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ABSTRACT

Contained are some of the instructional materials developed by the Science Project Related to Upgrading Conservation Education. Outdoor activities for elementary school children, suitable for use in camps, parks, playgrounds or sanctuaries are described. Programs are designed for one-day (K-4), two-day (grade 5), and three-day (grade 6) camps, and are intended to supplement an indoor-outdoor approach to teaching. The programs have been tested with elementary school children at camp Ashokan, New York. Thirty-one investigations are described, each contains a problem to guide observations, suggested observations to be made, and lists of questions for discussion. The investigations aim to increase the childrens' understanding of animal and plant adaptations and of the interrelationships between organism and their habitats. Possible effects of disturbing the habitat are emphasized. Some investigations require a minimum of simple equipment, others require none. Several activities suitable for rainy days are described, including six games. The appendix gives a summary of themes and teaching schedules, drawings of leaves of common trees and of pond insects, charts for use in some of the investigations, a complete list of materials and equipment required, and a short list of references for teacher and pupils. This work was prepared under an ESEA Title III contract. (EB)

A New Approach to
SCHOOL CAMPING
Grades K-6

Some suggestions for
OUTDOOR INVESTIGATIONS in
SCIENCE-CONSERVATION for
Camps·Parks
Playgrounds
Sanctuaries

S.P.R.U.C.E.

SCIENCE PROJECT RELATED TO UPGRADING CONSERVATION EDUCATION

A Title III E.S.E.A. Project Administered by Ulster County B.O.C.E.S.

DR. PHYLLIS S. BUSCH
Project Director

1969

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A NEW APPROACH TO SCHOOL CAMPING

SOME SUGGESTIONS FOR OUTDOOR INVESTIGATIONS IN

SCIENCE-CONSERVATION K-6

THIRTY-ONE DIFFERENT EXPERIENCES FOR CHILDREN AT

CAMPS **PARKS** **PLAYGROUNDS** **SANCTUARIES**

CREDITS

Program conceived by and designed by Dr. Phyllis S. Busch

Program tested by Jane Geisler, Grace Godley, and Kay Widmer in June 1968 at Camp Ashokan, State University College at New Paltz, New York (12561)

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INTRODUCTION AND ORGANIZATION OF GUIDE

Introduction

School camping as an educational vogue is increasing due to greater availability of funds for recreation purposes and also because many educators are accepting school camping experiences as fulfilling the conservation education requirements for children.

The most common form of these camping experiences is a week's stay at a camp where the children participate in a variety of activities: nature walks, talks, games, swimming, boating, cooking, etc.

Such exposure surely has desirable psychological and social effects. It also has some positive educational results. But as the conservation experience, it is simply too little and too late, and frequently totally inadequate.

Project S.P.R.U.C.E. has experimented with a modification of school camping focusing on conservation education. A camping experience is designed for grades K to 6, and is predicated upon an approach to teaching THROUGHOUT THE ENTIRE YEAR utilizing "indoor-outdoor" procedures as an ongoing "daily" method of teaching. The camping trip is only a highlight, not the total conservation learning opportunity offered. By focusing on the child's immediate outdoor environment all year, he benefits by the enrichment made possible in a camping situation. The enrichment lessons are equally appropriate for a sanctuary, a park, or a playground.

This guide is limited to the INSTRUCTIONAL part of the camping program. All the details of permission slips, finances, transportation, dress, health, food, and recreation are left to the camp and school administrations. The teachers who are concerned with conservation education, or science-conservation education are invited to avail themselves of the following suggested outline developed by Project S.P.R.U.C.E.

It is recommended that grades K, 1, 2, 3 and 4 spend one whole day at camp. The programs in this guide cover instructions for one day for each of these grades.

The fifth grade spends two days and one night at camp, while the sixth grade is offered three days and two nights. Thus, in a school which follows this timetable, a child will accumulate a total of ten days of conservation education at camp from kindergarten to the end of the sixth grade.

Organization

For each grade there is a stated THEME in keeping with the New York State Elementary Science Curriculum. This is followed by suggested field experiences. The field experience is initiated with a problem. Orientation follows. Materials necessary are

distributed. The investigation is carried out. At the end of the trip the data is reviewed and results are expressed. New problems are posed, hopefully by the children. Discussion questions are suggested to help guide the thinking into conservation channels. Possibilities for action by the children should be invited.

For grades K-4 there is one educational activity planned for the morning and two for the afternoon.

For grades 5 and 6 there are longer sessions: one in the morning and one in the afternoon, with extras such as an experience before breakfast and at night.

The above teaching schedule arrangement allows for arrival and departure, meals, rest, and play.

In case of rain a suggested series of rainy day activities will be found on pages 27-30.

These consist of investigations grouped according to grade, some appropriate discussion questions, and a selection of science-conservation games.

Included in the Appendix are a summary of schedules and themes for each grade, a list of teaching materials and supplies, some diagrams and data sheets, recommended pupil and teacher references.

The aims for the outdoor experiences which are here provided are: to stimulate the curiosity of children, to provide rich opportunities to inquire, investigate, and discover, to seek and to find ecological relationships, to develop a sense of responsibility, to translate this sense into positive action for improving the quality of our environment.

Phyllis S. Busch
Director, Project S.P.R.U.C.E.

PROGRAM FOR KINDERGARTEN (ONE DAY)

THEME: CHILDREN CAN LEARN ABOUT DIFFERENT KINDS OF LIVING THINGS IN THE WATER AND IN THE WOODS THROUGH ALL THEIR SENSES.

MORNING SESSION

A.M. PROBLEM: What kinds of living things do we find in and near the water?

Investigation Procedure:

At the edge of a pond the teacher uses a strainer to scoop up some bottom mud which is then placed on newspaper. Living things are then transferred to basins of water where they can be more clearly observed. Rocks are lifted and turned over in search of life beneath them, and then replaced. The group moves to a stream area if available and the same sort of investigation is repeated for running water. (See pictures of pond insects, Appendix)

Discussion Questions:

What living things do you see?
What non-living things do you see?
What is the biggest thing you see?
What is the smallest thing you see?
What did you find in the water near it? over it?
What would happen if the mud or rocks which you removed were not replaced?
What would happen to the living things in the water if trash, cans and bottles were put into the water?

Equipment: 1 long handled strainer (a regular soup strainer is fastened to an old broomstick or mop handle - see Appendix)
plastic basins
newspapers

AFTERNOON SESSION

P.M. PROBLEM I: What living things can be detected in the woods with our senses?

Investigation Procedure:

For sight, touch, and smell introduce two different kinds of leaves, such as sassafras and mullein. Sassafras has four different shapes, is smooth, and is fragrant when crushed. Mullein has a simple outline, is not especially fragrant, and is very fuzzy. (See Appendix for outline of leaf shapes).

Other good examples are American beech leaves and bark, white oak, birch, moss, maple leaf viburnum, pine needles, cones, lichen on trees, white pine bark, briars, cedar, mint, skunk cabbage.

For sound, listen to the sounds made by walking on leaves, the calls of birds, running streams, splashes of animals, sounds of animals, squeaking of branches, etc.

Discussion Questions:

If everyone were to pick a leaf from one bush what would happen? Why might the bush die?
How can you smell a tree or shrub without damaging it? (The bark can be scraped from a twig with the fingernail until green shows, then smell)
How can you tell one tree from another?
What do these sounds mean? Squeaking of a tree, chattering of a squirrel, song of a bird, etc.

Equipment: Specimen needed for demonstration.

P.M. PROBLEM II: How do the shapes of leaves resemble each other? How are they different?

Investigation Procedure:

Give each child a copy of some leaf shapes (see diagram of leaf shapes in Appendix) and then look for matching shapes. When the child finds a match outdoors, he fills in the outline with crayon.

Discussion Questions:

How many different leaf shapes did you find?
Which is the most common shape?
What color are leaves?
What happens in green leaves?
Why is it best not to remove the green leaves from the plants which we study?

PROGRAM FOR FIRST GRADE (ONE DAY)

THEME: PLANTS AND ANIMALS ARE FITTED TO LIVE IN DIFFERENT KINDS OF PLACES (HABITATS OR "NEIGHBORHOODS").

MORNING SESSION

A.M. PROBLEM: Where do we find animal homes?

Investigation Procedure:

A hike is taken to look for animal homes at different levels of the forest or field (ground level, eye level, and overhead) as well as by the pond or stream.

Examples of homes to look for are nests, hives, holes, spittlebug foam, webs, rolled leaves, cocoons, galls, caves, muskrat mounds, beaver lodges.

Discussion Questions:

What animals live in these woods? fields? streams? ponds?
What materials did some animals use to make their homes?
How many different animals could use holes in a dead tree?
When should a dead tree be left standing? When should it be removed?

Equipment: None

AFTERNOON SESSION

P.M. PROBLEM I: What kinds of coverings do different plants and animals have?

Investigation Procedure:

Go on a hike, Study the differences in bark textures by feeling with fingers. Make rubbings of barks in order to compare designs. Rub crayon over tracing paper held against bark.

Observe and feel differences in other parts of plants: leaves, trunk, twigs, roots, flowers, branches.

Look for animal coverings to study. Perhaps there is a rabbit, a snake, a frog, a salamander, a bird or a feather, an insect, an earthworm. Show samples of animal coverings.

Discussion Questions:

Compare the bark between two very different trees.
How may the bark differ on the same tree?

Why do young trees need more protection than older trees?
What happens when bark is removed from a living tree by a bulldozer or knife?
If a tree is injured - bark removed - how can you prevent disease or decay from entering?
How is the outside covering of people different from that of birds, squirrels, snakes, frogs?
What animals are trapped by man? Why?
Who is allowed to trap animals?
What would happen to muskrats if they were all trapped? How can this be prevented?

Equipment: Samples of animal coverings (snakeskin, chamois, leather, fur, feathers)
Crayons
Tracing paper

P.M. PROBLEM II: What plants and animals live in dead trees?

Investigation Procedure:

A dead standing tree is examined in order to find out how it feels, smells and looks. The children look for scars, breaks, holes and for plants and animals on it and in it. A fallen rotting tree is examined in the same way. (Do not break rotting log apart. Replace whatever is moved.)

Discussion Questions:

How is a standing dead tree different from a fallen log?
Which has the greatest number of animals and plants living on it?
What will eventually happen to both trees?
How would the removal and burning of these dead trees in the forest affect the plants and animals that live in them? Affect other forest animals and plants?
If the dead tree were standing in the middle of the playground, would it be better to remove it or let it stand? Why?

Equipment: Magnifiers

PROGRAM FOR SECOND GRADE (ONE DAY)

THEME: WATER, WOODS, AND SOIL PROVIDE VARIED KINDS OF ENVIRONMENTS FOR LIVING THINGS.

MORNING SESSION

A.M. PROBLEM: What lives in water?

Investigation Procedure:

At the edge of the pond the group begins looking for evidences of plants and animals that live in and around the pond. Then the water is examined. A strainer is used to obtain a sample of bottom mud which is placed on newspaper. Any living things are transferred to basins of water where they can be clearly observed. Very small creatures are placed in plastic vials of water. All water, mud and animals are carefully replaced. (See diagrams of pond insects in Appendix)

Discussion Questions:

What plant life do you find in the water?
What kinds of animals live around the pond? in the pond?
How do animals that live in the pond breathe?
How do the animals change as they grow?
How do water animals move?
How do they find and catch their food and what do they feed upon?
What would happen if the pond were sprayed to kill insects?

Equipment:
Small plastic vials
Magnifiers
Basins
Newspaper
Regular strainers
Long-handled strainers (see Appendix)

AFTERNOON SESSION

P.M. PROBLEM I: What lives in the woods?

Investigation Procedure:

A hike is taken through a woods. Animals as well as evidences of animals are observed. Plants are observed. Evidences of animals might be tracks, eaten nuts, spider webs, nests, the sounds they make, their droppings, etc.

Discussion Questions:

How is it possible for so many different plants and animals to live in one place?
What kinds of things do animals living in the woods feed upon?
What are some of the ways the woods animals find their food?
How do meat-eating animals catch their food?
After a chipmunk has finished eating, what signs of his meal might be left behind?
What signs might be left behind after an owl? a fox? a spider? a worm?
How would it affect the squirrels if all the oaks in the woods died or were cut down? How would it affect the foxes? the owls?

Equipment: None

P.M. PROBLEM II: What lives in the soil?

Investigation Procedure:

Introduce the study of soil by discussing its origin, composition, importance. Soil is made up of broken down parent rock, decayed plant and animal material, live organisms, water, air.

The children are divided into groups. Each is assigned to a different area: evergreen woods, field, deciduous woods. Each group examines a soil sample in a pie tin. Samples of the soil contents are glued to a white cardboard. Animals are drawn on the cardboard.

Discussion Questions:

Why is soil important? Trace food, clothes, dwellings back to soil.
How do worms and other insects living in the soil affect the soil?
What happens to the soil where people walk and make a well-worn path?
What do you think the soil is like under black top? under gravel? under a driveway?
Where is it a good idea to leave fallen branches and leaves lying on the ground? Where is this not a good idea?
Why are grass clippings and fallen leaves from lawns and parks saved?

Equipment: Trowels (or old metal spoons)
Magnifiers
Containers for soil
White cardboard
Glue (such as Elmer's, Glue Bird)
Crayons

PROGRAM FOR THIRD GRADE (ONE DAY)

THEME: ADAPTATIONS HELP LIVING THINGS TO SURVIVE.

MORNING SESSION

A.M. PROBLEM: What conditions help trees to survive?

Investigation Procedure:

The class observes differences between mature and immature trees -- bark texture, size and shape of leaves, color of twigs and bark, shape and height of tree. The leaf canopy of the tallest trees is observed in contrast to the lack of lower branches. Several bark rubbings of older and younger specimen of the same kind of trees are made. Younger barks are apt to be smoother than older ones. Trees grow in width as well as length. Growth in width causes ridges, cracking, peeling. (Make a bark rubbing by rubbing a crayon over tracing paper held against the bark.)

Discussion Questions:

What might be the advantage to the young tree to have a few big leaves?
How do some trees change as they grow?
What are some natural ways in which trees are pruned? (wind, lightning, squirrels, deer browsing, porcupine)
How does pruning affect the growth and shape of the tree?

Equipment: Black crayons
Tracing paper

AFTERNOON SESSION

P.M. PROBLEM I: How fast do trees grow?

Investigation Procedure:

Different methods of telling the age of a tree are demonstrated (counting the whorls of branches on pine trees, the annual rings of a tree cross section, and the growth rings or bud scale scars on branches of deciduous trees. This last method is done by measuring the distance between terminal bud and the first set of "growth rings". (See Appendix for diagram of horse chestnut twig.) This is the current growth. Then measure the distance between these growth rings and the next lower set (see Appendix, same diagram) for previous year's growth.

The children select two twigs which are two years or older. They measure and record the amount of growth for the present year and for the last year.

Discussion Questions:

Did the tree grow more this year or last year?
What might explain the difference?
How does the growth rate of branches on your tree compare to that of other trees?
Which seems to be the slowest growing tree around here?
Which seems to be the fastest growing tree?
What is a fast-growing tree that might be planted in a yard or parking lot?
What kind of conditions would help a tree to grow quickly?

Equipment: Rulers, paper, pencils
Twigs showing "growth rings" (and/or diagrams of same. Some trees useful for observing bud scale scars are ailanthus, ash, sassafras, horse chestnut.)
Cross section of a tree showing "annual" rings

P.M. PROBLEM II: How does shape and color in animals help them to survive?

Investigation Procedure:

The class discusses animal adaptations for protection and camouflage. Toothpicks of assorted colors (which have been counted ahead of time) are scattered in the grass and the children try to pick up as many as possible. Observations are made as to what color toothpicks are most difficult to locate (green). Each child receives a small plastic vial and is assigned an area in which to hunt for and capture insects. Captured insects are observed carefully in the vials, discussed, and then the insects are released.

Discussion Questions:

What color toothpicks are easiest to find? most difficult? why?
Where would it be hardest to see each collected insect?
Do markings make it easier or harder to find an insect?
What other ways do the insects protect themselves (stingers, biting, rolling into a ball, running)?
What would happen to the insects if they were kept in tightly closed containers?
Where should the insects be released?

Equipment: Pre-counted toothpicks of assorted colors
Small plastic vials
Magnifiers

PROGRAM FOR FOURTH GRADE (ONE DAY)

THEME: LIVING THINGS ARE CONSTANTLY CHANGING AND PRODUCING CHANGES IN THEIR ENVIRONMENT.

MORNING SESSION

A.M. PROBLEM: How do some immature land insects change?

Investigation Procedure:

A hike is taken to look for immature insects in various land locations - near the water, in the woods, in the field, and along the fence rows and roadside. Look for caterpillars hanging from trees, rolled up in leaves, inside galls on various parts of plants, etc. (depends on time of year).

Discussion Questions:

Where do immature insects obtain food?
How would one caterpillar affect one tree?
What would happen to the tree if there were hundreds of caterpillars feeding on it?
How would spraying the tree with insecticide affect the caterpillars? the birds and other animals that feed on the caterpillars?
What becomes of the caterpillar when it "grows up"?

Equipment: None

AFTERNOON SESSION

P.M. PROBLEM I: How do some immature water animals change?

Investigation Procedure:

The different stages of growth in insects, frogs and toads are discussed and contrasted with each other and with stages of growth in turtles and fish. The teacher shows how a strainer is used to obtain a sample of bottom mud which is then placed on newspaper. Any living things are transferred to basins of water where they can be clearly observed. Very small creatures are placed in plastic vials to be more closely observed. (See diagram of pond insects in Appendix.)

The children are divided into smaller groups and each group is given a long-handled strainer, a basin, some newspaper, pictures of aquatic insects and assigned an area to explore. From the pictures provided, the children try to discover what insects are in the pond and in what stage of development the insects and the other animals are.

Discussion Questions:

Are more of the animals mature or immature?
How will the immature ones change when they become adult?
How does such a pond get polluted?
What would happen to the animal life if too much silt got into the pond during heavy rains or after some construction work nearby?
If the pond were polluted how would this affect the insects? the frogs? you?
What do you like about a pond?

Equipment: Long-handled strainers, short-handled strainers
Basins
Newspaper
Pictures of immature and mature insects (see Appendix)

P.M. PROBLEM II: What kinds of changes can be found in plants and in the physical environment?

Investigation Procedure:

The children are divided into small groups in order to explore very carefully a portion of the outdoor environment.

They will look for: (a) changes in plants such as rolled leaf edges, galls, holes in trees, (b) changes in the physical environment such as decreased sunlight in an area, holes in the ground, flooding of an area.

Discussion Questions:

How many plant changes did you observe?
How many were made by other plants?
How many were made by animals?
How many were made by people?
What changes made by plants, animals, or people affected the soil, temperature? or other parts of the physical environment?
What changes were produced by water, wind, sun, etc.?
How do these changes affect the living environment?
In what ways are the changes which people made different from changes made by plants or animals?

Equipment: Thermometers
Magnifiers
Rulers
Paper and pencil

PROGRAM FOR FIFTH GRADE (TWO DAYS & ONE NIGHT)

THEME: PLANTS AND ANIMALS ARE FOUND IN THEIR OWN HABITATS ("NEIGHBORHOODS").

FIRST DAY — MORNING SESSION

A.M. PROBLEM: What kind of habitat is occupied by people at this camp?

Investigation Procedure:

The idea of habitat is discussed. (See Appendix for book reference #5 for discussion on habitat.) Simple area maps are distributed or made as the investigation proceeds. A hike is taken to locate various habitats around the camp, including lawns, athletic fields, tall grass fields, beaches, lakes, ponds, streams, buildings, parking lots and wooded areas. These areas and the trails leading through them are marked on the maps.

The habitats are observed, wind direction and wind speeds are recorded. Air temperatures are taken. All records may be put on the maps.

Discussion Questions:

Where is it coolest on a hot day? hottest?
Where is it warmest on a cold day? Why?
What location is most exposed to the wind?
most sheltered from the wind?
Where is the most shelter from rain? Where is the least shelter? Where is it the driest? Where is it the wettest? How might this affect you?
What would happen if trash were allowed to accumulate on the grounds? if garbage were dumped into the pond? if it were buried?
How can we best protect this area? Improve it?

Equipment: Clipboards with pencils, papers
Compasses
Small maps of camp area
Thermometers

FIRST DAY — AFTERNOON SESSION

P.M. PROBLEM: What organisms live in an aquatic habitat and how do they survive?

Investigation Procedure:

After discussing the source of water for a pond, lake or stream, the water is explored. Strainers are used to obtain a sample of bottom mud which is placed on newspaper. Living things are transferred to basins of water; small creatures can be placed in plastic vials of water. The animals are closely examined and discussed. The plants are then examined and the number, kinds and location in the pond are noted. All water, mud, plants and animals are carefully replaced. (See diagrams of pond insects in Appendix).

Discussion Questions:

Where do the water animals get their energy?
Where do plants get their energy?
From where does the water come? To where does it flow?
How are some of the animals especially fitted to swim in the water?
Which part of the pond has the greatest variety of plants? the greatest number? Which has the greatest variety of animals? the greatest number?
What would happen if a pond or lake were dredged and all the mud on the bottom and all the plants were removed? How would this affect the insects? the fish? the frogs? How would the plants grow back?
What will eventually happen if a pond or lake were not dredged?
How are some of the insects and other animals fitted to breathe in the water?
To kill mosquito larva, oil is sometimes put on the surface of ponds. The mosquitoes cannot breathe through the oil. How would this affect the diving beetles? dragonflies? fish?

Equipment: Long-handled & short-handled strainers (see Appendix)
Plastic basins
Tweezers
Plastic vials
Newspaper
Magnifiers

EVENING SESSION

EVENING PROBLEM: What animals are active around here during the night?

Investigation Procedure:

It is explained that some animals in a habitat are active only at night. One way to find out which kinds, is to set live

traps. Small Hav-a-Hart traps are demonstrated, baited and set out for small mammals. It is emphasized that permits are required if larger mammals are trapped. The necessity of warmth, food and quick release of the animals is also discussed. No large animals will be trapped.

Equipment: Live animal traps (small)
Peanut butter and pieces of apple

SECOND DAY MORNING SESSION

BEFORE BREAKFAST PROBLEM: What animals were active around here last night?

Traps to be examined before breakfast and animals released after they are observed, counted, recorded. Children should be advised where they can learn more about these animals.

A.M. PROBLEM: What kind of land habitats do insects occupy?

Investigation Procedure:

A hunt is made for insects in several different areas (short grass fields, tall grass fields, deciduous woods, coniferous woods). Special attention is given to the soil, litter, and shrub growth of each area. When the insects are found, the habitat, the location and composition, the relative quantity and kinds of insects, as well as where within the habitat, are recorded. Some small insects may be placed in vials for observation by all, then released.

Discussion Questions:

In which habitat were the most insects found? Where were the greatest variety found? What might be some reasons why more insects are found in one habitat than in another?
How might insects affect the plants in the habitat? the soil? the animals? you? How would it affect the plants if all the insects in one habitat were eliminated? the animals? you?
If man sprayed the woods with insecticide to eliminate the tent caterpillars, how would this affect others in the area? the plants? the animals? you? Which animals would be particularly affected? Why?

Equipment: Vials
Clipboards and pencils
Magnifiers

SECOND DAY AFTERNOON SESSION

P.M. PROBLEM: What can we learn from a comparative study of two selected land habitats: forest, field?

Investigation Procedure:

A hike is taken through deciduous woods, coniferous woods, along the edge of the woods bordering a field, and through the field. In each area the types of vegetation, dampness, temperature, and light conditions of the habitat are noted. Search is then made for animal and animal signs - tracks, homes, food scraps, droppings. A record is made.

Discussion Questions:

(See Appendix book reference #9 for background.)
Why do you find a certain plant in one habitat and none of that same kind of plant in another habitat? What is an example?
How would it affect the plants if all the animals disappeared from this area?
How has man's cutting the mature forest impaired the habitat for many animals? Where have the animals gone?
What animals did you only find in one habitat and not in any other habitat? Why?
In which habitat did you find the most animals? the least? Why?
How has man changed this area in order to make this a suitable habitat for him? What parts has man not touched at all?
How does man's activities eliminate animals? Why are some animals extinct? Why are more becoming extinct?

Equipment: Clipboards and pencils, paper
Maps of the area
Thermometers
Photography light meter (Different ones record the amount of light differently. Directions will advise one how to hold the meter in order to get a reading of the amount of light in a given spot.)

PROGRAM FOR SIXTH GRADE (THREE DAYS & TWO NIGHTS)

THEME: NATURAL COMMUNITIES CONSIST OF PLANTS AND ANIMALS WHICH LIVE INTERDEPENDENTLY IN THE SAME ENVIRONMENT AND WHICH FORM A COMPLEX "WEB OF LIFE". THEY INTERACT WITH EACH OTHER AND WITH THEIR PHYSICAL ENVIRONMENT SUCH AS AIR, WATER, SOIL.

FIRST DAY — MORNING SESSION

A.M. PROBLEM: What changes has man made in this community and how have these changes affected other members of the community?

Investigation Procedure:

Distribute and discuss the uses of geological survey maps. Review simple mapping. Distribute outline maps of the camp. A hike is taken through the camp. All changes made by man as well as natural changes are located and noted on the maps. The children's maps are then compared to old and new maps of the community and to geological survey maps in order to discover man-made changes.

Discussion Questions:

What is the effect of the removal of a dead tree on the road?
How may the building of a dam affect a stream? life in a pond? man's community?
What effect will making a sand beach at the edge of a lake have on the life in and around the lake?
Does cutting a trail through a woods affect any of the wildlife within the woods?
How does blacktopping affect the soil? the plants? you?
What will eventually happen to a pond if it is not disturbed? to an abandoned field?

Equipment: Clipboards and pencils
Simple maps of area
Compasses
Geological survey maps of the area

FIRST DAY — AFTERNOON SESSION

P.M. PROBLEM: What kind of predatory insect life is present in greatest numbers in the pond?

Investigation Procedure:

A strainer is used to obtain a sample of bottom mud which is placed on newspaper. Any living things are transferred to

basins or vials of water where they can be more closely observed. Observation is made of the insect mouth parts in order to determine which insects are predatory and which are not. The predator-prey relationships of the insects are discussed. The children are divided into groups and assigned a location at the edge of the pond (or stream) in which they are to determine the number and kinds of predatory and prey insects. Locations include a stony area with no vegetation, mud bottom area with emergent vegetation and mud bottom with floating vegetation. A comparison of data is made and it is determined which kind of insect is present in the greatest number. (See Appendix for diagrams of pond insects and for data sheet for this problem. See book reference #4 and #7 on structure of pond insect mouth parts.)

Examine the clearness of water by holding samples of water against the light. This can be used as a measure of comparison of numbers of organisms too small to be seen with the naked eye.

Discussion Questions:

What forms of life might be introduced which would reduce mayfly larvae? mosquito larvae?
How would that affect the dragonfly larvae? minnows? bass? you?
How would you increase the total population of insects in this pond? of just the predators? of the fish?
What would happen to the insects if the area of the pond where the emergent vegetation is found were destroyed, and a sand and pebble beach put in? How would this affect the fish? you?

Equipment: Long-handled strainers, short-handled strainers
Plastic basins and vials, newspaper, magnifiers
Pictures of pond insects, data sheet (see Appendix)

FIRST NIGHT EVENING SESSION

EVENING PROBLEM: Where in the camp area could a trail be made which would show changes made by various organisms?

The children plan a trail in the camp area which they will make the following day. They discuss what kinds of changes to look for. On the "Trail of Change" each child is responsible for one station which will show change made in the environment by one organism. Examples of stations might be a pile of sawdust made by carpenter ants, holes in a tree from woodborers, a stump resulting from a cut tree, a ditch due to the wheels of a car, change in the shape of a cedar tree due to deer browsing, a pile of garbage thrown away by people, a stone wall made by man, and a pile of soil made by ants.

Time permitting, a short exploratory walk is taken.

SECOND DAY MORNING SESSION

BEFORE BREAKFAST PROBLEM: What weather is forecast for today at the weather station?
What birds can you see and hear before breakfast?

A.M. PROBLEM: The underside of a water-lily leaf is a special habitat. What organisms, plant and animal, do you find there? How does each plant and animal affect the others?

Investigation Procedure:

Several lily pads are placed upside down in a pan or basin of water.

The undersides of the lily pads are investigated for organisms such as snails, red water-mites, rotifers, midge larvae, and eggs of snails, mites, beetles or water insects. The plant stems are examined for algae, snails, tube worms, sponges.

Pictures of these organisms should be used to help identify them (see Appendix - Reference Book #4).

Discussion Questions:

What is the food of each organism on the lily pad?
Starting with algae, develop a food chain.
How do several food chains interrelate?
How would it affect the snails if all the algae died?
the midge larvae? the beetles? the eggs of insects?
Play the game "Web of Life" (see Rainy Day Suggestions to play game) How can you relate this game to the "Web of life" on the underside of the lily pad?

Equipment: Plastic basins and vials
Magnifiers
Ball of string
6" x 8" cards
Magic marker
Pictures of organisms found on underside of lily leaf

SECOND DAY AFTERNOON SESSION

P.M. PROBLEM: The plans for a "Trail of Change" were developed the night before. (See preceeding page, evening session.)

Investigation Procedure:

The children work on the trail they had previously planned - marking out the trail, clearing where necessary, marking their stations with numbered luggage tags and planning their walk. A hike is taken along the trail and each child explains to the others the nature of the change at his station.

Discussion Questions:

How does each change affect other plants in this community? animals? soil? man?
Which changes were made by man? How are they beneficial? harmful?
Which were made by animals? by water? weather? by plants?

Equipment: Luggage tags, magic markers

SECOND NIGHT EVENING SESSION

EVENING PROBLEM: How many animals which are active at night can we discover?

Investigation Procedure:

This will be done in two ways: (1) by setting traps before dark and (2) by taking a hike after dark.

1. After review of the procedure for baiting and setting live animal traps and the habits of some small nocturnal animals, the traps are set out before dark in the appropriate locations in the fields and woods.

2. A night hike is taken through the fields and woods. The children rely on their ears for information and their eyes only secondarily. The night life heard and seen may include: crickets, katydids, various frogs, mosquitoes, bats, moths, owls, mice, oppossum, raccoons, skunks, wolf spiders, phosphorescent fungi, sounds made by caterpillar droppings.

Discussion Questions:

What animals appear to come out only at night?
Why do some of these animals come out only at night?
What special adaptations enables a deer mouse to get around in the dark? an owl to hunt in the dark? bats to find food in the dark?
How do the sounds of various animals differ from one another? How is the sound made in each case? Why is trapping of certain animals restricted to certain times of the year?

Equipment: Live animal traps (small), bait
Flashlights

THIRD DAY MORNING SESSION

BEFORE BREAKFAST PROBLEM: Which animals are active at night? Which are the commonest?

Before breakfast, the live animal traps are collected, the catch examined, discussed and released. Additional animals are added to the list of night animals discovered in the night hike. Discussions should be held of the various kinds, the commonest ones and their importance. References for further study should be given.

A.M. PROBLEM: How does the soil (part of the physical environment) of several different habitats compare?

Investigation Procedure:

Select several study areas where the soil may be different; for example, a well-worn path, a grassy field, a deep woods, a beach area. Indicate sites on map.

A group of pupils is assigned to each site. The soil is studied in each area. At each site the water absorption of the soil is first measured. This is done by sinking into the ground a #2 can which is open at both ends to a depth of one inch. The can can be hammered down gently with a rock. A cup of water is poured into each can. The amount of water that is left after ten minutes is recorded.

Then other on-site studies are made: the soil temperature in the sun and in the shade, the air temperature in both places, the plants growing, evidences of animal life on the surface, etc., are observed.

After these investigations a cupful of soil is collected for more careful study. Children note color, texture (how it feels), small organisms that may be present, decayed plant parts, etc.

Discussion Questions:

How does the soil differ in the various sites?
(use data sheet)
How do the plants in the area influence the composition of the soil?
How does a hard-worn, bare path affect tree growth? grass growth?

Equipment: #2 tin cans open at each end
Containers of water
Measuring cups
Rulers
Thermometers
Trowels or metal spoons
Map of area on clipboard with pencil
Data sheets (see Appendix)

THIRD DAY AFTERNOON SESSION

P.M. PROBLEM: What does a habitat map show us about the different kinds of habitats in this area? Where are these habitats? What is the relationship among these habitats?

Investigation Procedure:

A large map of the area is used to summarize the work of the class. The areas of study are located on the map and some of the information noted by way of labels pinned in position. Colored paper may be used to make information labels. The finished map is given to the class as a basis for further discussion and study back at school.

Also, small editions of the larger map may be used by the children, then taken back to school.

Discussion Questions:

How are the various communities dependent upon each other?
What would be the result of a man-made change on any habitat? How might such change affect other habitats?

Equipment: Small maps of area
Large map of area
Colored paper or cards for labels
Marking pencil
Pins

PROGRAM FOR RAINY DAYS

It is recommended that the teacher read the regular program and the suggested rainy day program. Then prepare materials in advance so that if the day is a rainy one the materials will be ready and dry.

A. Rainy Day Investigations

Grades K-1

1. A flannel graph story can bring out themes planned for each grade level. Cut-out objects are placed on a flannel covered board as the story is created. Kindergarten can concentrate on the pond, the big and little animals and plants living around or in it. First grade can work with animal homes and their location and relation to plants.

2. Soil study can be done inside as well as out, if the teacher collects the soil ahead of time. In addition, small bags of leaves and litter can be examined for evidence of change and discussion of what makes up soil.

Grades 2-4

1. The process of decay can be examined inside by bringing in logs of different stages of decay. Be sure to have newspaper on which to place logs. Small plastic vials are useful for collecting organisms for closer study if such are discovered.

2. Tree growth can be studied if the teacher provides cross sections of various trees, and branches of different ages showing bud scale scars. Bark rubbings of logs can also be made.

Grades 5-6

In the event of total rain there would be 2 two-hour or 4 one-hour science-conservation sessions. The following suggestions could be suitably adapted to either group.

1. Analysis of owl pellets.
2. Construction of a key for leaves, flowers, skulls, etc.
3. Packets containing animal evidence to use as a source of animal activities. (Examples: beaver chips, tent caterpillar egg case, rabbit scat, gnawed nut shell, etc.)
4. Investigation and discussion of various galls and insects.
5. Close examination of animal teeth in skull collection with related discussion of eating habits of animals. Use mirrors for pupils to examine their own teeth and to make comparisons.
6. Pond or brook dip contents brought inside in plastic bowls for careful examination.
7. Pond or brook bottom material spread on newspaper inside for close examination.

8. Forest litter from a variety of sites spread on newspaper for close examination.
9. Play recordings of bird songs, field sounds, pond sounds, etc.
10. Descriptive writing of everything seen and observed outside of a window from a particular station over a set period of time can be used to sharpen concentration and collect information.

B. DISCUSSION QUESTIONS FOR A RAINY DAY (ALL GRADES)

What happens to rain which falls in the pond?
What happens to rain which falls in a nest?
What happens to rain which falls on a blade of grass?
What happens to rain which falls on a tree?
What happens to rain which falls on an ant?
What happens to rain which falls on a frog?
What happens to rain which falls on a cat?
What happens to rain which falls on a dog?
What happens to rain which falls on a flower?
What happens to rain which falls on the soil?
What happens to rain which falls on the pavement?
What happens to rain which falls on a car?
What happens to rain which falls on your books?
What happens to rain which falls on you?
What things need rain?
How does the rain get into trees and other plants?
What use do you make of rain? Try to go for a day without using any water before you answer this question.
Why is it important to protect people and books and clothes from rain?
What is the best way to do this?

Try to investigate different materials in order to discover the best way.

If you were a grasshopper, what would you do when it rains?
If you were an earthworm, what would you do when it rains?
If you were a frog, what would you do when it rains?
If you were a bird, what would you do when it rains?
If you were a fish, what would you do when it rains?
If you were a fly, what would you do when it rains?
If you were a squirrel, what would you do when it rains?
Because you are a person, what can you do when it rains?

C. GAMES FOR RAINY DAYS (ALL GRADES)

1. Where did it come from?

A game of questions with each answer tracing everything back to the soil is good. Ex: what did you have for breakfast? Where did it come from? Where did it grow? What are you wearing? What are you sitting on? etc.

2. Using Your Senses

Small vials each containing a variety of spices, seasonings, and teas from the kitchen as well as objects with distinct odors from outdoors can be passed around for identification and discussion. A small group may be interested in experimenting with making various drinks from sassafras root chips, peppermint, sumac fruit and others.

3. Match it

This is a variation of "Steal the Bacon" which can be played indoors. Two teams are lined up facing each other about 25 feet apart, with the players on each team numbered. Two similar sets of leaves and other natural objects are needed. One set is laid out in the middle between the two teams. The other set is kept by the leader, possibly in a bag. The leader holds up an object for all to see, calls out a number, and then the two people with that number run to the middle to touch (but not to pick up) the object that matches what the leader is holding up. The first person to touch the correct item and run back to his team without being tagged by his opponent gains a point for his side. If tagged he still gains a point, but the other team also gains a point.

4. Game of Touch

Two teams are lined up facing each other with the players numbered. Numerous natural objects are laid out between the two teams. The leader calls a number after stating a broad science concept which would apply to one of the items, such as "This produces its own food". (Leaf) The two players called run up to touch the correct object and then run back to their team. The leader can make further identifying statements if necessary.

5. Twig Matching

Cut twigs 8-12 inches long into two parts, mounting the lower half on cardboard. Distribute the upper halves to members of two teams who closely observe the mounted twigs and try to match their upper half with the mounted lower half. Collect twigs and distribute again so that team members receive different twigs. Cut leaves may be used, or flowers may be matched to their stems and leaves, or leaves matched to leaf scars.

6. Web of Life

Construction of food chains and/or web of life using people as the representative parts and strings to indicate the links. You will need a large ball of string cut into 10 foot lengths, an audience, cards (about 6" x 12") lettered clearly. There should be one card for each item in the story. Any number of animals may be used. A chair or other article may be used as a focal point to which the strings may be tied. (Cards could be labelled: plants, soil, water, mouse, insect, rabbit, bird, coyote, skunk, man)

1. Discuss how and why 'soil' and 'water' are necessary for life: place these cards centrally. Tie 'plant' card to chair while stressing that plants are the basis of animal life.
2. Start with one card such as the 'mouse'. Have a member of the audience hold the 'mouse' card and with appropriate remarks, run a string from 'mouse' to 'plant'.
3. Give the next card such as 'insect' to another person and run strings from insect to plant and insect to mouse.
4. Successively give all cards to members of the audience and place the person in the framework being developed. Run strings between cards where direct relationships occur. The web of string quickly forms as the story progresses.
5. Use the 'man' card last.
6. Have each card-holder tighten his strings. Then, going around the circle and ending with 'man', consider what relationships are upset by elimination of each species. Consider the idea that man is the one species with which the world could dispense. This idea heightens the presentation of the thought that man, as a thinking animal has a profound obligation and responsibility to the rest of the "Web of Life" shown and to the soil, water, and plant resources on which all animals depend.
7. Bring out strongly the idea that we must have perspective and insight in dealing with the complex web of life. No animal is all 'good' or all 'bad'. Too many or too few of any species present problems for many other species.

This game was recommended by Dr. Wilson Clark, Eastern Montana College of Education, Montana.

APPENDIX

SUMMARY OF THEMES AND TEACHING SCHEDULES

Grade K

THEME: CHILDREN CAN LEARN ABOUT DIFFERENT KINDS OF LIVING THINGS IN THE WATER AND IN THE WOODS THROUGH ALL THEIR SENSES.

Sessions: One Morning and Two in the Afternoon

A.M. PROBLEM: What kinds of living things do we find in and near the water?

P.M. PROBLEM 1: What living things can be detected in the woods with our senses?

P.M. PROBLEM 2: How do the shapes of leaves resemble each other? How are they different?

Grade 1

THEME: PLANTS AND ANIMALS ARE FITTED TO LIVE IN DIFFERENT KINDS OF PLACES (HABITATS OR "NEIGHBORHOODS").

Sessions: One Morning and Two in the Afternoon

A.M. PROBLEM: Where do we find animal homes?

P.M. PROBLEM 1: What kinds of coverings do different plants and animals have?

P.M. PROBLEM 2: What plants and animals live in dead trees?

Grade 2

THEME: WATER, WOODS, AND SOIL PROVIDE VARIED KINDS OF ENVIRONMENTS FOR LIVING THINGS.

Sessions: One Morning and Two in the Afternoon

A.M. PROBLEM: What lives in water?

P.M. PROBLEM 1: What lives in the woods?

P.M. PROBLEM 2: What lives in the soil?

Grade 3

THEME: ADAPTATIONS HELP LIVING THINGS TO SURVIVE.

Sessions: One Morning and Two in the Afternoon

A.M. PROBLEM: What conditions help trees to survive?

P.M. PROBLEM 1: How fast do trees grow?

P.M. PROBLEM 2: How does shape and color in animals help them to survive?

Grade 4

THEME: LIVING THINGS ARE CONSTANTLY CHANGING AND PRODUCING CHANGES IN THEIR ENVIRONMENT.

Sessions: One Morning and Two in the Afternoon

A.M. PROBLEM: How do some immature land insects change?

P.M. PROBLEM 1: How do some immature water animals change?

P.M. PROBLEM 2: What kinds of changes can be found in plants and in the physical environment?

Grade 5

THEME: PLANTS AND ANIMALS ARE FOUND IN THEIR OWN HABITATS ("NEIGHBORHOODS").

Sessions: First day - one in Morning, one in Afternoon, one at Night
Second day - one before Breakfast, one in Morning, one in Afternoon

FIRST DAY

A.M. PROBLEM: What kind of habitat is occupied by people at this camp?

P.M. PROBLEM: What organisms live in an aquatic habitat and how do they survive?

EVENING PROBLEM: What animals are active around here during the night?

SECOND DAY:

BEFORE BREAKFAST PROBLEM: What animals were active around here last night?

A.M. PROBLEM: What kind of land habitats do insects occupy?

P.M. PROBLEM: What can we learn from a comparative study of two selected habitats: forest, field?

Grade 6

THEME: NATURAL COMMUNITIES CONSIST OF PLANTS AND ANIMALS WHICH LIVE INTERDEPENDENTLY IN THE SAME ENVIRONMENT AND WHICH FORM A COMPLEX "WEB OF LIFE". THEY INTERACT WITH EACH OTHER AND WITH THEIR PHYSICAL ENVIRONMENT SUCH AS AIR, WATER, SOIL.

Sessions: First day - one Morning, one in Afternoon, one at Night
Second day - one before Breakfast, one in Morning, one in Afternoon, one at Night
Third day - one before Breakfast, one in Morning, one in Afternoon

FIRST DAY:

A.M. PROBLEM: What changes has man made in this community and how have these changes affected other members of the community?

P.M. PROBLEM: What kind of predatory insect life is present in greatest numbers in the pond?

EVENING PROBLEM: Where in the camp area could a trail be made which would show changes made by various organisms?

SECOND DAY:

BEFORE BREAKFAST PROBLEM: What weather is forecast for today at the weather station?
What birds can you see and hear before breakfast?

A.M. PROBLEM: The underside of a water-lily leaf is a special habitat. What organisms, plant and animal, do you find there? How does each affect the others?

P.M. PROBLEM: The "Trail of Change" planned the previous night is executed.

EVENING PROBLEM: How many animals which are active at night can we discover?

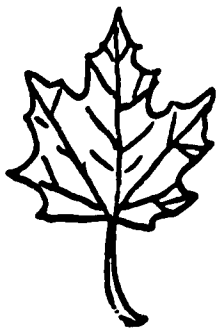
THIRD DAY:

BEFORE BREAKFAST PROBLEM: Which animals are active at night? Which are the commonest?

A.M. PROBLEM: How does the soil (part of the physical environment) of several different habitats compare?

P.M. PROBLEM: What does a habitat map show us about the different kinds of habitats in this area? Where are these habitats? What is the relationship among these habitats?

LEAF SHAPES

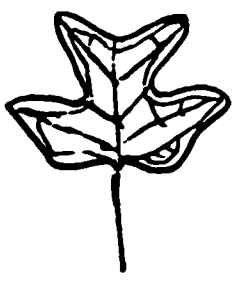


Maple

White Oak

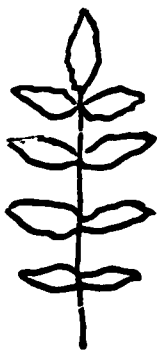
Beech

Gray Birch

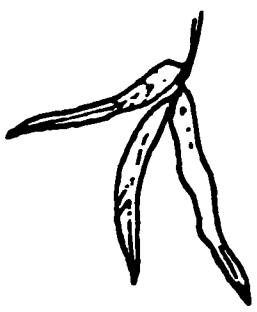


Tulip

Sassafras



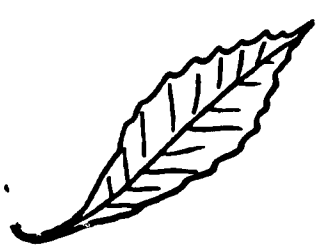
Ash



Willow

Mullein

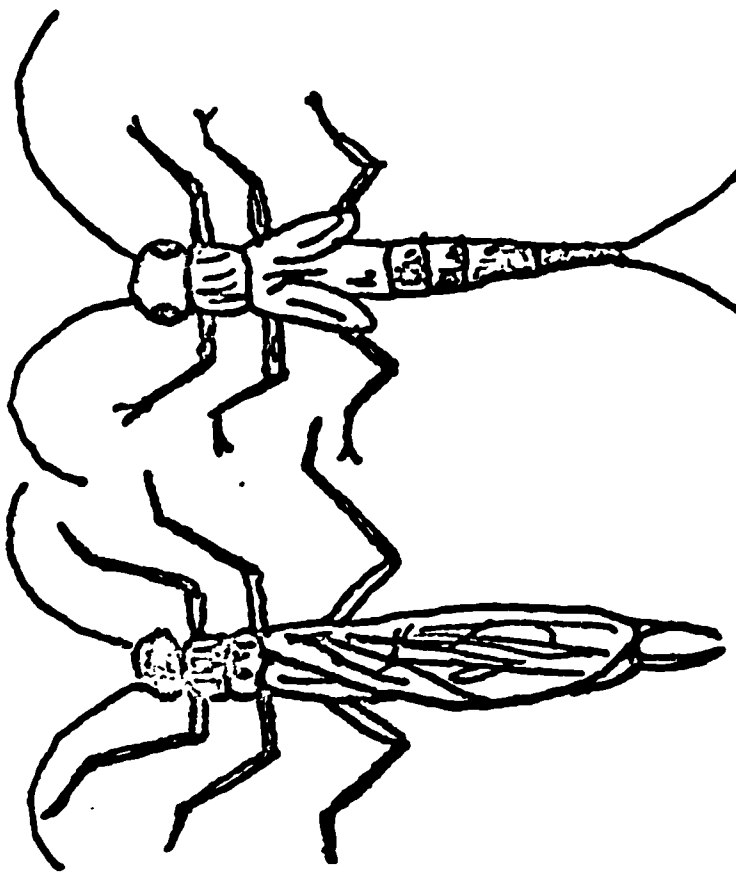
Red Cedar



Chestnut Oak

Spruce

POND INSECTS 1

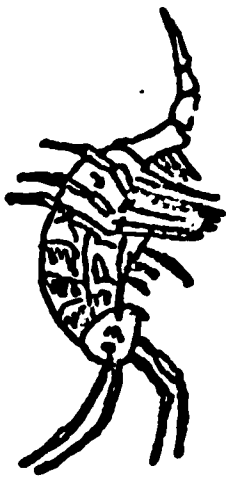


ADULT

NYMPH

STONEFLY

BACKSWIMMER

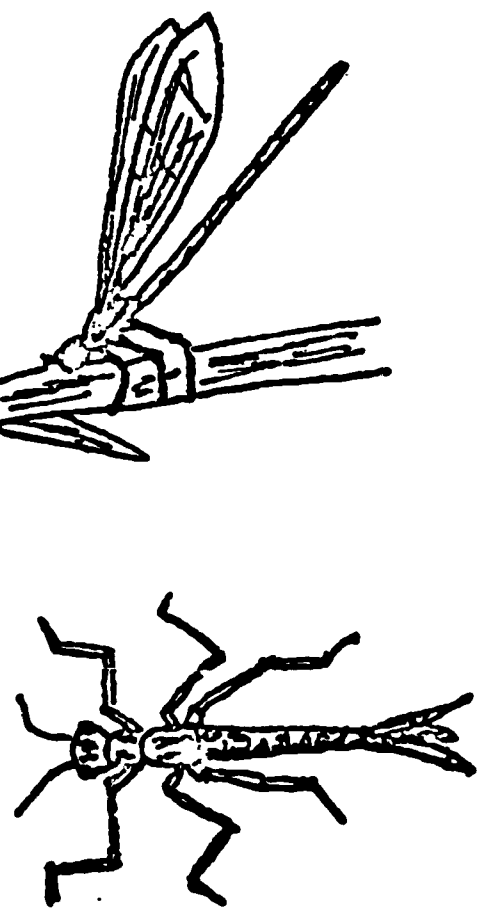


FRESH-WATER SHRIMP

NYMPH

ADULT

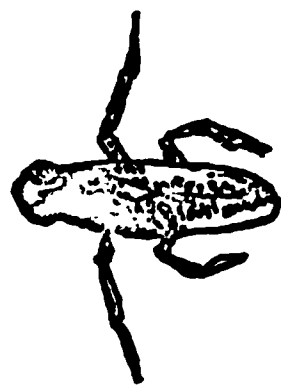
DRAGONFLY



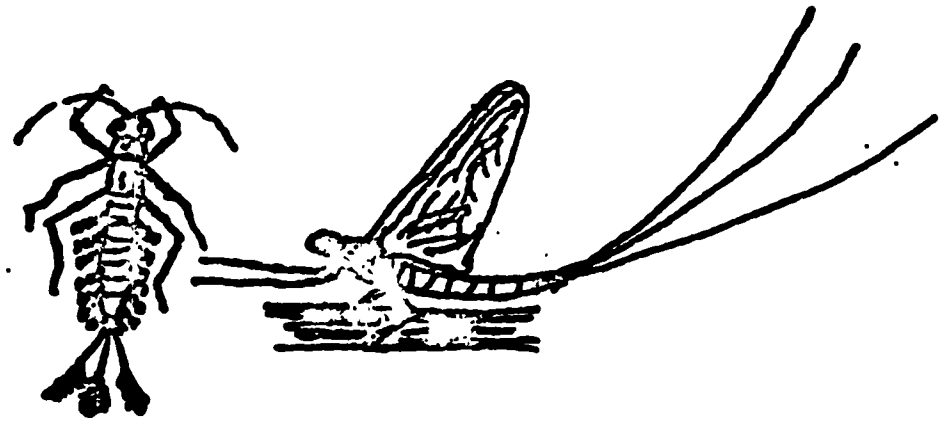
NYMPH

ADULT

DAMSELFLY

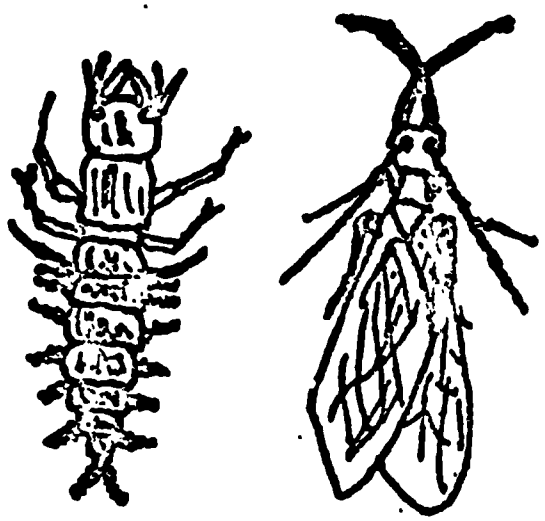


WATERBOATMAN



NYMPH ADULT

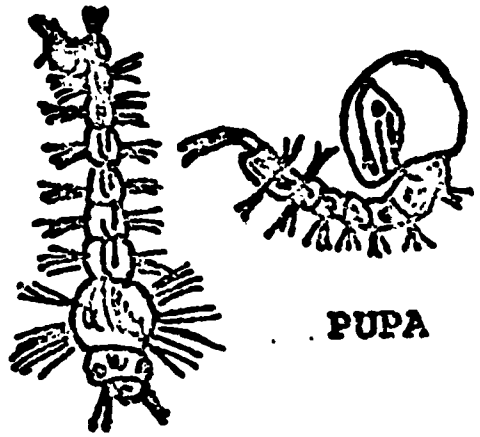
MAYFLY



LARVA ADULT

DOBSONFLY

(HELLGRAMMITE)



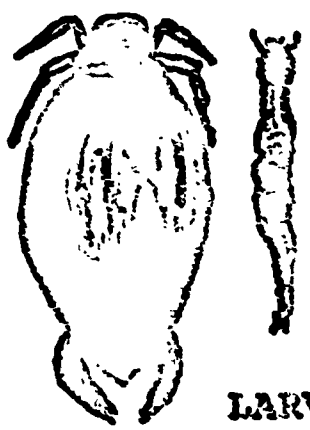
PUPA

LARVA

MOSQUITO

LARVA ADULT

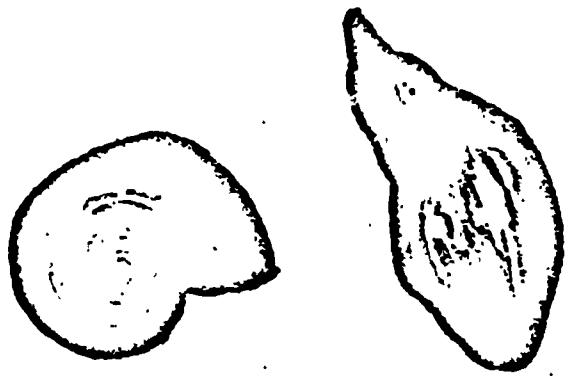
CADDISFLY



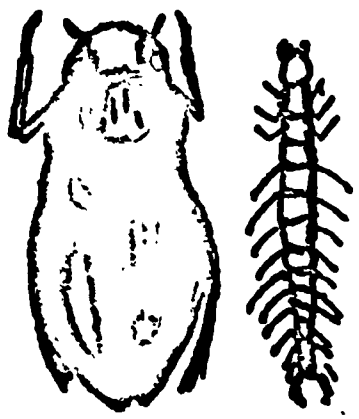
LARVA

ADULT

WHIRLIGIG BEETLE



WHEEL SNAIL POND SNAIL



ADULT LARVA

DIVING BEETLE

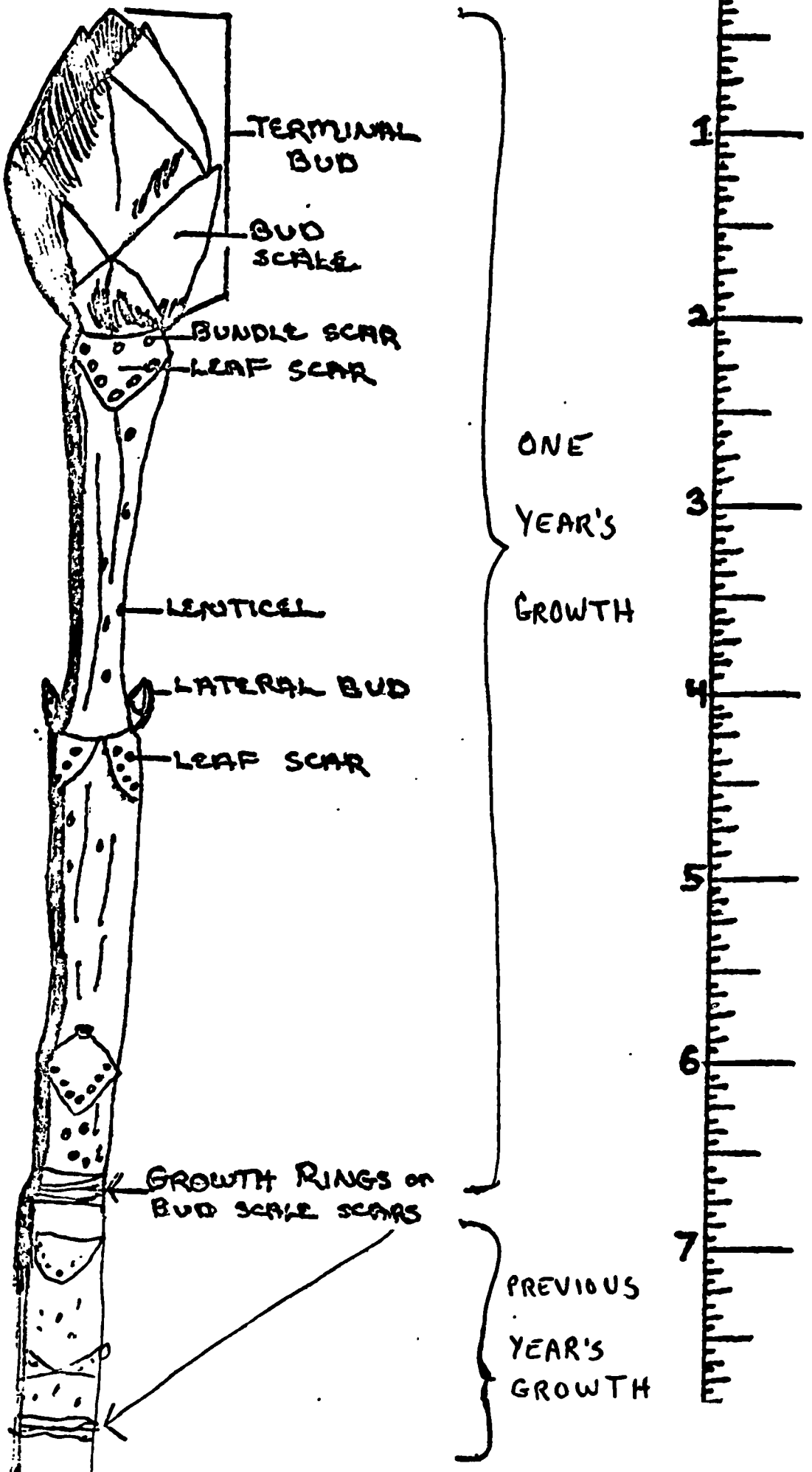
PREDATORY INSECT SUMMARY

PREDATORY INSECT SUMMARY

PROBLEM: What kind of predatory insect life is present in greatest numbers in the pond?

INSECT PREDATOR	NUMBER IN STONY BOTTOM	NUMBER IN MUD BOTTOM WITH EMERGENT VEGETATION	NUMBER IN MUD BOTTOM WITH FLOATING VEGETATION	TOTAL
Water Strider				
Diving Beetles				
Dragonfly Larvae				
Damselfly Larvae				
Backswimmer				
Caddisfly Larvae				
Other				

TWIG OF HORSE CHESTNUT



PROBLEM: How does the soil (part of the physical environment) of several different habitats compare?

CRITERIA	SITE #1	SITE #2	SITE #3
Color			
Texture (How does it feel when rubbed between two fingers)			
Temperature of soil in sun Temperature of air above soil in sun			
Temperature of soil in shade Temperature of air above soil in shade			
Composition (living things) Plants and Animals Kinds Number			
Absorption Rate - amount of water (from one cup) absorbed by soil after 10 minutes			
Kinds of animals indications			
Kinds of plants found			

SOIL STUDIES

MATERIALS AND SUPPLIES

Animal coverings (samples)

Bags

Bait (peanut butter & apples for traps)

Basins (plastic)

Books (for reference)

Cans (#2 tin cans open at both ends)

Cardboard (white)

Cards (Web of Life game)

Charts (copies of charts and other necessary Appendix material for class)

Clipboards (with pencil attached)

Compasses

Containers (for water & soil)

Crayons

Cups (measuring)

Flashlights

Glue

Light meter (photography)

Magic Marker

Magnifiers (hand lenses)

Maps (small ones of area, large ones of area, & geological survey map of area)

Newspapers

Paper (tracing & construction)

Pencils

Rainy day materials

Rulers

Strainers (long-handled & short-handled)

String

Tags (for trail markers)

Traps (small live animal) (10" x 3" x 3")

Thermometers

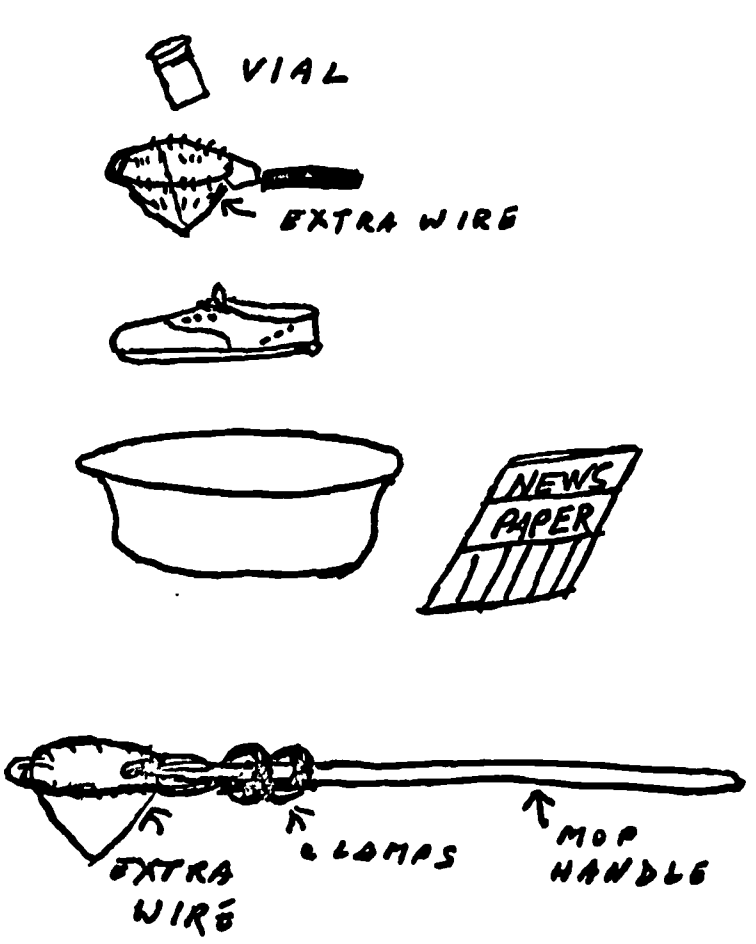
Toothpicks (assorted colors)

Trowels (or old metal spoons)

Tree (cross section showing annual rings) (twigs showing growth rings)

Tweezers

Vials (small plastic with covers)



Water exploration materials

TEACHER AND PUPIL REFERENCES

1. Audubon Nature Notebook. Slingerlands Comstock Publishing Co., Ithaca, N.Y. Pocket size. Leaflets (black & white) water insects, bird nests, nature games, camp cookery.

2. Fichter, George S. Insect Pests. Golden Nature Guide. Golden Press, N.Y.

3. Hammerman & Hammerman, Teaching in the Outdoors. Burgess Publishing Co., Minneapolis, Minn.

4. Morgan, A.H. Field Book of Ponds and Streams. G.P. Putnam's Sons, N.Y.

5. Nicklesburg, Janet. Field Trips (Ecology for youth leaders). Burgess Publishing Co., Minneapolis, Minn.

6. Palmer, E. Laurence. Fieldbook of Natural History. McGraw-Hill, N.Y.

7. Ried, Zim & Fichter. Pond Life (A Guide to Common Plants & Animals of North American Ponds and Lakes). Golden Nature Guide.

8. Shuttleworth & Zim. Non-Flowering Plants. Golden Nature Guide.

9. Vosburgh, John. Living with your Land (A Guide to Conservation for the City's Fringe). Cranbrook Institute of Science Bulletin 53, Bloomfield Hills, Michigan.

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