INCOMPLETE COMBUSTION

INERT

INTEGRAL

KEROSENE

METHANE

MINERAL

NATURAL GAS

NON-METALLIC

NON-RENEWABLE

ORE-ROCK

PETROLEUM

PROPANE

RECOVERY

RECYCLING

REFINING

ROCK OIL

SALT

SALT DISTILLATION

SALT DOME

SHAFT MINING

SOLAR ENERGY

SULPHUR

SULPHURIC ACID

SYNTHESIS

WET GAS

SUGGESTED QUESTIONS TO ACCOMPANY: UNIT 6, MINERALS

1. What is meant by the term *fossil fuels*?
2. What are the fossil fuels?
3. Which of the fossil fuels are found to great extent in Louisiana?
4. To what do the terms *coal oil* and *rock oil* refer?
5. List three of the products obtained through oil refining.
6. Why do oil and natural gas occur together in nature?
7. List five products which may be derived from natural gas.
8. What makes natural gas so convenient a fuel to use?
9. In what two ways does salt occur underground?
10. What are two methods used in our state to obtain salt?
11. List four uses of salt.
12. What method is used to obtain sulfur? Why is this the method preferred?
13. In what two forms is sulfur used?
14. List four uses of sulfur.
15. List five materials made from minerals.
16. What minerals are necessary for proper body functioning? What do they do?
17. List the non-renewable mineral resources found in our state and in our area.
18. What are some ways in which we might conserve our non-renewable natural resources?
19. Why is the proper utilization of non-renewable resources important?
20. Of what use might we make of atomic energy, electricity, and solar energy?

RESOURCE MATERIALS

FILMS:

Sulfur: From Brimestone to Bread, color, 25 min.--Freeport Sulfur Company, P. O. Box 61520, New Orleans, La. 70160.

Conservation of Natural Resources, b/w, 11 min.--Regional Film Library, University of Southwestern Louisiana, Lafayette, La.

FILMSTRIPS:

Mineral Resources and Conservation, Louisiana Social Studies (sound filmstrip)--St. Martin Parish Instructional Center, Breaux Bridge, La.

Salt, Set No. 18 (sound filmstrip)--St. Martin Parish Instructional Center.

TRANSPARENCIES:

Salt Domes, Louisiana Social Studies-Geography--St. Martin Parish Instructional Center.

Solar Energy, The Earth--St. Martin Parish Instructional Center.

Major Mineral Resource Areas of Louisiana, Louisiana Social Studies--Conservation Resources--St. Martin Parish Instructional Center.

Minerals, Elementary Science--St. Martin Parish Instructional Center.

Mining-Petroleum and Related Products, Louisiana Social Studies--Economics--St. Martin Parish Instructional Center.

PICTURES:

"CONSERVATION: A PICTURE DISCUSSION KIT"--Plate V, 1965--American Petroleum Institute, 1271 Avenue of the Americas, New York, New York 10020.

BOOKS, BOOKLETS, AND PAMPHLETS:

Brennan, Mathew J. *People and Their Environment* (Grades 4, 5, 6). Chicago, Ill.: J. G. Ferguson Publishing Co., 1969.

_____. *People and Their Environment* (1-12 Outdoor Laboratory). Chicago, Ill.: J. G. Ferguson Publishing Co., 1969.

"Conservation Tools for Education." Alexandria, Louisiana, USDA, 1968.

"Guide for Teaching Conservation and Resource--Use Education in the Schools of Louisiana--Minerals, A." North Louisiana Supplementary Education Center, 1969.

Mallinson, George G. and Jacqueline B., Douglas Brown and William Smallwood. *Science--Understanding Your Environment.* Morristown, New Jersey: Silver Burdett Co., 1972.

"Outline for Teaching Conservation in Elementary Schools, An." Alexandria, La.: USDA, 1971.

Schneider, Herman and Nina. *Science for Today and Tomorrow.* Lexington, Massachusetts: D. C. Heath and Company, 1968.

UNIT 7
PESTICIDES

UNIT 7 PESTICIDES

For many years potential animal and plant pests lived side by side with man without any major conflicts occurring. There are several reasons why these conflicts did not occur. Two of these reasons are that many of the potential pests were sufficiently controlled by natural predators, and some plants developed natural pesticides such as pyrethrin, which is found in certain flowers.

Today, a tremendous increase in human population has brought about an increased need to control plant and animal pests which compete with man for essentials such as food, and/or which are simply annoying to man. As a result, man has developed, and is continuing to develop, pesticides to control pests. Some of these pesticides are called *hard pesticides*; others are called *soft pesticides*. The hard pesticides, such as DDT, DDD, and heptachlor are usually cheap, easy to use, relatively safe to apply, and are long lasting. This last attribute has caused severe problems. Since these pesticides do not break down quickly, they accumulate in the tissues of living organisms and have been found to have adverse effects on many organisms.

The soft pesticides, such as pyrethrin, malathion, rotenone, and petroleum derivatives, are generally more expensive to produce than hard pesticides, are initially more poisonous to humans than the hard pesticides, and break down fairly quickly. Because of the first two attributes of soft pesticides, these pesticides are not commonly used on large scales. The last characteristic of soft pesticides makes them more desirable so far as the safety of the environment is concerned.

Another way man restrains pests is by using biological controls. A common example of this is the use of cats instead of poisons to control mice. The use of biological controls also has its drawbacks in that if they are used incorrectly, the intended controls may themselves become pests, which are generally harder to regulate than the original pests, which they, the controls, were supposed to check.

The solution to the pest control problem is not simple, and will require much work for years to come. Soft pesticides and biological controls provide only partial solutions to the problem, so hard pesticides must continually be used and will continue to pollute the environment until continue to pollute the environment until other workable methods of pest control are developed.

CONCEPT 1:

Man competes with insects.

OBJECTIVES:

1. Provided with encyclopedias and other research materials, the students will do research on insect pests which have caused crop damage in the past. Each student will identify at least three of these insect pests and the crops which they damaged.

2. After viewing a series of ten slides of insects which may cause crop damage, the students will correctly identify at least eight.

3. Provided with samples of sugar cane, sweet potatoes, corn, cotton, or other seasonal farm or garden crops which are infested with insect pests, the students will list these on a chart provided by the teacher and identify each of the insect pests on each of the respective samples.

ACTIVITIES:

1. Students will do research on insect pests of the past and identify at least three of these and the crops which they damaged.

2. Students will view a series of ten slides of insects which may cause damage to crops and will correctly identify at least eight of them.

3. Student will list a variety of local farm or garden crops and the insect pests which have infested them on a chart provided by the teacher. (The chart below may be duplicated on the chalkboard.)

INFESTED CROP SAMPLES	INSECT PESTS

CONCEPT 2:

Insecticides are used by man to destroy insects in and around the home.

OBJECTIVE:

1. Provided with a variety of insects and contact and ingested insecticides, the students will perform an experiment to determine which insecticide affects which insects.

ACTIVITY:

1. An experiment will be conducted by the students to determine which insects are affected by ingested insecticide, which are affected by contact insecticide, and which are affected by both. (See Student Worksheet.)

STUDENT WORKSHEET

To Accompany: Concept 2, Activity 1

PESTICIDES

TASK:

Determine which of the following insects are affected by ingested poison, contact poison, or both.

MATERIALS:

20 live insect samples--2 of each from the following: roaches, ants, house flies, moths, grasshoppers, termites, boll weevil, sweet potato weevils, beetles, butterflies, wasps, silverfish, earwigs, horse flies, crickets, stink bugs, mosquitoes, and any other insects as determined by the teacher
Contact poison (Sevin, Diazinon, Dilemulsion, or Chlordane)
Ingested poison (Calcium arsenate, Metaldehyde bait, or Kepone bait)
20 baby food jars with lids (punch holes in lids)
Food for each of the containers to be determined by the teacher

PROCEDURE:

1. Place one of each of the ten pairs of insects selected into ten of the baby food jars and label these *Contact Poison*. Cover with lids.

2. Place one of each of the remaining insect pairs into the other ten baby food jars; label these *Ingested Poison*; cover with lids.

3. Apply contact poison into each of the containers labeled *Contact Poison*.

4. Apply ingested poison into each of the containers labeled *Ingested Poison*.

5. Let the poison set in each of the containers for approximately 24 hours; observe, and record results.

NOTE: If poison should contact skin in any way, wash thoroughly and immediately with soap and water.

RESULTS:

Record your observations on the following chart (place check marks in appropriate columns).

INSECT SAMPLE	CONTACT POISON	INGESTED POISON	BOTH
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

_ 1. When buying a pesticide, what consideration should be given as to the insect to be killed?

1. _____

_____

_____

2. What environmental consideration should be taken when purchasing an insecticide?

2. _____

_____

_____

CONCEPT 3:

Man devises various methods to help control disease-causing pests.

OBJECTIVES:

1. Working in groups, the students will conduct research and prepare written and oral reports on the following diseases: malaria, bubonic plague, encephalitis (sleeping sickness), Rocky Mountain spotted fever, typhus fever, and yellow fever. Their presentations should include the cause, carrier, effects, controls, treatment and/or cure. The teacher may require students to make a visual presentation on the accompanying chart.

2. After several viewings of a series of ten slides concerning insects and other arthropods which may carry diseases that affect man, the students will again look at the slides and will identify each of the insects or other arthropods, the disease(s) each carries, and controls which are utilized. Performance level to be determined by the teacher.

ACTIVITIES:

1. Students will do group reports on a variety of diseases caused by pests.
   (See Chart with which students may provide visual presentations.)

2. The students will collect articles and illustrations from a variety of periodicals, bulletins, and pamphlets concerning pests and related diseases, as well as control measures with which they will construct a classroom poster.

3. Students will view a series of ten slides and identify the insects which cause diseases in man, the disease caused, and controls utilized.

CHART TO ACCOMPANY: CONCEPT 3, ACTIVITY 1 - PESTICIDES

DISEASES	CAUSES	CARRIERS	EFFECTS	CONTROLS	TREATMENTS AND/OR CURES
MALARIA					
BUBONIC PLAGUE					
ENCEPHALITIS					
ROCKY MOUNTAIN SPOTTED FEVER					
TYPHUS FEVER					
YELLOW FEVER					

CONCEPT 4:

When selecting pesticides, extreme care should be taken.

OBJECTIVES:

1. Provided with a pesticide chart (with harmful and safe ingredients noted), the students will conduct a survey both at home and in the community on brand name pesticides to determine the content of each. Upon completion of the survey, the students will be able to identify brand name pesticides which are safe to use in and around their homes.

2. In an effort to influence friends, relatives, and local merchants to use safe pesticides, the students will distribute to them five charts of safe pesticides with which to combat various home and garden pests.

ACTIVITIES:

1. The students will be provided with a pesticide chart with which they will conduct a survey of brand name pesticides in their homes and community. It is suggested that the teacher prepare a transparency of the pesticide chart in order that a composite of the entire class survey may be presented to the class. (See Student Worksheet.)

2. Each student will distribute five charts of safe pesticides with which to combat various home and garden pests to friends, relatives and local merchants. (See Chart.)

STUDENT WORKSHEET

To Accompany: Concept 4, Activity 1

PESTICIDES

TASK:

Determine which brand name pesticides are *safe* to use in and around the home.

MATERIALS:

Pesticide chart (provided in unit)
Brand name pesticides in the home
Brand name pesticides in the community (drug store, grocery store, hardware store, feed mill, etc.)

PROCEDURE:

1. Examine the content label on each of the brand name pesticides listed on your chart.

2. Place an *X* in the appropriate column for ingredients for each brand name pesticide (see example on chart).

RESULTS:

1. Which of the brand name pesticides contained dangerous ingredients for home use?

   1. _____
   _____

2. Which of the brand name pesticides contained *safe* ingredients which are not too dangerous for home use?

   2. _____
   _____

3. Which of the brand name pesticides would you recommend to your parents and friends? 3._____

4. Why would you not recommend the others? 4._____

5. What might happen if pesticides containing dangerous ingredients were used in your neighborhood? 5._____

6. What do you think should be done concerning the sale and use of pesticides containing dangerous ingredients? 6._____

7. Do you know of any of the ingredients listed on this chart that have been banned by the government? If so, which one(s)? 7._____

Pesticide Chart

Brand Names	Dangerous Ingredients														"Safe" Ingredients						
	Aldrin	Arsenic	BHD	Chlordane	DDT	Dieldrane	Endrine	Heptachlor	Lead	Lindane	Mercury	Q45T	Taxaphene	2,4D	Malathion	Methoxychlor	Pyrethrum	Rotenone	Sevin	Diazinon	Nicotine Sulphate
RAID																					
BUG X																					
GULF SPRAY																					
BLACK FLAG																					
MYREX																					
D-CON																					
NO BUGS M'LADY																					

Students may list additional brand name pesticides.

CHART TO ACCOMPANY: CONCEPT 4, ACTIVITY 2 - PESTICIDES

PEST	"SAFE" PESTICIDE
Aphids	Can often be washed off; otherwise, use nicotine sulphate, pyrethrum, rotene, malathion.
Caterpillars	Rotenone, Diazinon, methoxychlor, or carbaryl Sevin.
Chiggers	Malathion
Chinch bugs	Diazinon, Sevin
Cutworms	Diazinon, Sevin
Earwigs	Try dessicants in dry places.
Grasshoppers	Diazinon, Sevin
Japanese beetles	For soil grubs; malathion or Sevin for adults
Lawn moths	Diazinon
Mites (red spiders)	Oil spray, hot water
Scale insects	Diazinon, malathion, Sevin
Spittlebugs	Malathion, Sevin
Thrips	Nicotine sulphate, Diazinon, malathion, rotenone
Wireworms	Diazinon
Wood borers	Diazinon
Ants	Myrex
Roaches	Malathion, Diazinon, Baygon
Silverfish	Chlordane, Diazinon, malathion
Mice and rats	Anticoagulant baits: Warfarin or Pival

NOTE: Diazinon (Spectracide) is a broad-spectrum, reasonably short-lived phosphate that does not build up in food chains. Therefore, it is broadly effective. However, like Baytex, it has a peculiarly increased toxicity to birds; thus, do not spray a bush that may have an active bird's nest in it.

SUGGESTED QUESTIONS TO ACCOMPANY: UNIT 7 - PESTICIDES

1. How does excessive use of pesticides affect the balance of nature?
2. How has the increase in human populations throughout the world affected the use of pesticides?
3. To what types of pollution do pesticides contribute?
4. What are the two methods of controlling insect pests, and which is more ecologically sound?
5. What are some of the insect pests which damage crops locally?
6. What are some of the diseases transmitted by animal pests?
7. The Louisiana state bird faces extinction due to man's use of pesticides; which bird is this?
8. What is a destructive animal called?
9. What are natural enemies of animals called?
10. What factors have caused an increase in the use of pesticides?
11. When selecting a pesticide, what environmental factors should be considered?

VOCABULARY
UNIT #4 PESTICIDES

BIOLOGICAL CONTROL

CONSUMER

CONTACT POISON

FOOD CHAIN

INGESTED POISON

NATURAL

PEST

PESTICIDE

PREDATOR

SYNTHESIS

RESOURCE MATERIALS

FILMSTRIPS:

"Insects: Man's Greatest Rival." Source: St. Martin Parish Instructional Center.

"Insects: Helpful and Harmful Insects." Source: St. Martin Parish Instructional Center.

SLIDES:

Slide series # ___, demonstrating insects which damage crops. Source:

Slide series #____, demonstrating insects which may carry human disease. Source:

BOOKS, BOOKLETS, AND PAMPHLETS:

Carson, Rachel, Silent Spring. Greenwich, Connecticut: Faucet Publications, Inc., 1962.

Leinwand, Gerald, Air and Water Pollution. New York: Washington Square Press, Inc., 1969.

Turk, Amos and Jonathan, and Janet Wittes. Ecology Pollution Environment. Philadelphia, Pennsylvania: W. B. Saunders Co., 1972.

GLOSSARY

GLOSSARY

ABIOTIC COMMUNITY All non-living things that are part of food chains and webs.

ACTIVE ELEMENT An element which combines readily with other elements.

ADAPTATION The adjustment to the conditions of life.

AIR POLLUTION The addition of impurities to the air.

ARTESIAN WELL A deep well in which the water is forced upward by great underground pressure.

ATMOSPHERE The gaseous envelope of air which surrounds the earth.

ATOMIC ENERGY Energy derived from the splitting of atoms.

BAY Part of a sea or a lake that cuts into a coastline.

BIOLOGICAL CONTROL Plants and/or animals which control populations of other plants and/or animals by their activities.

BIOTIC COMMUNITY All organisms, both plant and animal, that compose food chains and webs.

BRINE Water which contains all the salt it can hold.

BUTANE A product of "wet" gas used as a fuel.

BY-PRODUCT Something that is produced or left over in addition to the main product in chemical and manufacturing processes. Example: Oxygen is a by-product of photosynthesis.

CARBON BLACK A produce of natural gas which is the blackest substance known to man, used to make ink, paint, rubber, batteries, and radio tubes.

CARBON DIOXIDE A heavy, colorless gas (CO_2) which is formed usually by the combustion and decomposition of organic substances, and which is taken in by green plants in photosynthesis.

CHANNEL EROSION The cutting away of soil by water concentrated in a drainage way.

CHLOROPHYLL The green substance found in most plants, which in the presence of sunlight, makes possible the process of photosynthesis.

CHLOROPLASTS The parts of green plants that contain chlorophyll.

COAL A mineral formed by the decomposition of vegetable matter.

COAL OIL Any oil refined from petroleum, especially kerosene.

COAST Land along the sea; seashore.

COMMUNITY A group of plants and animals living together.

COMPLETE COMBUSTION To burn completely, leaving no ash.

COMPOUNDS substances formed by the combination of two or more different kinds of atoms.

CONSERVATION Care and preservation of such natural resources as oil, coal, forests, and wildlife.

CONSERVATIONIST Person who practices conservation.

CONSUMER A plant or animal that does not produce its own food.

CONSUMPTION The using of a substance or resource.

CONTACT POISON A deadly chemical which is absorbed into an organism when the organism touches it.

CONTAMINATED Impure; unfit for use because of the presence of unwholesome or undesirable elements.

CONTOUR PLOWING Plowing across slopes.

CORROSIVE Anything that causes a gradual wearing away by chemical action.

CROP ROTATION Alternating of different crops in one field.

CULTIVATION The loosening or breaking up of soil. Usually in preparation for growing crops.

DAM — A barrier built across a waterway to check the flow of water.

DECOMPOSER — An organism which causes other organisms to rot and decay after they are dead. Example: bacteria

DEPLETED — Lacking one or more principal substances; lessened in quantity. Example: Soil low in available nitrogen.

DEPLETION — The emptying or reducing in amount.

DISTILLED WATER — Water from which impurities have been removed.

DROUGHT — A prolonged period of dryness.

ECOLOGY — The study of the relationship of living and non-living things to their surroundings and to each other.

ECOSYSTEM — Biotic (living) and abiotic(non-living) things interacting with one another.

ENERGY — The ability to do work.

ENVIRONMENT — The surroundings of living and non-living things at any given time.

EROSION — The carrying away of soil by wind or water

ETHANE — A product of "wet" gas used to manufacture petro-chemicals.

EXHAUST — Fumes given off by internal combustion engines such as automobiles, buses, jet planes, etc.

EXHAUSTIBLE — Subject to being used up entirely.

EXTERMINATED — Having gotten rid of completely.

EXTINCTION — The condition of being out of existence.

FALLOW — Cultivated land allowed to be idle during the growing season.

FILTERING — To remove solid material from a liquid through the use of a porous material.

FLAMMABLE — Capable of being ignited (lit) and of burning rapidly.

FOOD CHAIN — Food sequence in a community.

FOOD WEB — Interlocking food chains in a community.

FOSSIL FUELS — Coal, oil, and natural gas formed from decayed plants and/or animals millions of years ago.

FRASCH PROCESS — Method of mining sulphur which includes drilling of wells and pouring in boiling water to obtain the sulphur in liquid form.

FRESH WATER — Water which is not salty in composition.

GRANULES — Small particles.

GROUND WATER — Water within the earth which supplies wells and springs.

GULF — A large area of ocean reaching into the land.

GULLY EROSION — Temporary runoff during and right after a rain which washes so deep that it forms huge cracks in the earth's surface.

HABITAT — The place or type of site where a plant or animal naturally or normally lives.

HERBICIDE — A chemical substance used to kill plants.

HYDROSPHERE — The liquid portion of the earth.

IGNITE — Set on fire

IMPURITIES — Any foreign matter in a substance.

INCINERATION — The burning of material to ashes.

INCOMPLETE COMBUSTION — To burn leaving an ash behind.

INERT — Having no active chemical properties.

INGESTED POISON — A deadly chemical which must be eaten by organism in order to kill the organism.

INSECTICIDE — A chemical substance designed to kill insect

INTEGRAL — Necessary for completeness.

INTERDEPENDENCE — The dependence of things upon one another; mutually dependent.

KEROSENE — A mixture distilled from petroleum, used to burn for light.

LEVEE — Built up river banks made of either earth or concrete.

LOAM — Soil with varying proportions of clay, silt, and sand.

MACROSCOPIC — Large enough to be seen with the naked eye.

METHANE — A product of "wet" gas used as a fuel and in chemical synthesis. The main component of natural gas.

MICROSCOPIC — Too small to be seen with the naked eye.

MINERAL — Any substance found in the earth that is neither plant nor animal.

NATIVE — Born in or belonging naturally in a certain area.

NATURAL — Produced by nature

NATURAL GAS — Gas coming from the earth's crust through natural openings or wells, used chiefly as a fuel.

NON-METAL — Not metallic, lacking the properties of a metal.

NON-POROUS — Material which will not allow the penetration liquids.

NON-RENEWABLE — Anything which cannot be replaced.

NON-RENEWABLE RESOURCES — A natural resource which cannot be replaced.

NUTRITIONAL VALUE — The amount of growth and repair that food allows.

ORE-ROCK — Rock containing a valuable resource.

ORGANISM — Any individual animal or plant that has life and is so organized that it can continue the process of life.

OXYGEN — A colorless, odorless, tasteless gas which is a by-product of photosynthesis and is essential to the maintainance of life.

PEST — A plant or animal harmful to man; a nuisance.

PESTICIDE — A chemical substance designed to kill or get rid of pests.

PETROLEUM — An oily liquid found in earth (rock oil).

PHOTOSYNTHESIS — The process whereby green plants use sunlight to manufacture food.

PHYTOPLANKTON — Tiny living plants living in bodies of water

POLLUTANT — A substance or material which makes things impure.

POLLUTION — The process of making dirty or impure.

POROUS — Allows penetration of liquids.

PRECIPITATION — Moisture condensed in the atmosphere and falling upon the earth, such as rain, hail, sleet, or snow.

PREDATOR — An organism which feeds on other organisms

PRODUCER — An organism which makes food such as green plants.

PROPANE — A product of "wet" gas used as a fuel.

PROSPERITY — The condition of being successful.

PURIFY — To make pure or clean.

RADIATION — The process of emitting radiant energy in the form of waves or particles.

RADIOACTIVE WASTES — Waste products produced in the production of radioactive materials.

RECOVERY — To get back; reclaim.

RECYCLING — To make a used produce usable again.

REFINING — Reducing a mineral to a pure state.

RENEWABLE NATURAL RESOURCE — A natural resource which can be replaced.

RILL EROSION — Very shallow trenches cut by running water.

ROCK OIL — Petroleum.

RUNOFF — Water from rain or melted snow that flows on the surface of the land.

SALINE — Consisting of or containing salt.

SALT — White substance, sodium chloride, found in sea water and embedded in sedimentary rock layers.

SALT DISTILLATION — The heating of sea water in order to separate the salt from the water.

SALT DOME — An underground bed of rock salt which has been pushed upward through the overlying layers in the shape of a dome.

SEA WATER — Water in or from the sea.

SEWAGE — Waste material carried by water.

SHAFT MINING — A type of mining in which a vertical or inclined hole is dug in the ground to allow removal of minerals.

SHEET EROSION — Uniform removal of soil from an area in thin layers.

SMOG — A mixture of smoke and fog; also, a mixture of exhaust substances that are changed by sunlight.

SOIL BLOWING — Soil-filled wind blowing over an area.

SOIL CONSERVATION — The wise use and management of soils to get the most production with the least amount of deterioration to the soil.

SOLAR ENERGY — Energy produced by the action of the sun's light or heat.

SOOT — Smoke and ash produced by burning.

SPLASH EROSION — The breaking up of soil mounds and granules by the action of raindrops.

STREAM EROSION — The erosion of river banks and beds by the action of a moving river.

STRIP CROPPING — Growing a strip of grass or other close growing crop between strips of cultivated crops.

SUBSOIL — The layer of soil beneath the topsoil, which extends on downward to the bedrock.

SULPHUR — A light yellow, non-metallic chemical element formed in sedimentary rock layers.

SULPHURIC ACID — A dense, oily, colorless, highly acid liquid, used extensively in manufacturing.

SURFACE WATER — Water which flows on the surface of the land, such as lakes, rivers, and streams.

SYNTHESIS — To unite or build up to a compound; the artificial formation of a naturally occuring compound.

TECHNOLOGY — Applied science.

TERRACING — A type of farming in which crops are grown on raised embankments with level tops. This is done on hilly or mountainous land.

TOPSOIL — The upper layer of soil.

URBAN ENVIRONMENT — Environment in or characteristic of a city.

VEGETATION — Plants growing in an area.

WATER TABLE — Topmost layer of underground water; level below which the ground is saturated with water.

WATER WELL — Hole dug down into the earth to reach the underground water table.

WATERFALL EROSION — Removal of soil by water over a soil bank causing the waterfall to move upstream.

WEATHERING — The wearing away of rock by the factors of the weather (rain, wind, etc.) to form soil.

"WET" GAS — Natural gas which contains a high percentage of condensable hydrocarbons.

WIND EROSION — Removal of soil by the action of the wind.

ZOOPLANKTON — Tiny animals living in bodies of water.