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ABSTRACT

This conservation curriculum guide contains units on the air, water, soil, plants, and animals. The guide is organized by grade levels--kindergarten, primary, intermediate. Objectives and concepts are listed and suggested activities are complete with a statement of procedure and necessary materials. A resource appendix includes books, films, and filmstrips. This work was prepared under an ESEA Title III contract. (LS)

The Project Earth curriculum is directed toward those who would use the environment to learn about man's role and responsibility to nature and to learn to conserve and enjoy his natural surroundings.

It is the hope of the curriculum committee that teachers will use this guide to the fullest and add further innovations.

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THE USE OF THE PROJECT EARTH GUIDE

This guide was prepared to assist the teacher in the preparation of lessons pertaining to the various aspects of the environment. The language of the guide is, for the most part, that of the teacher. It was felt that the teacher can best determine the appropriate translation of terminology for her own students.

Levels. An attempt was made to include objectives concepts, and activities that would be most appropriate within broad age levels. Again, each class and some individuals cannot be matched to any process involving levels. The teacher's knowledge of her own students and her expertise in assessing individual needs will make the difference in each lesson.

Objectives. The objectives for each unit are stated in terms of what the student should be able to do after he has engaged in activities designed to assist him in the adoption of particular concepts.

Concepts. The concepts listed with each unit are mostly for the teacher's information and guidance. It may be desirable in some cases, for students to view them, but they are not listed for the purpose of providing a student activity.

Activities. These are only suggested activities. The teacher is urged to enlarge upon them, refine them, and select from among them for particular student needs and interests.

AIR - THE ENVIRONMENT

Level - Kindergarten

A. Objectives:

1. The child will be able to explain how air can be felt.
2. The child will be able to explain how wind helps man.
3. The child will be able to explain how wind can harm man.
4. The child will be able to recognize obvious pollution of air.

B. Concepts:

1. Air is all around us.
2. Air pushes.
3. Wind is moving air.
4. Wind may either help or harm man.
5. Air has substance.
6. Smoke pollutes the air.

C. Activities:

1. Teacher Demonstration:

a. Materials - glass dish, jar, water.

Procedure - invert a jar in a glass dish of water.

Observe that the water does not go in the jar until you tip it and allow bubbles of air to escape.

b. Materials - rectangular piece of cork, paper or cloth scraps, balloon, water, container for water (with wide flat surface).

Procedure - make a boat using the rectangular piece of cork. Place a paper or cloth sail on it. Place the boat in the container of water and blow air against it. Inflate a balloon. Release the air near the boat. Her air is strong wind.

c. Materials - ripe milkweed pod or dandelion.

Procedure - observe ripened milkweed seeds or dandelion seeds on a relatively calm day as they float through the air. Compare the results with those received on a windy day.

d. Make carbon monoxide. Give each child a small portion of baking soda in paper cups. Add vinegar. Discuss the reaction. Talk about where carbon monoxide is produced and released.

2. Student Activities:

a. Make a pinwheel.

b. Make a miniature windmill.

c. Tell about or collect pictures that show things which depend on the wind (kites, windmills, gliders, balloons, sailboats, etc.)

d. Tell about experiences with the wind.

e. Make a hand fan.

f. During one week, observe and count the number of smoke stacks or chimneys from which smoke is rising.

g. Observe the things that move through the air on a windy day.

h. Observe what happens when a blown up balloon is released. Try different positions.

i. Bring in pictures from newspapers and magazines of "things" that cause air pollution.

j. Place vaseline on cardboard strips. Ask each child to place them in certain places in school or at home for 3 days. Look at them and discuss what is found there. Discuss the fact that this is the air we breathe. Variation: Assign certain places in which they shou be placed, e.g.: behind car exhaust.

AIR - THE ENVIRONMENT

Level - Primary

A. Student Objectives:

1. The child will be able to prove that air has substance.

2. The child will be able to explain & demonstrate how man uses air in his work.

3. The child will be able to demonstrate how we can feel air though we cannot see it.

4. The child will be able to list the pollutants of air -- man-made and natural.

5. The child will be able to illustrate actions that he can take to reduce air pollution.

6. The child will be able to show & explain what happens to plants that have lost their oxygen supply.

7. The child will be able to list the physical properties of air & & tell how we can recognize them.

B. Concepts:

1. Air is everywhere and takes up space.

2. Air presses on many things and can be made to do work.

3. Winds are caused by moving air.

4. Although we cannot see the air around us, it has many physical properties.

5. Air is essential to plant and animal life.

6. Cutting off man's air supply will cause him to suffocate.

7. Automobile fumes, industrial wastes, and dust particles can make air harmful to breathe.

C. Activities:

1. Teacher Demonstration:

a. Materials - large flowering plant, jar large enough for plant.

Procedure - seal a large growing plant with flowers on it in a jar. Fill the jar with the plant in order to use up oxygen. Observe how long it takes for the flower and plant to wither and die.

b. Materials - flask, one-holed rubber stopper to fit flask, two-holed rubber stopper to fit flask, funnel with a tube of the right size for the holes in the stoppers.

Procedure - put the tube of the funnel through the hold in the one-holed rubber stopper. Use a twisting motion so that the tube will not break. Put the stopper in the neck of the flask. Pour water into the funnel. The water will not run steadily into the flask. Perhaps, after a little has run into the flask, no more will run in until you jar the flask. Then it will flow into the flask in spurts. Take the one-holed stopper out of the neck of the flask. Remove the funnel and put it in the two-holed stopper. Empty the water from the flask and insert the two-holed stopper in the neck. Pour water into the funnel. It will run steadily into the flask.

2. Student Activities:

a. Have children blow on their hands to demonstrate that air can be felt. Discuss the power of winds.

b. Go outdoors and have the children run and feel the air against their faces and hair.

c. Go outside and see how many things the children can observe that the wind is moving.

d. Discuss the "good" and "bad" air. Bad air causes sleepiness and can cause suffocation as a result of a lack of oxygen. Always have

a supply of fresh air. The more people in a room, the more is needed.

e. Discuss diseases caused by air pollution - common cold and other communicable diseases.

f. Discuss the human filter system (moist hairs and membranes in nose catch dust particles and other pollutants). Sneezing expels excess of particles. Emphasize importance of breathing through the nose.

g. Discuss breathing. Animals breathe oxygen from the air; fish are adapted to inhaling oxygen from the water. Both expel carbon dioxide. Plants absorb carbon dioxide from the air and expel oxygen.

h. Discuss all kinds of suffocation - drowning, cellophane, abandoned refrigerators, and other enclosures. Emphasize the danger of playing with anthing which could block air supply. Putting cellophane over one's mouth or hear is like closing oneself in a jar.

i. Draw pictures of a skindiver with oxygen tanks to show how people can prevent suffocation. Draw pictures of refrigerators with the doors off.

AIR - THE ENVIRONMENT

Level - Intermediate

A. Objectives:

1. The child will be able to list and explain how one can recognize the physical properties of air.

2. The child will be able to explain how plants, humans and animals depend on air for their existence.

3. The child will be able to demonstrate and illustrate air pollution.

4. The child will be able to illustrate the layers of the atmosphere.

5. The child will be able to demonstrate how man uses air in his work.

6. The child will be able to diagram the composition of air.

7. The child will be able to illustrate and demonstrate the interdependence of plants and animals. (O-CO_2 cycle)

8. The child will be able to explain why an airplane flies.

9. The child will be able to show ways by which one can prevent suffocation.

10. The child will be able to demonstrate expansion and contraction of air.

11. The child will be able to show changes in air conditions which would affect weather.

12. The child will be able to explain the environmental changes made by man.

13. The child will be able to explain the environmental changes made by natural causes.

14. The child will be able to discuss some solutions to environmental problems.

B. Concepts:

1. Air is composed of a combination of gases and has recognizable physical properties.

2. Humans, plants, and animals depend on air for life.

3. Cutting off man's air supply will cause him to suffocate.

4. Pollution replaces oxygen in the air with poisonous substances, making air harmful to breathe.

5. Air is one of nature's most universal resources and serves man in many ways.

6. Air contains two basic ingredients - nitrogen and oxygen.

7. Air expands when heated and contracts when cooled.

8. Air expands and becomes lighter when it is warmed, and it is pushed up by cooler, heavier air.

9. Changes in air conditions determine the weather.

10. We live at the bottom of an ocean of air called the atmosphere.

11. Air has weight.

12. Atmosphere is divided into troposphere, stratosphere, and ionosphere.

13. Man uses air in his work.

14. Air transportation is possible because air is dense enough to support considerable weight.

C. Activities:

1. Teacher Demonstrations:

a. Materials - atomizer.

Procedure - demonstrate the movement of air by the use of an atomizer. Release a minute amount of vapor (perfume) from one corner of the room and have the children raise their hands as the scent reaches them.

b. Materials - ammonium nitrate, several small plants in a planter.

Procedure - using ammonium nitrate, show the effect of nitrogen on plants by fertilizing one small area in a planter.

c. Materials - two healthy plants, two clean glass jars with covers.

Procedure - put healthy plants in two clean jars with covers. Cover

one of these jars and leave the other one uncovered. Keep out of direct sunlight. Check peri ally.

d. Materials - toy airplane, fan.

Procedure - demonstrate air lift on a toy plane by use of a fan. Explain that the difference in pressure above and below the wing caused the lift.

e. Materials - a glass flask, a one-holed rubber stopper of the right size to fit the flask, a twelve inch glass tube, smoothed at both ends, of the right diameter to fit the hole in the rubber stopper, a glass bowl, red ink.

Procedure - put the glass tube through the hole in the rubber stopper. Put the tube in with a twisting motion to lesson the danger that it will break. Put the stopper in the neck of the flask. Fill the bowl with water colored with red ink. Turn the flask upside down. Put the end of the tube in the water in the bowl. Clasp the large part of the flask with your hands. Bubbles will soon begin to come from the end of the tube. Keep your hands on the flask until you have driven out at least twenty-for bubbles, or until the bubbles stop coming. Then remove your hands from the large part of the flask and hold the flask by the neck. Keep the end of the tube in the water in the bowl. Soon water will rise in the tube from the bowl. When it stops rising, clasp the flask again and watch it go down.

f. Materials - a quart milk bottle (glass), a hard-boiled egg, a large kitchen match.

Procedure - take off the shell of the hard-boiled egg. Light the match and drop it into the milk bottle. Put the egg in the mouth of the bottle. You will find that the egg is a little larger around than the mouth of the bottle. It cannot fall through. It may bounce up and down once or twice. The match soon goes out. Then the egg goes slowly down through the neck of the bottle and drops with a "plump". Next, turn the bottle up so that the egg is resting at the lower end of the neck of the bottle. The egg is still too large to fall through the neck. Hold the mouth of the bottle to your lips. Blow hard into the bottle. If you blow hard enough, the egg will come out.

g. Materials - a pyrex test tube, a ring stand, a burette clamp, a Bunsen burner, red oxide of mercury, paste sticks.

Procedure - put about an inch of red oxide of mercury in the bottom of the pyrex test tube. Stand the Bunsen burner on the base of the ring stand. With the clamp fasten the test tube in place over the Bunsen burner. The test tube should be slanted. Light the Bunsen burner. After a minute or two light a paste stick and then blow out the flame. While the stick is still glowing, thrust it into the test tube. It will probably furst into flames. If it does not, try at one minute intervals until it does. Look closely at the test tube after it has been heated for several minutes. You will see a silvery coating on the inside of the tube a short way above the red oxide of mercury.

2. Student Activities

a. Construct graphs to show the composition of air - oxygen, nitrogen, carbon dioxide, inert gases, moisture.

b. Demonstrate elementary theories of aerodynamics by flying paper airplanes or paper plates outdoors.

c. Discuss the oxygen-carbon dioxide cycle and the interdependence of plants and animals.

d. Discuss the nitrogen-fixing bacteria from air on the roots of legumes. Lightening frees nitrogen which combines with rain helping in fertilization.

e. Draw pictures illustrating how man uses air for transportation - planes, balloons, sailboats, etc.

f. Show how plants depend on the air to scatter their seeds and ensure survival of the species. Discuss how the various seed structures are adapted to air transportation.

g. Discuss cause of suffocation that relate especially to children. Emphasize the danger of playing with anything which could block air supply.

h. Construct a graph of the relationship between O_2 and CO_2 in a place where air supply cannot be replenished.

i. Discuss oxygen supply problems in space travel.

j. Discuss the causes of air pollution.

k. Collect pictures and newspaper articles concerning air pollution.

l. Discuss the problems of space travel:
    1. Difficulties in eating because of lack of air pressure (gravity is the principal problem).
    2. Problem of extreme changes of outside pressure when the vehicle re-enters the atmosphere.
    3. Providing air supply (for breathing) in flight.

WATER - THE ENVIRONMENT

Level - Kindergarten

A. Objectives:

1. The student will be able to list functions of water and its importance to life.

2. The student will be able to tell where water is found near his home.

3. The student will be able to list several uses of water.

4. The student will be able to identify clear water and water containing suspensions of foreign materials.

5. The student will recognize water in its different states.

6. The student will be able to identify the relationship of the use of water to the generating of electricity.

B. Concepts:

1. Everything alive needs water.

2. Everything alive uses water.

3. Water is used to bathe.

4. Everyday we drink water.

5. Water is needed to swim.

6. Plants need water.

7. Mother needs water to cook.

8. Water is needed to clean things.

C. Suggested Activities:

1. Teacher Demonstrations:

a. Materials - paper cup, water, refrigerator.

Procedure - fill paper cup with water and place in refrigerator's freezing compartment. When water changes to ice, remove from the refrigerator. Observe the ice return to water.

b. Materials - glass of water, kettle.

Procedure - pour glass of water into a kettle. Observe water go out from kettle as steam.

c. Materials - pan, faucet.

Procedure - catch some rain in a pan. Compare it with water from a puddle and a faucet.

d. Materials - plants.

Procedure - observe plants that are watered regularly and some that are not watered.

e. Materials - stalk of celery, dye, water, glass.

Procedure - to observe how water circulates in plants, place a stalk of celery in a glass of colored water.

f. Materials - carrot top, dish, water.

Procedure - place a carrot top in a dish of water. Observe it begin to grow.

g. Materials - sweet potato, water, glass, toothpicks.

Procedure - place sweet potato in a glass of water using toothpicks so that only half is submerged. Potato will begin to sprout leaves.

h. Introduce the idea of the importance of water in industry and to generate electricity.

i. Stress the importance of saving water from pollution that results in health hazards, less wildlife, poisoning of the water, and waste.

j. Locate the bodies of water surrounding or near the state. Discuss these as a natural resource for recreation and how different life would be if they were all polluted (including the ocean).

2. Student Activities:

a. Materials - snow, faucet.

Procedure - melt some snow. Compare it with water from a faucet.

b. Materials - pictures.

Procedure - collect pictures of plants and animals that live in water.

c. Materials - seeds.

Procedure - children can bring in seeds and plant a garden. They will see that unwatered seeds will not grow.

d. Materials - pictures.

Procedure - children can discuss how animals use water. Pictures of animals drinking, bathing, etc. can be taken to school from magazines.

e. Materials - health books.

Procedure - through class discussion, children will mention how we use water for hygiene.

f. Materials - pencil and paper.

Procedure - have children list the many ways in which mother uses water in the home.

g. Materials - pictures.

Procedure - have children bring in pictures showing the use of water for recreation such as swimming, fishing, and boating.

h. A field trip to a polluted stream, if possible, to show the damage caused by careless citizens.

i. Plan a "water hunt" in the school to find out where the water outlets are and what carries it through the school. Examine pipes and the point at which water enters the school.

WATER - THE ENVIRONMENT

Level - Primary

A. Objectives:

1. The student will be able to list many living things that need water for survival and growth.

2. The student will be able to explain how water travels through plants.

3. The student will be able to demonstrate evaporation caused by heat and moving air (wind).

4. The student will be able to identify suspensions of soil in water.

5. The student will be able to explain that fish use air that is dissolved in water.

6. The student will be able to recognize that fog and clouds are water suspensions in air.

7. The student will identify water as the most universal solvent.

8. The student will recognize snow, sleet, and rain as water being returned to the land.

9. The student will be able to trace streams and rivers running into larger bodies of water.

10. The student will be able to find examples of many animals which live in the water.

11. The student will be able to recognize how man uses water to do some of his work.

12. The student will be able to recognize how plants take in and give out water.

13. The student will be able to recognize the need for irrigation in certain areas.

14. The student will be able to infer the large amounts of water used in daily life.

15. The student will be able to describe occasions on which men have survived without food as long as a water supply was available.

16. The student will be able to recognize the need for clean water for plant and animal use and for recreational purposes

B. Concepts:

1. Rain is water.
2. All living things need water.
3. Some things float in water, some sink.
4. Heat and wind make water evaporate quickly.
5. Water can be harmful and useful.
6. Water will evaporate.
7. There is air in water.
8. Some water has soil in it.
9. Plants and animals need water to live.
10. Many substances will dissolve in water.
11. Water has different kinds of things in it.
12. Rain and snow make the water on the land.
13. Big rivers run into lakes and seas.
14. Water is a home for many animals.
15. Water can work for man.
16. Plants take in water and give off water.
17. Different animals get water in various ways.
18. Water is used to play in, drink, and to help us keep clean.
19. Irrigation has made good farms out of dry lands.
20. Some furnaces use water for heating.
21. Because we use billions of gallons of water daily, we must have good water.
22. Water is necessary for the well-being of plants, animals, and man.
23. Water is the most important substance for growing crops.
24. Water is used for recreational purposes.
25. From earliest time, man made his home around water.
26. Water has always been a precious commodity.

27. More effort should be made to prevent pollution.

C. Suggested Activities:

1. Teacher Demonstrations:

a. Take a field trip to observe and bring back samples of water from an irrigation ditch, pond, and various places.

b. Dissolve sugar and salt in water. Put soil in a jar of water and shake.

c. Show how running water carries soil.

d. On a foggy day, point out that we get wet even though it is not actually raining.

e. Examine the schools heating plant. Does it use water or steam for heating?

f. Use a film and show what irrigation can do for dry lands.

g. Help the children to plan and set up a balanced aquarium.

h. Discuss the importance of protecting fish and animals so there will always be enough left.

i. Visit ponds and streams nearby and discuss observations of pure and polluted conditions. Discuss ways by which some pollution may have been avoided.

2. Student Activities:

a. Boil water. Steam rises. Hold a glass above the steam. Watch steam cool, collect on glass, then fall.

b. Take large cookie tin with clay. Build landscape on hills, gulleys, etc. Pour water over this. Watch how ponds and lakes would be formed.

c. Measure rainfall be leaving a can out in the rain. Measure with a ruler.

d. Water one plant and not another. Observe.

e. Observe how water circulates in plants. Place a stalk of celery in a dish of colored water.

f. Place sweet potato in a glass of water using toothpicks so that only half is submerged. Potato will begin to sprout leaves.

g. Children can bring in seeds and plant a garden. Let them observe that seeds will not grow underwater.

h. Write short stories on ways water is used at home and at school.

i. Collect pictures of plants and animals that live in water.

j. Notice where and what plants were growing in moist and semi-moist areas.

k. Make a chart with pictures showing animals that live in fresh water and in salt water.

WATER - THE ENVIRONMENT

Level - Intermediate

A. Objectives:

1. The student will be able to list means by which water can be polluted.
2. The student will be able to suggest methods by which water pollution can be avoided.
3. The student will be able to construct models which demonstrate several methods of irrigation.
4. The student will be able to give examples of industrial and highway construction which interferes with plant and animal life.
5. The student will be able to suggest alternatives for the use of land by industry.
6. The student will be able to estimate how much more water his community will need as land is further developed for habitation.
7. The student will be able to illustrate the water cycle in detail.
8. The student will be able to list and give examples from his own community or neighborhood of water erosions brought about by the removal of plant life.
9. The student will be able to locate watersheds in his area.

B. Concepts:

1. Water carries many kinds of materials.
2. Food and air dissolved in water can enter cells.
3. The world's water never stops traveling.
4. The top line of water is called the water table.
5. Even though water looks clear and tastes good, it may not be fit to drink.
6. Water can be useful or harmful according to the way people use and control it.
7. Growing plant life protects the soil from being washed away.
8. Dams and reservoirs can be built to store water for future use.
9. People can cooperate and work together to protect the land from floods.

10. Running water can change the earth's surface.

11. To survive, man must work to preserve the abundance of water needed for living.

C. Suggested Activities:

1. Teacher Demonstrations:

a. Discuss ways impure water can be made safe to drink.

b. Use diagrams or pictures to show what is meant by "water table".

c. Investigate how the water supply is purified. Examine the filtering beds and other methods used for purifying water.

d. Observe how streams cut through land. Look at the banks of the streams. Examine the water to see whether it is muddy or clear.

e. Visit the dam and reservoir (Scituate) in your state. Look for the following:
   1. how experts are trying to manage the water supply so that it can be used when and where it is needed.
   2. the several uses of dams.

f. Familiarize pupils with natures way of storing water:
   a. underground streams.
   b. pools.
   c. soil.

g. Review the relationships of water to life:
   1. life is impossible without water.
   2. only water can make a seed germinate.
   3. once alive, a plant can stay vigorous and green, only as long as it has plenty of water.
   4. cut off from water, any living thing dies.

2. Student Activities:

a. Gather samples of water and examine droplets under a microscope.

b. Build two mounds of soil. Leave one bare and cover the other with sod. Experiment with sprinkling both and observing for erosion. Discuss the results.

c. Make a study of the purposes and importance of irrigation. There are 163 important dams and 37 are in different states. Locate most important ones on a map. Decide how dams and reservoirs affect us locally.

d. Experiment to learn about the water supply. Because the problem of an adequate water supply has become acute in certain sections of the country, the children should investigate to find the answers to the following questions:
   a. where does our water supply come from?
   b. how is it made pure?
   c. is there any danger that the supply will be depleated?
   d. should anything be done to increase it?

e. If water comes from deep wells, pupils may be able to find a place where a well is being driven. Talk to the well drillers. Get samples of the soil that is brought up in the drilling, and learn something about the nature of the layers through which the drilling is being done.

f. If water comes from lakes, streams, or similar sources, pupils may visit the water works to learn what the source of the water is - whether or not it is adequate and whether there are plans for enlarging the supply.

g. Visit a watershed. Then make a model watershed by building a hill and valley with a stream in it. Stress that a natural watershed may be a little thing like the sides of a ditch or a brook or it may be as large as the slopes of the Continental Divide in the Rocky Mountains.

h. Read about water problems in the community. Locate water sources on a map. Is there ever a shortage? If so, why? Find out whether the river near you is polluted. Read the anti-pollution laws in your state.

i. Draw a diagram of the water cycle. Water is always going up into the air in the form of vapor. It comes down as rain, snow, sleet, hail, or mist.

j. Explore the uses of water in our daily living:
   a. putting out fires.
   b. washing clothes.
   c. washing dishes.
   d. plants.
   e. drinking.
   f. electrical power.
   g. fish survival.
   h. swimming.
   i. sail boating.
   j. transportation

k. Investigate watersheds:
   1. government controlled observations.
   2. is ground well covered with grasses, shrubs, or trees?

l. Learn about the evaporation process. Discuss examples of evaporation, the causes of fog, and the causes of clouds such as water vapor ascending and the cooling of water vapor.

m. Study the value of water storage:
   1. clean water essential for health.
   2. clean water is as important as life itself, for without it people could not live.
   3. reservoirs are full of cool clear water.

n. Investigate the water conservation practices in your town. Visit neighboring lakes and rivers. Contact the local water authority.
   1. Learn about how sewage and street run-off is handled in your town.
   2. Find out if any raw sewage is dumped into streams.
   3. Find out what your local industries and government are doing to use water wisely.

o. Water conservation comes about through effective cooperation by government, industry, and private citizens. Investigate what dollar and cents benefits come to the community that is willing to invest money to clean up its waters.

p. Obtain information on how many more houses will be built in your neighborhood, or some other area in your community. Find out how many gallons of water your family uses in a day for all purposes and calculate how much this amounts to over a ten year period. How much more water will be needed by the addition of homes in the area?

SOIL - THE ENVIRONMENT

Level - Kindergarten

A. Objectives:

1. The student will be able to describe by appearance several types of soil.

2. The student will be able to explain how soil is formed from rock.

3. The student will be able to identify some objects, substances, products, and materials that come from soil.

B. Concepts:

1. Soil is formed from rocks.

2. Soil is formed from decaying materials.

3. We use many things that come from the soil.

C. Activities:

1. Teacher Demonstration - take a walk to a nearby group of trees. Teacher can show how fallen leaves, needles, and decaying wood become soil.

2. Student Activities:

a. Rub soft rock together (clay, sandstone). Note beginning of accumulation of soil.

b. Collect pictures from magazines of food, clothing, and shelter that we use in our daily lives.

c. In the classroom or in a garden, begin to grow plants, vegetables, and/or flowers in sand or soil.

d. Ask children to bring in samples of soil from different locations. Note the color differences. Then glue samples on cardboard with rubber cement, arranging them from the darkest to the lightest.

e. Experiment to find out how the color of soil is affected by moisture.

f. Note soil texture, then, separate the different sized particles by straining them through sieves. Examine the particles with a magnifying glass. Glue samples of different sizes particles on a chart to illustrate soil texture.

g. Have each child listen to the sounds of soil by rubbing samples between thumb and finger next to ear. What causes the different sounds?

h. Note the way the soil holds together, by letting the children take different samples and thoroughly wetting them until they can be molded like clay. Ask the children to press them out like pancakes to see how they hold together. Let them dry. See how they hold together.

i. Pan some dry soil on a cardboard. Note how it is blown about, compare results with that obtained by fanning moist soil.

SOIL - THE ENVIRONMENT

Level - Primary

A. Objectives:

1. The student will be able to list some reasons why soil is one of our greatest natural resources.

2. The student will be able to give examples of how wind and water can destroy valuable soil.

3. The student will be able to explain several ways in which living things use the soil.

4. Students will be able to illustrate components of soil.

5. Students will be able to describe living things to be found in soil.

6. Students will be able to describe how soil clings to grass roots.

B. Concepts:

1. Soil is the primary source of our food, clothing, and shelter.

2. Wind and water are the major factors in destroying soil and moving soil.

3. Soil, plants, and animals are interdependent.

4. Plants need good soil to grow well.

5. There are many different kinds of soils and they must be cared for in different ways.

6. Soil has many things in it.

7. Soils differ in color and texture.

8. Good soil has humus in it.

C. Activities:

1. Teacher Demonstration:

a. Discuss pictures of plants, animals, and landscape. Where do the plants and animals obtain their food.

b. Discuss the sources of avious materials - cotton, wool, silk, rayon, leather, and rubber. Display these. Talk about the clothing we get from our own area.

c. Discuss the way in which man causes erosion - digging up trees recklessly that serve to hold the soil, building roads, blasting with powerful explosions, etc.

d. Discuss what man can do to prevent erosion. Ask children to list what they see around their own houses as ways to prevent erosion. Some possibilities are stone walls, planting pine trees, planting grass and certain other plants.

2. Student Activities:

a. Place one seed in moistened soil, place another in water. Help the children to observe that the one in water will die while the other will not. At first, both plants will seem to be doing equally well. The change will occur after the plant has used up the food in its seed and must get it from the soil.

b. Place loose soil on one half of a divided cookie sheet. On the other side, put soil held together by grass or weed roots. Turn on an electric fan directed at the cookie sheet. Children should observe that soil is, in fact, moved by wind and that grass or some other such covering helps to prevent this.

c. After a heavy rainstorm, visit a place where the water made a gulley. If there is a pool at the foot of the gulley, collect some of the water in it and put it in a jar. Soon the soil in it will settle to the bottom. If the place where the water collected is dried up, observe where the eroded soil landed.

d. On one half of a divided cookie sheet, place some loose sand. On the other half, put soil held together by grass or weed roots. Sprinkle both sides lightly and collect the water runoff. Compare the amount of erosion on each side. Then douse both sides with a heavy shower and again collect runoff. Compare these with one another and then with the first two to see if speed of the water has effect on erosion.

e. Place on exhibit several different kinds of soil. Allow the children to touch and observe the color. Use a magnifying glass for closer observation.

f. To observe which types of soils is best for most plants, plant three similar seeds or plants. Put one in a good rich soil, one in clay, and one in beach sand. Observe which one does better.

g. To observe some of the different kinds of life in the soil, dig up a shovel full of good rich soil. Make sketches of everything found in this soil and try to identify what the children see.

h. Dig up a clump of sod and note how soil clings to the grass roots.

i. List all animals that live in the ground.

SOIL - THE ENVIRONMENT

Level - Intermediate

A. Objectives:

1. Students will be able to recognize the many ways in which soil may be either destroyed or depleted.

2. Students will be able to list some chemical methods of improving soil.

3. Students will be able to list means by which soil can quickly be destroyed.

4. Students will be able to describe the components of soil.

5. Students will be able to explain the important factors by which soil produces our food.

6. Students will be able to identify ways in which soil contributes directly and indirectly to the building material industry.

7. Students will be able to explain some ways that erosion may be prevented.

8. Students will communicate to their parents and friends their own ideas for erosion prevention around their own homes.

9. Students will be able to identify some types of soil for the growth of plants.

B. Concepts:

1. Forests save the soil and help prevent floods.

2. Soil can be destroyed or depleted in a short time.

3. It takes a long time to build good soil (300 to 1000 years per inch of topsoil).

4. All soils contain minerals in varying elements. They are also combinations of living organisms, organic matter, water, and air.

5. Soil becomes worn out when the same crop is planted year after year.

6. Contour plowing helps save soil from washing away.

7. Rotation of crops helps put minerals into the soil.

8. Soil is found in layers of varying thicknesses.

9. Organic soil is made of decayed organic matter.

10. Inorganic soils made up of broken up rocks.

11. Soil is built up from the top and from the bottom.

12. Land must be used wisely in order to produce enough food for our expanding population.

13. The welfare of people is effected by the way the soil is used.

C. Activities:

1. Teacher Demonstrations:

a. Make dust or fine soil by rubbing 2 stones together. One stone must be softer than the other. How does this tie in with the glacier and the effect of the wind blowing sand against rocks?

b. To show how grass helps to hold down the soil so the wind will not blow it away -

Use 2 flat wooden boxes lined with newspaper. Soil is placed in each box to within an inch of the top. Sprinkle grass seed (or birdseed) in 1 box. Water the soil in both boxes each day. Weed any plants which may start up in the unplanted box. The grass should be about 2 inches high to complete the experiment. A calm day is best to receive the best results. Do not water the boxes on this day. Take the boxes outdoors. Set up an electric fan. Place the grassy box in front of the fan (level with fan - it may need to be propped), turn on fan and record results. Repeat with unplanted box. Discuss results and draw conclusions.

C. To demonstrate the effectiveness of contour farming, prepare 2 hills of soil, about the same height and width. Soak with water and allow to harden. Using a pencil as a plow, mark hill with furrows going

with the curve of the hill. Plow the other hill with furrows against the curve of the hill. Use a sprinkling pail to wet down the hills, both at the same time and with the same amount of water. Record results and discuss.

d. Study the effectiveness of the use of dams to protect soil through research.

e. To test soil -

Get blue and red litmus paper strips and soil samples. Place a soil sample in a paper cup. Add water to make it fairly moist. Put a piece of blue and red litmus paper into the cup and leave them a while (5 minutes). Take out the strips and record results. Continue same procedure with the other samples. Discuss results and draw conclusions.

f. Display building materials obtained from the soil.

2. Student Activities:

a. Children bring in soil samples from their yards to see the differences in color and texture (brown - organic, red - oxidized).

b. Find out how and why crop rotation saves soil. Name some crops that help build soil and those that deplete it.

c. Make a study of natural and commercial fertilizers that help rebuild soil.

d. Children should gather pictures to show good practices in soil conservation as against misuses of soil.

e. The texture of a soil can be determined by settling the soil in water. Have the children fill a one quart jar two-thirds full of water. Add soil to almost fill the jar. Screw on the top and shake vigorously.

f. Ask children to measure the depth of topsoil around their houses. Use a shovel and ruler. Find where topsoil is thick and where it is thin. Record findings.

g. Refer to an encyclopedia and compare the amount of topsoil in the United States of America today with the amount in pioneer days.

h. Collect samples of various types of soil (clay, sandy, gravel, loam). Place each in a small jar. Moisten with water. Put in a sunny place for several days. Discuss dryness level of each.

i. Research the term "humus". Locate a pile of decaying leaves and carefully investigate, watching for the decaying process. Locate a fallen log and observe decomposition by fungi, bacteria, and small animals.

j. In the Autumn, start a small "compost heap" by gathering moist leaves in a terrarium. Keep covered to retain moisture. Observe carefully from time to time to see if soil is forming.

PLANTS IN THE ENVIRONMENT

Level - Kindergarten

A. Objectives:

1. The student will be able to list the plant needs for air, soil and water in order to grow.

2. The student will be able to see why plants are important to man's life.

3. The student will be able to understand how plants use air, sun, soil and water.

4. The student will be able to compare plants nam uses for food, clothing and shelter with plants he uses for other purposes.

5. The student will be able to recognize other uses of plants. (Ornamentation)

B. Concepts:

1. Plants need air, sun, soil, and water.

2. Plants are especially important to you for:

   a. food
   b. clothing
   c. shelter
   d. air (oxygen)

3. Trees are plants.

C. Activities:

1. Teacher Demonstration:

   a. Divide children into groups of 3 or 4 pupils. Take a walk in a wooded area or park. Assign each group the task of counting different sized plants - include trees.

   b. Make a bulletin board of different kinds of plants. Label each kind of plant to acquaint the child to names of different plants.

   c. Make posters of trees and the food, clothing and shelter one derives from trees.

d. Place trees near a window and some away from the window. Observe the differences in color and growth. For double check, reverse the positions.

e. Place two similar trees near a window. Water one regularly and do not water the other. Observe and try to revive the tree.

f. Place two similar plants near each other. Cover one thoroughly with a plastic bag. Leave the other exposed to air. Watch growth patterns.

g. Place two large pieces of newsprint on the floor. On them place a small piece of soil and a piece of grassy sod. Allow one of the children or several children to take turns to stand on a table and drop water on the bare soil with a medicine dropper. Show the children the splash pattern of the bits of soil on the newsprint. Repeat the action, dropping water on the grassy area. Point out that grass helps to hold the water in the soil. Introduce the word erosion to the children.

2. Student Activities:

a. Collect pictures of plants from magazines.

b. Collect pictures of plants we do not use for food, clothing, or shelter.

c. Collect pictures of plants we do use for food, clothing, or shelter.

PLANTS IN THE ENVIRONMENT

Level - Primary

A. Objectives:

1. The student will be able to observe that seeds come from plants.
2. The student will be able to see that many plants come from seeds.
3. The student will be able to identify plants as considered living things.
4. The student will be able to observe the physical differences of seeds.
5. The student will be able to identify the main parts of a plant and explain the function of each part.
6. The student will be able to give examples of plants which do not come from seeds.
7. The student will be able to observe that seeds move by air, water and humans.
8. The student will be able to see that plants adapt to their environment.
9. The student will be able to recognize the parts of plants which we use for food, shelter and clothing.
10. The student will be able to see that flowers make seeds.
11. The student will be able to see that seeds become flowers.
12. The student will be able to explain the relationship between man, animal and plant.
13. The student will be able to see that some plants remain green all year and others do not.
14. The student will be able to observe that most plants do not grow well in dry sandy soil.
15. The student will be able to describe different kinds of seed encasements.

B. Concepts:

1. Plants are alive.
2. Plants grow at different rates.
3. Seeds come from plants.

4. Seeds grow into plants.

5. Each seed contains a baby plant.

6. There are many kinds of seeds.

7. Animals eat plants and seeds.

8. Some plants live through the winter.

9. Some plants grow from bulbs.

10. Many plants are made up of roots, stems, and leaves.

11. Seeds are dispersed and travel in many ways.

12. Many trees shed leaves in the fall and are called deciduous.

13. Many trees and plants adapt themselves to the area in which they are found.

14. Green plants make their own food.

15. Food can be stored in all parts of the plant.

16. Trees which remain green during the winter are called evergreens.

17. We grow plants for food.

18. We use the stem, leaves, roots, seeds, and flowers.

C. Activities:

1. Teacher Demonstration:

a. Make a seed collection of many common seeds. Display in jar covers on a table. Allow the children to handle seeds to note different feeling of seeds. Note also color and size.

b. Point out the trees near the school yard. Note the leaves, stems, seeds and, where possible, the roots.

c. Arrange field trips to observe seasonal changes in trees.

d. Talk about plants of the desert.

e. Collect pictures of plant products.

f. Make a list of fruits obtained from trees in our area.

g. Bring in pictures of fruits shipped in from other areas.

h. Compare and explain why certain fruits grow only in particular areas.

i. Bring in wild or cultivated plants which can be used to discuss the principle parts of a plant.

2. Student Activities:

a. Materials - lima bean, magnifying glass, water, jar.

Procedure - soak lima bean. Open seed so that the baby seed may be observed with a magnifying glass.

b. Materials - bean or pea seeds, pots, soil.

Procedure - plant bean or pea seeds in pots with good soil. Place near window. Watch for effect of light on seed growth.

c. Materials - two similar plants, pots, soil.

Procedure - place one plant on a window sill and one in a closet. Water regularly and allow to stand at least two weeks. Observe growth and effect of light on plants.

d. Materials - narcissus bulbs, tulips.

Procedure - plant bulbs in soil. Plant other bulbs in dish with stones. Note root formation.

e. Materials - pictures.

Procedure - draw a picture of a familiar tree. Mount the leaf of the tree and the drawn picture on cardboard. Label and display.

f. Draw outlines of various tree forms to compare tree formation.

g. Make a chart story about trees.

h. Make a study of the many ways man uses plants. Include food, shelter, and clothing and also mention medicinal, recreational, and industrial uses.

PLANTS IN THE ENVIRONMENT

Level - Intermediate

A. Objectives:

1. The student will be able to realize why we must preserve our natural resource - plants.

2. The student will be able to tell about the functions of various parts of a plant.

3. The student will be able to become aware of the care our government must take in order to preserve wildlife.

4. The student will be able to tell how the world's people get their food.

5. The student will be able to explain the various differences in plants.

6. The student will be able to tell how plants obtain minerals.

7. The student will be able to describe how plants manufacture food for themselves.

8. The student will be able to understand how plants help us to breathe.

9. The student will be able to understand and describe how the balance of nature continues year after year.

10. The student will be able to list ways by which plants protect themselves.

11. The student will be able to explain the process by which plants reproduce themselves.

12. The student will be able to explain the process of how plants produce seeds and how they are dispersed.

B. Concepts:

1. Forests, grasslands, and plants are natural resources.

2. Forests have many enemies but man is learning to control them.

3. Forest have been wasted for many years.

4. Forests are helpful in the conservation of soil, water,and wildlife.

5. All plants have special parts that help the plant obtain food, water, and air.

6. Government control of forests and grassland have helped to protect our wildlife.
7. Forest Rangers and National Parks affect the lives of every citizen.
8. Green plants feed all the people and all the animals.
9. Plants vary according to the length of time they live in.
10. Many new plants may be grown from roots, seeds, stems, or bulbs.
11. Water and minerals enter many plants through the roots.
12. Sap is a watery substance containing varying amounts of sugar.
13. Many different natural protections can be observed in plants.
14. Plants produce an abundance of seeds but through natural conditions all do not survive.
15. There are plants that reproduce by means other than seeds.
16. Non-green plants do not namufacture their own food.
17. Some plants are harmful to man.
18. Photosynthesis is the process whereby, in the presence of sunlight, the plant makes food from water, carbon dioxide, and chlorophyll.
19. A by-product of photosynthesis is oxygen.
20. Minerals which are absorbed from the soil by tiny root hairs along with other substances in the plant are converted into food through chemical action.
21. The green plant is the beginning of all food for all life on the earth.
22. The simplest of plants such as bacteria and yeast are unicellular.
23. Bacteria can be both helpful and harmful.
24. All flowering plants have seed-making parts.
25. Flowers need pollen to keep on forming seeds.

C. Activities:

1. Teacher Demonstration:

   a. Exhibit and compare pictures of forest lands showing healthy strong stands as against forest that have been neglected.

   b. Show films on methods of forest conservation and management.

   c. Plant bean seeds in various positions against the clear glass of a small jar and watch them grow.

   d. Show films and pictures that portray airplanes used in spotting forest fires, spraying or dusting for pest control, and in transporting Forest Rangers into areas.

   e. Arrange to have a Forest Ranger visit the school.

   f. Write to the Forest Service for information and materials.

   g. Find meanings of annual, biennial, and perennial as they apply to plants.

   h. Obtain two glass plates. Place seeds in between the plates and hold in place with rubber bands. Stand in a container of water until growth is observed. Avoid direct sunlight. Examine system from above.

   i. Bring in samples of fungi. Allow to dry. Shake spores.

   j. Using iodine and Benedict Solution, test various foods for the presence of starches and sugars.

   k. Show yeast growth by placing part of a cake of dry yeast in warm water. After a few hours, examine under a microscope.

   l. Invite a horticulturist to speak to the children.

2. Student Activities:

   a. Bring in pictures of foods from magazines and label roots, seeds, stems, bulbs, or leaves.

   b. Display various types of seeds, roots, and bulbs to show food storage.

c. Plant bulbs, seeds, roots, and stem in milk cartons, cheese boxes, or paper cups. Keep a record of plant change.

d. Place a celery stalk in colored water and observe.

e. Cut a celery stalk in cross sections and observe tubes.

f. Prepare a research report on trees that produce sap.

g. Bring in plants or specimens of plants which are protected by thorns or spines.

h. Examine the bark of trees in the vicinity. Bring in pieces of bark from various plants. Note thickness.

i. Find pictures of harmful plants and find out why they are harmful.

j. Set up a display of seed plants.

k. Make a thorough list of plants that reproduce without seeds.

ANIMALS IN THE ENVIRONMENT

Level - Kindergarten

A. Objectives:

1. The student will be able to recite the three basic needs of fish in an aquarium: food, air, and water.

2. The student will be able to verbally state several examples of how animal life depends on the parent for food and protection.

3. The student will be able to tell how birds build their nest.

4. The student will be able to compare and contrast the needs of animals in confined areas as zoos and parks to those of animals which must search for their food and shelter.

5. The student will be able to list several examples of how man depends on animals for food.

6. The student will be able to care properly for animals as pets.

B. Concepts:

1. Animals provide food for each other.

2. Animals provide pleasure for us.

3. Humans - adults and children - must protect animals.

C. Activities:

1. Teacher Demonstration:

a. Materials - an aquarium complete with pump, gravel, plants, net, pictures of animals feeding their young, pictures of birds, construction paper.

Procedure - observe the life cycle of small fishes such as guppies. Encourage the children to bring in small pets and talk about their care. Have pictures of birds for the children to color and discuss the different colors. Make simple forms of birds from construction paper.

b. Watch tadpoles develop. Some children may want to keep an observation chart with dates when tail begins to become smaller; what time fed; when all legs have appeared. Charts may be composed by either words or pictures. Note: Frogs feed on living moving insects or worms. If it is not possible to provide living material it may be necessary to return the frogs to their pond. Discuss this.

c. Place a grasshopper in a jar partly filled with soil. The cover should be pierced to admit air. (Cheesecloth is suitable.) A peeled piece of apple will provide necessary food.

d. Put a garden spider into a jar which contains a twig, a lump of soil with grass or plants in it. (A house spider will do. In this case, a twig in the jar is sufficient.) Spiders will eat live insects that you drop into their webs. Watch the spiders spin a web.

e. Among other animals to watch are praying mantises, ants, brine shrimp, silkworm, beetles and lady bugs.

2. Student Activities:

a. Visit zoos and bird sanctuaries.

b. Visit dairy farms and dairies.

c. Take walks around the school to try to find bird nests in the spring.

d. See how many different kinds of birds can be found in the neighborhood.

e. Make a list of all the different pets owned by the class.

f. Some children or teachers may have access to a pond where frogs are breeding. The frogs eggs may be scooped up into a jar with water from the pond. Using a magnifying glass, children can examine these eggs and discover that each is enclosed in a jelly-like capsule.

g. Frogs eggs may be kept in an aquarium, a glass bowl or jar. Only a few

dozen eggs should be kept in one container. Add a few water plants and set the container in a window where it will get sun part of the day.

h. Children can watch the eggs change into tadpoles. Note: The eggs of common frogs hatch in a few to 21 days. If the eggs turn white, the eggs are not developing. Frogs eggs turn into tadpoles. Tadpoles eat ground spinach.

ANIMALS IN THE ENVIRONMENT

Level - Primary

A. Objectives:

1. The student will be able to describe the life cycle of animal life.

2. The student will be able to list the classification of animal life: mammals, amphibians, reptiles, birds and fishes.

3. The student will observe that animals seek shelter to protect themselves.

4. The student will be able to compare and contrast birds that migrate in the winter to animals that hibernate.

5. The student will be able to describe how animals feed and care for their own.

6. The student will be able to identify several ways in which man uses animals for enjoyment.

7. The student will be able to list several examples of how animals and insects are helpful to man.

B. Concepts:

1. The farmer is dependent upon animals and insects for the care of his crops.

2. The dairy man is dependent upon the cow for his milk supply.

3. Human life is dependent upon animals for much of its food.

4. Man is dependent upon animals for clothing needs.

5. Animals are part of our enjoyment of life - fishing, at the circus, at animal shows, at the zoo, and as pets.

6. Animals provide food for each other.

7. Animals need food, air, and water just as man.

C. Activities:

1. Teacher Demonstration:

a. Materials - tape recorder, slide projector, film strip projector, bird charts, plastic chlorox bottle, bird seed, an abandoned nest.

Procedure - listen to the sounds of birds and try to identify them. Watch one special bird and try to study his habits. Look at nests and see what materials are in it. Learn the names of birds common to the area. Combine bird study with the listening skills. Make a bird feeder by cutting an opening in the plastic bottle and try to attract birds. List names of birds and colors. Make a bird chart of birds common to the area. Make a scrap book of bird pictures. See how many birds one can observe in a yard. Study bird models and make a chart of beak and feet differences.

b. Materials - insect net with wire and cheese cloth, large jam jar, an ant farm, cotton, carbon tetrachloride, hand magnifying lens, wooden box with glass front, earth worms.

Procedure - take wide-mouthed jar and place cotton on bottom. Cover with blotting paper that has several holes punched in it. Saturate cotton with carbon tetrachloride and place the blotting paper over cotton. Place the moth or butterfly in the jar being careful not to tear the wings. Seal the jar until the insect is dead. Find the parts of the body under the hand lens. Note the differences in the antenna of the moth and the butterfly. Collect other insects and note differences. Keep insects in jar and observe eating. Fill wooden box nearly to the top with layers of sand, leaf mold, and loam padding down each layer before adding the next. Place lettuce leaves, dead leaves, carrots, on the surface soil together with some worms. Keep contents damp and study the behavior of worms. Purchase an ant

farm and observe the work habits of ants. Make a chart showing helpful and harmful insects. Observe a spider making his web. Stand a plant in a pot in a bowl of water or on a polished table. Put two or three strips of cardboard together and lean the structure against the plant. Put an orb spider on the plant and it will make a web.

c. Materials - an aquarium complete with pump, plants, net, small fish, snails.

Procedure - place small fish in tank. Observe their habits and their breeding habits.

d. Materials - animal cage, watering device, soup plate.

Procedure - place samll animal as a hamster, guinea pig, mouse or small rabbit in cage. Regular feeding and watering of animals and regular cleaning of the cages are important.

2. Student Activities:

a. Visit near-by ponds and use a net to gather pond life.

b. Visit wooded areas and look on leaves and plants for signs of insects feeding on the leaf.

c. Visit wooded areas and peel off bark from a rotting log. See what lives underneath.

d. Dig a small pit of earth and see what worms or insects are underneath.

e. Visit bird sanctuaries and areas where animals can be observed in their natural habitat.

f. Show film strips of animal life - its habitat and life cycle.

ANIMALS IN THE ENVIRONMENT

Level - Internediate

A. Objectives:

1. The student will be able to classify several animals.

2. The student will be able to list the various roles of animals.

3. The student will be able to compare and contrast the importance of animals through the past, present, and future:

    a. The student will be able to list the Indians' uses of animals.
    b. The student will be able to list the early settlers' need for animals.
    c. The student will be able to find effects of industrial development on animal habitat.
    d. The student will be able to show examples of man's invasion of of nature on the animal world.

4. The student will be able to separate living and non-living things.

5. The student will be able to list gaming laws which aid in the conservation of wild life.

6. The student will be able to list some contributions of various organizations which aid in the conservation of wild life.

7. The student will be able to cite some existing laws that insure the safety of nature's creatures.

B. Concepts:

1. Living things are products of their heredity and environment.

2. Living things survive and grow.

3. Animals must adapt to their environment.

4. Living creatures are forced to move.

5. Man and living creatures are interdependent.

C. Activities:

1. Teacher Demonstration:

    a. Materials - old galvanized bath with wire netting, clean sand, bread,

crushed oat seeds, lentils, milk, greenstuff, a little salt, small amount of meat, pair of rats, small box, scale.

Procedure - the sand in the cage must be changed daily. Torn newspapers may be used when cage is cleaned weekly. The rats should have clean rags for nesting purposes. If given the listed diet they will thrive and multiply rapidly. They should be handled by the same people. Observe weight changes.

b. Materials - jam jar, old bird cage, glass jars, cotton, shoe boxes, plants, soil, small dishes.

Procedure - frogs and toads may be kept in an old bird cage. Put in plants and soil and empty dish or two of water. Put a small bottle of water through the small door of the cage and fill the dish from it. Feed the frogs and toads on small earth worms and flies.

c. Materials - jam jars, plants, shoe box.

Procedure - place stick insects in an inverted jam jar. Place little foliage in jam jar. Use shoe box to give insect more room.

d. Materials - plastic bottle.

Procedure - place a feeding station made with the plastic bottle where it may be observed. Observe the way birds get food. Compare sizes of these birds. Do birds come alone or in flocks?

2. Student Activities:

a. Visit a fish hatchery.

b. Take a field trip to a pond and study animal life.

c. Study pond water under a microscope.

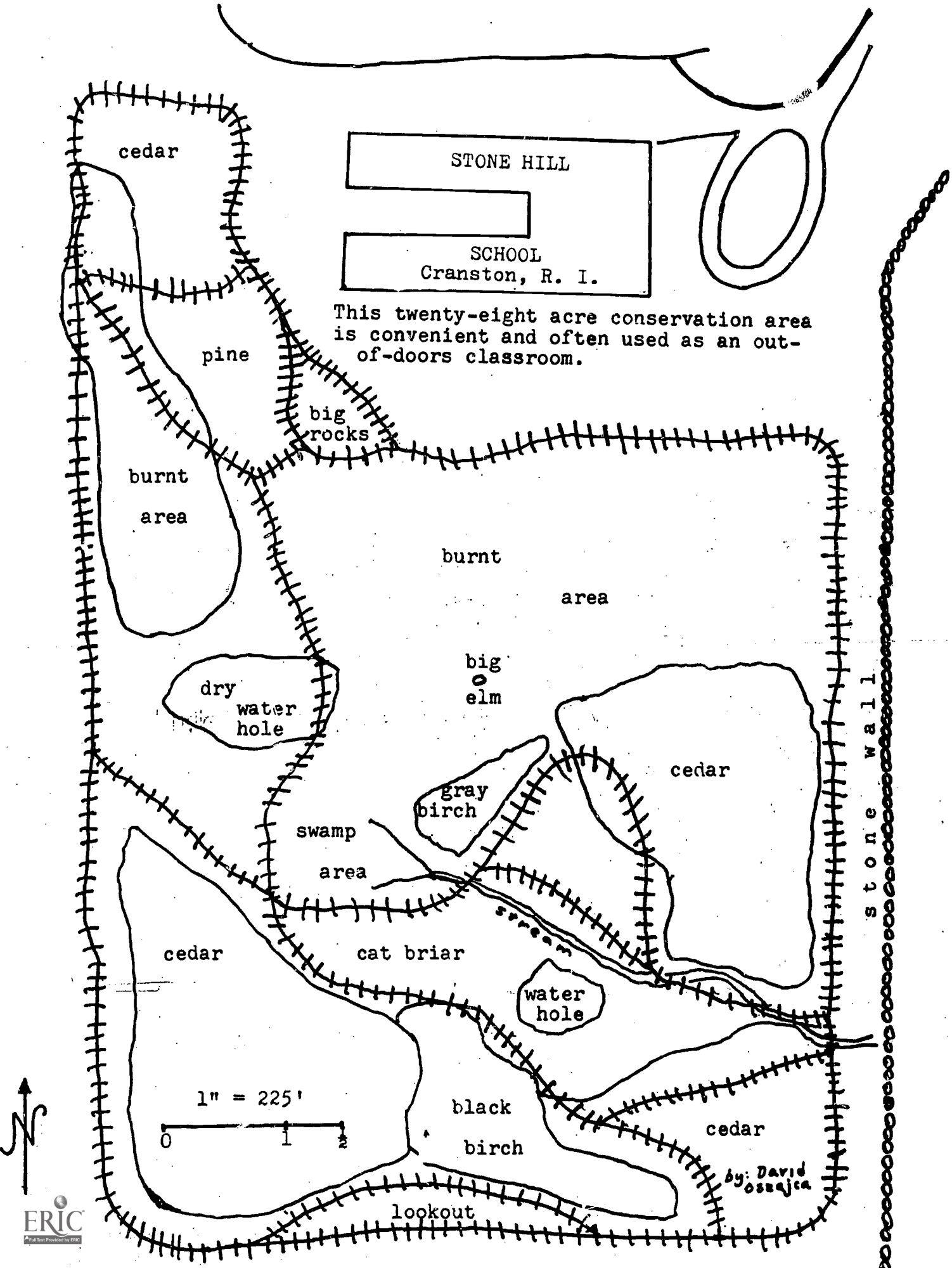
d. Visit a museum to study fossils of animals.

e. Visit a zoo and learn about animal care.

f. Visit exterminating plants.

g. Visit a bee farm.

h. Consult with 4-H for helpful information.


STONE HILL
SCHOOL
Cranston, R. I.
This twenty-eight acre conservation area is convenient and often used as an out-of-doors classroom.
cedar
pine
big rocks
burnt area
burnt area
big elm
dry water hole
gray birch
cedar
swamp area
stream
cedar
cat briar
water hole
1" = 225'
0
1
2
black birch
cedar
by: David Osojca
lookout
stone wall

PAST LEGISLATION ON POLLUTION

1899 - Rivers & Harbors Act. Prohibited discharge or deposit into any navigable waters of any refuse except that which flowed from streets and sewers in a liquid state.

1912 - Public Health Service Act. Authorized surveys and studies of water pollution, particularly as it affected human health.

1924 - Oil Pollution Act. Prohibited oil discharges into coastal water damaging into aquatic life, harbors and docks, and recreational facilities.

1948 - First Federal Water Pollution Control Act with a five year expiration date.

1953 - Federal Water Pollution Control Act extended for three years.

1956 - First Permanent Federal Water Pollution Control Act. Extended and strengthened the 1948 law in areas of enforcement and research and initiated grants for construction of water treatment works.

1961 - Federal Water Pollution Control Act amended. Further strengthened enforcement authority and increased support for construction of municipal waste treatment works and research.

1965 - Water Quality Act, further amending the Federal Water Pollution Control Act. Established a Federal Water Pollution Control Act in the Department of Health, Education and Welfare. Required establishment of water quality standards for all interstate and coastal waters.

1966 - Federal Water Pollution Control Administration transferred to the Department of the Interior under Presidents Reorganization Plan No. 2 Clean Water Restoration Act, further amending Federal Water Pollution Control Act. Greatly increased authorizations for grants to help build sewage treatment plants for research and for grants to State Water Pollution Control Programs. Transferred administration of the Oil Pollution Act from the Secretary of the Army to the Secretary of the Interior.

APPENDIX

RESOURCE MATERIALS

Books For Pupils

Films and Filmstrips

Bibliography For Teachers

FREE FILMS FROM UNIVERSITY OF RHODE ISLAND

Address: University of Rhode Island
Audiovisual Instructional Materials Center
Davis Hall
Kingston, Rhode Island 02881

The Eternal Forest — Color 20 1/2 min 1970

The film describes efforts to restore nature's balance which began at the turn of the Century. Today's balance between use of our forest resources, and their protection for future generations, is highlighted at the conclusion of the picture. Narrated by Gregory Peck.

The Forest — Color 11 min

This film shows that the forest is many things: water to provide power for industry, light to homes, nourishment for all that grows, recreation, people who work and visit the forests, trees for timber, grasslands for grazing, shelter for American wildlife and source of eternal beauty.

Man Against Fire — Color 29 min

The story of man's fight to save forest resources from destruction by wildfire.

Safe Use of Pesticides — Color 22 min 1963

Tells farmers how to keep out of trouble in their use of pesticides. The film's message is of direct interest to consumers. Also the development of pesticides and registration by the U. S. Government agencies the responsibility of farmers for use and the consequences for illegal use.

Smokey and The Bear — B&W 8 min

Eddy Arnold on a camping trip and a group of boys, reminds them of their responsibility in ehlping to keep fire out of our forests. He plays his guitar and sings the song "Smokey the Bear" while Pleine the cook, doubles as a short order cartoonist.

Then It Happened — Color 10 min 1948

A dramatic documentary of the destruction of Maines' beautiful and valuable forest. Breath taking views of the raging fires that claimed human lifes, destroyed farms and villages, as well as famed summer resorts in the vicinity of Bar Harbor.

Conserving a Heritage — Color 16 min 1963

The search for petroleum takes oilmen into many of the country's remote regions where fish and wildlife abound. Their efforts to preserve these natural treasures are depicted in this film.

Fallout & Agriculture — Color: 23 min

This film provides information on radioactive fallout and its movement through the atmosphere. Discusses radioactive elements of concern to agriculture and means of protection.

Hurricane Watch — B&W 15 min

Describes the methods used by the U.S. Weather Bureau in locating and tracking hurricanes and shows how hurricane information is desseminated. Stresses the importance of safety precaution that should be taken by individuals to minimize the loss of property and life during a hurricane.

To Keep America Beautiful — Color 6 min

Bell Telephone Systems shows some of the ways industry is changing the appearance of America in an attempt to return the beauty of her cities.

The Unchained Goddess — Color 55 min 1954

Grass: The Big Story — Color 29 min

Story of an indispensable crop for the production of beef, milk, and food crops, also the prevention of erosion, land waste, and floods.

Harvest For Tomorrow — B&W 27 min

Film shows the basic need for soil conservation in New England, the use of soil building practices, particularly grasses and legumes.

In Common Cause — B&W 30 min

Film shows what conservation districts have accomplished, how they are formed and operated the programs for increasing crop production and saving our soil.

Let's Keep America Beautiful — Color 14 min

Presents the litter problem against a backdrop of some of the country's most beautiful landscapes. Breathtaking views of mountains, lakes, beaches and forest show a scenic wonderland while dramatizing the damage done by litterbugs.

Save The Soil — B&W 10 min

Conservation problems facing the U. S. and the steps which must be taken to prevent an agricultural decline.

Tree Bank — Color 14 min 1957

Shows how tree planting fits into America's Agricultural Soil Bank program. Illustrates the values of tree plant actions in conserving soil and water, in providing shelter for wildlife and recreational opportunities for the farm family, and as a source of additiona' cost income.

Trees for Tomorrow B&W 20 min

Shows the importance of our renewable forest resources with emphasis upon improve scientific management of tree-producing lands. Also depicts former and current uses of wood.

Inner Space - Sea of Opportunity B&W 30 min

Produced in cooperation with WJAR television, this film deals with what has been called the last frontier, the oceans. U.R.I. is one of the leading institutions in the country actively researching all aspects of the oceans. This film relates many of the research projects.

The films below can be obtained from any of the following sources:

Audiovisual Center
University of Massachusetts
Amherst, Mass. 01003

Audiovisual Center
University of New Hampshire
Durham, N. H. 03824

Audiovisual Center
College of Education
University of Maine
Orono, Maine 04473

Audiovisual Center
University of Vermont
Burlington, Vermont 05401

Audiovisual Center
University of Connecticut
Storrs, Conn. 06268

List film by following #: NACI - D 004

"Adventures of A Junior Raindrop" 16 min color - 8 min 1948

"Days of a Tree" 16 min color - 28 min 1956

"The Family Forest" 16 min color - 12 1/4 min 1963

"A Fire Called Jeremiah" 16 min color - 58 min 1961

"The Forest" 16 min color - 28 min 1960

"Islands of Green" 16 min color - 14 min 1965

"Smokey & His Friends" 16 min color - 3 1/2 min 1967

"Soil & Water Conservation" 16 min B&W 9 min 1948

"Woddland Manners" 16 min color 19 1/2 min 1952

Modern Talking Pictures
1212 Avenue of the Americas
New York, New York 10036

Modern Talking Pictures
160 East Grand Avenue
Chicago, Illinois 60611

List #: NACI - H 013

"Hurricane Watch" 16 min B&W - 15 min

"Tides & Currents" 16 min color - 18 min

"Tornado" 16 min color - 15 min

"Weather Satellites" 16 min color - 15 min

FREE FILM LISTING ON CONSERVATION AND POLLUTION

Motion Pictures of the U.S. Department of Agriculture:

U.S. Department of Agriculture
Motion Picture Service
Washington, D. C. 20250

E.S.S.A. Motion Picture Films:

Environmental Science Services Administration
U.S. Department of Commerce
6010 Executive Blvd.
Rockville, Maryland 20852

Films on Air Pollution on Loan for Group Showing:

National Air Pollution Control Administration
801 N. Randolf Street
Arlington, Virginia 22203

Latest Listings of Conservation Films:

U.S. Department of the Interior
Office of the Secretary
Washington, D. C. 20240

Also: Director
Bureau of Land Management
Department of the Interior
Washington, D. C. 20240

Bureau of Sport Fishies and Wildlife
Department of the Interior
59 Temple Place
Boston, Mass. 02109

Sterling Movies USA, Inc.
43 West 61st Street
New York, N. Y. 10023

BOOKS FOR PUPILS

The following books are suggested for pupil research purposes. Most of these books can be found in the school libraries.

Adler, Irving, Dust, Day, 1958

Adler, Irving, Rivers, Day, 1961

Baker, Will, Winter - Sleeping Wildlife, Harper, 1958

Bancroft, Henrietta & Richard Y. VanGilders, Animals In Winter, Crowell, 1964

Barnard, J. Darrell, The MacMillan Science/Life Series, MacMillan Company, 1959

Bartlett, Ruth, Insect Engineers, Morrow, 1957

Baur, Helen, Water: Riches or Ruin, Doubleday, 1959

Bendick, Jeanne, All Around You: A First Look AtThe World, McGraw-Hill, 1951

Blough, Glenn O., Discovering Plants, McGraw-Hill, 1966

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Branley, Franklyn M., Flash, Crash, Rumble and Roll, Crowell, 1964

Bronson, Wilfred, Freedom and Plenty: Ours To Save, Harcourt, 1953

Bulla, Clyde R., A Tree Is A Plant, Crowell, 1962

Burns, William A., A World Full of Homes, McGraw-Hill

Bulter, M. D., Conserving Soil, VanNostrand, 1955

Burger, Carl, All About Fish, Random, 1960

Carlson, Carl, Water Fit To Use, Day, 1966

Colby, Carroll B., Soil Savers, Coward, 1957

Cormack, Maribelle, First Book of Trees, Crowell, 1956

Craig, Gerald S., Experimenting in Science, Ginn and Company, 1961

Craig, Gerald S., Science For You, Ginn and Company, 1961

Ditmars, Raymond, Reptiles of North America, Doubleday, 1936

Dunn, Phoebe & Tris, Things, Doubleday, 1968

Fenton, Carroll, Birds and Their World, Day, 1954

Fenton, Carroll, The Land We Live On, Doubleday, 1945

Ferarolo, Rocco V., Water Experiments, Garrard Publishing Co., 1958

Freeman, Moe, Fun With Scientific Experiments, Random House, 1960

Friskey, Margaret, The True Book of Air Around Us, Children's Press, 1964

Gans, Roma, Birds Eat and Eat and Eat, Crowell, 1963

Golden Book Encyclopedia of Natural Science; Volume 1, Golden Press

Golden Treasury of Knowledge; Volumes 1 and 10, Golden Press, 1962

Green,Ivan, Water: Our Most Valuable Natural Resource, Coward, 1958

Guilcher, J. M., A Tree Is Born, Sterling, 1960

Hegner, Rober, Parade of the Animal Kingdom, MacMillan, 1935

Helfman, Elizabeth S., Water for the World, McKay, 1960

Hofmann, Melita, A Trip To The Pond: An Adventure In Nature, Doubleday, 1966

Hogner, Dorothy, Conservation In America, Lippincott, 1958

Jordan, Helene S., How A Seed Grows, Crowell, 1962

Jordan, Helene S., Seeds by Wind and Water, Crowell, 1962

Lemmon, Robert, All About Birds, Random, 1955

Lubell, Winifred and Cecil Lubell, Green Is For Growing, Rand McNally, 1964

Mason, George F., Animal Homes, Morrow, 1947

National Geographic Society, The Book of Fishes, The Society, 1958

Pearson, Wanda Lynn, The American Buffalo, Steck-Vaughnn, 1961

Pettit, Theodore, Animal Signs and Signals, Doubleday, 1958

Pine, Tillie S., Water All Around, McGraw-Hill, 1959

Preston, Edna M., Air, Follett, 1965

Riedman, Sarah R., Water for People, Abelard, 1961

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Scoboat, G. Warren, Jr., The Magic In Water, Scribnert & Sons, 1955

Sebastion, Lee, Rivers, Holt, Rinehart & Winston, 1966

Shannon, Terry, About the Land, the Rain and Us, Childrens' Press, 1963

Smith, Frances, First Book of Conservation, Watts, 1959

Smith, Frances, First Book of Water, Watts, 1959

Sterling, Dorothy, The Story of Mosses, Ferns, and Mushrooms, Doubleday, 1955

Syrocki, B. John, What is Soil, Benefic Press, 1961

Van Dersol, William R., Water for America, Walch, 1956

Walsh, Mary, Water, Water Everywhere, Abingdon, 1953

Weigle, Oscar, Happy Animals, Grosset and Dunlap, 1957

White, All About Great Rivers of the World, Random House, 1957

Zim, Herbert, Birds, Golden Press, 1956

Zim, Herbert, Fishes, Golden Press, 1956

Zim, Herbert, Flowers, Golden Press, 1950

Zim, Herbert, Frogs and Toads, Morrow, 1950

Zim, Herbert, Insects, Golden Press, 1956

Zim Herbert, Trees, Golden Press, 1950

The following materials are available through R. I. College Film Library and R. I. State Department of Education Film Library.

Films - Air

Screen News Digest
Unchained Goddess Part I and II
Weather

Films - Water

Adventure of Junior Raindrop
Clean Waters
Dams
Life Along the Waterways
Lifeblood of the Land
Nature's Plan
Pipelines to the Clouds
Raindrops and Soil Erosion
River, The
Soil and Water Conservation
What Makes Rain
Wonder of Water

Films - Soil

Erosion
Lava and the River
Mountian Building
Our Natural Resources
Soil and Water Conservation
Top Soil

Films - Plants

Conifer Trees of the Pacific North West
Forests and Conservation
Paper Making

Films - Animals

Alaska and Its Natural Resources
Animals in Winter
Common Animals of the Woods
Gray Squirrel
Wonders in the Desert
Zoo

Filmstrips - Air

Air in Action
How Clouds, Rain, Sleet, Hail, Snow are Formed

Filmstrips - Water

Conserving Water and Soil
Enough Water for Everyone
Home for Plants and Animals
Improving our Grassland
Water and Its Importance
Water Cycle
Why Water is Important

Filmstrips - Soil

Conserving Water and Soil
How Man Conserves the Soil
How Soil is Formed
Irrigation
Land and the Book
Minerals in the Soil
Soil and Its Uses
Soil Resources
What is Soil

Filmstrips - Plants

Cash Crops
How Trees Grow
Science and Fire
Wood for Homes

Filmstrips - Animals

Coral Reef
Creatures of the Sea
Fish
Fresh Water Shellfish and Amphibians
How Animals Get Air
How Animals Live in Fresh Water
Life in Ponds, Lakes, and Streams

TEACHER BIBLIOGRAPHY

The following reading materials are of interest to teachers for purposes of providing background understanding of many topics covered by this guide.

Ecology Topics

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Baltan, L. J., The Unclean Sky; A Meteorologist Looks at Air Pollution. 1966

Beluman, A. S., Water is Everybody's Business. 1968

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Lewis, H. R., With Every Breath You Take. 1965

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MacMillen, Wheeler, Bugs or People? 1965

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Wright, J. C., The Coming Water Famine. 1966

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A Desert In Your Own Backyard, National Wildlife Federation, Washington, D.C.

Air Pollution: The Facts, New York: National Tuberculosis Association, 1963

Air Pollution, Senior Scholastic, Vol. 81 (January 16, 1963) p. 17

Bale, R. O., Conservation For Camp and Classroom, 1962. Obtained from: Burgess Publishing Co., 426 South Sixth Street, Minneapolis, Minnesota

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Carter, Vernon Gill, Man On the Landscape; The Fundamentals of Plant Conservation, National Wildlife Federation, Washington; Government Printing Office, 1949

Clean Water: A Challenge to the Nation, Public Health Service Publication No. 816, U.S. Department of Health, Education and Welfare, Washington; U.S. Government Printing Office

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Kellogg, Charles E., Grass and Soil, U.S. Department of Agriculture Yearbook. Washington: Government Printing Office, 1948

Kendeigh, S. Charles, Animal Ecology, Englewood Cliffs: Prentice-Hall, Inc., 1961

National Audubon Society, Junior Audubon Program Flier, (Free) 1130 Fifth Avenue, New York, N. Y. 10028

Soil Conservation Service, Facts About Wind Erosion and Dust, U. S. Department of Agriculture, leaflet 394

Soil Conservation Service, Our American Land, U. S. Department of Agriculture, Bulletin 321, 1968

"Too Many People, Not Enough Water", U. S. News and World Report (June 17, 1963) p.62

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LITTER

This section may be adapted to any level.

A. Objectives:

1. The child will be more alert to the causes of litter.
2. The child will be able to explain how the environment can take care of some litter.
3. The child will be able to explain how man must re-cycle litter.
4. The child will be able to explain how man can reduce the amount of litter.

B. Concepts:

1. There is sacrifice involved in living an ecological life.
2. Living an ecological life means living a simpler one.
3. One can do something to change one's existence.

C. Activities:

1. After a warm day, let children visit a public beach about 5 or 6 o'clock in the evening. Collect some things from the beach and bring them to the classroom. Discuss "natural" litter and "man-made" litter. Compare your public beaches and pictures of beaches from magazines.
2. On the way to the beach, count the billboards. Is this a form of litter? Why?
3. Fold paper in half. Have children draw beautiful landscape across the whole paper. Draw billboards on one side. Discuss the appearance. Find out if there are any laws in Rhode Island governing them.
5. Have a child call or visit the Sewage Plant Works. Find out how much land is devoted to disposing of garbage and junk. Perhaps some children could visit and take some snaps. Discuss after information has been gathered.
6. Contact the Cranston telephone and power companies. Find out what their

plans are for undergrcund wiring. Discuss present system - perhaps compare to billboards.

7. Find out if anti-littering ordinances in Cranston are enforced. If not, discuss what you can do to discourage litterers.
8. Discuss what makes our cities so ugly, e.g. Providence.
9. Count how many glass containers your family throws away in a week. Can these by re-cycled?
10. Count how many metal cans your family throws away in a week. Where do they go when collected? Multiply the number by the number of children in your class - the number of families on your street.
11. Find out how long it takes an aluminum can to disintegrate.
12. Find out how much the State Highway Department spends each year to clean up litter.
13. Determine how many pounds of garbage your family produces in a week. Find out where it goes when it leaves your house.
14. Make a model city (Clay, paper mache, boxes) as a classroom project. While in construction, keep in mind that you will wish to eliminate litter.
15. Have a think session. Think how much it must cost to collect, re-cycle, or deposit waste material. Think of alternatives. (Container that manufacturers may be able to utilize or invent. Be creative.)
16. You can write an article on any of the above topics for your school newspaper or the local newspaper. Suggest possible solutions.
17. You can write a letter to authorities about your ideas, or to the editor of the local newspaper.
18. Your class can make a pollution "puzzle book" to distribute to the rest of the children in school.