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Robert W. George, Fisheries and Wildlife
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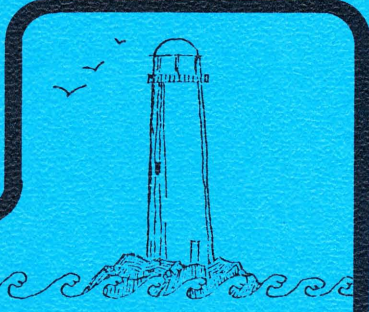
4-H 1045
Marine Science

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Leader/Teacher Guide



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Basic

WATER

ENVIRONMENT Series

Leader / Teacher Guide

4-H — Youth Programs
Cooperative Extension Service
Michigan State University

LEADER/TEACHER GUIDE

for

WATER

by

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This guide is a result of the pilot program evaluations and assistance of the 4-H NR and EE Developmental Committee and the able assistance of Chris Newhouse, Environmental Conservation Education Graduate Student.

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Leader/Teacher Guide for Basic WATER

To the Leader/Teacher

This unit of the Basic Environment Series is designed both to give members information about water and to help them use this knowledge in various activities. The intended result of this unit is a member who has the knowledge, abilities, and the environmentally sound attitudes to deal with the water resources and problems of today's world as well as with the world of the future.

BEFORE STARTING

1. Read the leader/teacher guide completely.
2. Read the member guide completely.
3. Note the additional resources for the Water unit. If any of these resources are desired, materials should be ordered and resource persons should be scheduled at least a month in advance.
4. Decide which discussion questions and activity options will be emphasized. (You may wish to involve your class or group in these decisions.)
5. Be ready to further define or discuss any of the vocabulary words which the students may not know.
6. Choose which of the concepts you will stress and be ready to emphasize these as they are encountered in the text.

OVERALL OBJECTIVES

- To help youth understand water and its importance in our lives.
- To investigate the water cycle.
- To appreciate our many uses for water and the need for water quality.

ORGANIZATION OF MEMBER'S GUIDE

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Water Characteristics	1
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Fertilized to Death	10
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PROJECT OBJECTIVES

Through the activities and information in this project, each member will be able to demonstrate having learned about:

- Water as a life requirement.
- Characteristics of water.
- The water cycle.
- Animal and plant consumption of water.
- How human activity affects water.
- Importance of clean water.
- Water uses: home, agriculture, community.
- Water quality tests.

LEARNING THROUGH ACTION

INDIVIDUAL activity is emphasized throughout this project. Through participation in self-conducted action projects, the learning process will be expanded and information learned will be reinforced. The activities are designed to appeal to several areas of interest and varying levels of knowledge and development.

GROUP participation in the project activities is easily accommodated and may offer special advantages. This may be of particular value with younger members and for those with little prior experience in self-conducted activity. Guided group activity is also an excellent introduction before individual studies are undertaken.

SUPPLEMENTAL ACTIVITIES

There are many opportunities for supplementing the activities offered in this project. One small body of water such as a pond, a stream, or even a soon-to-disappear puddle may be selected for intensive observation and the study of relationships between people and water. Learning about water also offers an excellent opportunity for extending the member's activity, leading to other projects with animals, wildlife, plants, forests, soil, air, and marine science. It is often suggested that water study offers one of the best means of instilling sound attitudes about the responsibilities of people toward all of their natural resources.

VOCABULARY LIST

NOTE:

1. The following words are among the most complex terms used in this unit. Depending on the level of your group, you may add to or delete from this list.
2. Many of these terms are defined within the text and the meanings of most of the others may be inferred from the context. Be sure that **you** are comfortable with your ability to define these terms before beginning the unit.

molecule
atom
transparent
conductor

solvent
precipitation
transpiration
succulent

vegetation
phosphate
bacteria
inhabitant

eutrophication
unscrupulous
effluent
porosity

KEY CONCEPTS

Several major concepts are developed through this project to promote an understanding of the value of water in our environment.

- Importance of water
- Water supply limitations
- Water cycle
- Plants and water
- Nutrients in water
- Water pollution
- Water conservation
- Water quality
- Percolation
- Human responsibility

ACTIVITY SEQUENCE

INTRODUCTION

The first four pages deal with water characteristics, importance, and problems. This part of the project bulletin is designed to prepare the member for the specific units and activities in the rest of the project. The information and attitudes shared here will be either introductory to or related to the understandings of the following activities.

Activity 1 — THE WATER CYCLE (page 6)

Members should be encouraged to trace several paths of water, with each starting and ending at the same point. Members may want to color the water cycle chart for clarity.

Optional Demonstration (depending on group level)

As an introductory activity, use an eye dropper to place 1 drop of water directly in front of each boy or girl—on the desk, the floor, or even on a member's shirt. It is important that each member recognizes the drop of water as "his or her **own**." Next, draw their attention away from their drop of water by discussing generalities of the water cycle. Following this, return to their drop of water. Is it still there? (Some or all of the water will have evaporated.) This demonstration can be used to help in discussion of the more specific portions of the water cycle.

Activities Re: Transpiration of Plants

Activity 2 — GRASSES AND SOIL (page 8)

Activity 3 — FLOWERING PLANTS (page 8)

Activity 4 — LEAVES (page 8)

Through these three sequential activities, the members will use and demonstrate their knowledge of the water cycle. They will observe water droplets collecting in the glass or jar—the source of these is evaporation from the soil and transpiration from grasses. Flowering plants as well will be shown to transpire. The third of these activities is more quantitative, showing that each leaf transpires; more leaves left on the branch result in more transpiration and faster use of the water.

Activity 5 — SURVIVAL STILL (page 9)

Each member will learn a valuable survival technique in addition to demonstrating transpiration. A survival still may also be constructed without adding greenery and useful comparisons made. Amounts of water collected in equal periods of time should be recorded.

Activity 6 — FERTILIZED TO DEATH (page 10)

Over fertilization will be much more meaningful to your group if you relate it to them **directly**. The exercise described allows each member to observe the process of lake eutrophication. Note: Heavy over fertilizing will kill most of the plants and algae immediately (within 48 hours). A more moderate fertilizing will still show ill effects but may take several weeks. The sight and smell of dead and decaying plant matter should make a lasting impression on the group members. Describe the parallels of what the group has done to “real life” situations near where you live. Be sure to stress that with prompt action and water quality management, local water supplies need not suffer the fate of the plant matter in the aquarium used for this activity.

Activity 7 — OIL SLICK or HOW FAR DOES OIL SPREAD? (page 11)

This activity is designed to impress youth with the ability of oil to cover a large amount of surface. Explain to the group members that oil on the surface—even a very thin layer—will hinder oxygen from entering or leaving the water. A similar principle was used years ago for mosquito control. A small amount of oil on the surface of the water of mosquito-breeding swamps would clog the breathing tubes of the immature mosquitoes which swim just under the surface of the water. Now that we know all of the harmful effects of this practice, other means of mosquito control are used. Note: The drop of oil used to cover the surface of the water in the activity-demonstration is only a minute fraction of the amount released by freighters and tankers in “normal” activities—let alone of the amount released in the sinking of a tanker.

An additional consideration to bring to the attention of the group is that **we now have an “environmental disaster”** (problem). The question is how to dispose of the “oil slick.” The options include the following:

1. A couple of drops of dish detergent should break down the oil droplet into droplets so small they are virtually harmless. (Explain that this is not feasible on a large scale.)
2. Ask a custodian or waste-disposal expert to take your sample to a location where the oil can be disposed of and broken down chemically or biologically. Stress the fact that pouring the oil down the sink is **not** a solution. It just gives the problem to someone else (the sewage treatment plant).

Relate this discussion to everyday activities like changing the oil in an automobile or cleaning the grease from a bicycle chain. Where do the wastes go?

Oil Pollution Watch—Members may also observe oil pollution that often appears in ditches after a rain as runoff from roadways and parking lots. The fact that this oil enters the groundwater system makes it an important form of pollution. Members without ready access to water may build a meaningful scrapbook of articles and photographs.

Activity 8 — PRIMARY WATER USES (page 14)

MAN'S USES OF WATER — This section is designed to serve as an information and motivation source for The “Primary Uses” section which follows. If you discuss the diagrams on page 14, be sure to remind the members that in the top diagram the 250 liters (55 gallons) per day figure for a person's use is only “direct” use. Indirect uses must be added to that figure, as in the middle diagram, bringing the **total** use figure per person to about 6000 (1585.21 gallons) per day.

1. Home

The water measures assigned to the students are for personal, direct use. As an option, you may assign some or all members to measure the use by their families. Since this figure will include activities like laundering and dishwashing, dividing this total by the number of persons in the family will give a better idea of direct personal use. Group averages and high and low amounts for each use displayed on a large chart vividly demonstrate water consumption.

2. Agriculture

Through this activity, the members will become much more aware of the needs of agriculture. An additional option here is to calculate the amount of water needed to sustain one of the animals for a year, or the amount necessary for the corn plants in the class' vegetable gardens. The numbers rise impressively.

3. Community (page 15)

The spaces allowed may not be sufficient to detail the water uses of your community. You may wish to list the uses on a poster or chalkboard. If you live where the drinking water is drawn from a river, be sure to list water problems upstream as well as those of your own community. Discuss the implications of your community's water use on other communities further downstream.

Activity 9 — WATER SANITATION CHECK (page 17)

YOUR DRINKING WATER — By now, group members should be familiar with the uses of and the need for fresh water. But some of these uses are not compatible with maintaining quality drinking water, as shown in the previous section on “Community Water Use.” To investigate water quality, many tests are used; two are described in this section.

Members should recognize that many sources of water are unsafe although they may be used regularly by people with built-up tolerances against the contamination. Vacation site water supplies may also be included in this check.

Activity 10 — PERCOLATION TEST (page 17)

Members are encouraged to perform this test in several different soil types to compare results. Surface vegetation may be undercut and tilted out of the way to expose the bare soil. Remind members to replace any vegetation removed during this test.

You may wish to have a county health officer or other official talk to the group about water testing and water quality.

MEMBER ACHIEVEMENT

The demonstrations in this unit are only one means of displaying achievement. Member development begins with broadened understanding of water and its essential value. Members are offered many opportunities to learn about water, to learn about interrelationships, and to see their own skills and knowledge develop. The accomplishment of the activities should result in pride of performance which is then visibly displayed through public demonstration.

INDOOR AND OUTDOOR

The activities in this project include some which may be conducted indoors and others for the outdoors. The convenience of indoor activity is, however, supplementary to the dynamic outdoor environment. Weather and seasonal variations provide a broad range of excellent opportunities for additional activities and further understanding of water through direct experience as an essential part of our environment. Some of the experiences may be especially effective when conducted as group experiences while others offer particular value as individual exploration.

INTERDEPENDENCE

Throughout this unit it is of value to stress the interactions that occur between air, soil, plants, animals, and water. Treating one part of the ecosystem individually aids member learning. However, it is important that members understand how all the parts of an ecosystem fit together—each part affecting all of the others. Water offers an exceptional opportunity for relating all parts of the environment together.

After teaching this unit, please take a few moments to complete the following evaluation. It will help us in future revisions of this unit, as well as in the development of related units. Any additional comments would be especially appreciated. Upon completion of the evaluation, please send it to:

Extension Project Leader
 Environmental Conservation Education
 9 Natural Resources Building
 Michigan State University
 East Lansing, MI 48824

Basic Water Project

EVALUATION

HOW to use the form: Encircle the number after each statement that indicates the degree of inclusion of each "understanding" in this project unit (as you have taught it).

WHAT the numbers indicate: (Degree of Inclusion)

- | | |
|-----------------|---------------|
| 1 — none | 3 — some |
| 2 — very little | 4 — very much |

A. Characteristics, Distribution, and Status of Water Resources

- | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 1. All fresh water resources originate as precipitation in a very pure condition. | 1 | 2 | 3 | 4 |
| 2. Water is a self-replenishing and self-depleting resource. It is intermittently replenished by precipitation and is steadily depleted by evaporating into the air and by draining away to the ocean. | 1 | 2 | 3 | 4 |
| 3. The force of gravity is always pulling water down toward lower levels. In response to this pull, water generally exerts force. | 1 | 2 | 3 | 4 |
| 4. Water tends to cling to earth particles and to spread through the earth materials by capillary attraction. | 1 | 2 | 3 | 4 |
| 5. Water is unevenly distributed geographically and the quantity of water in any locality varies from time to time. | 1 | 2 | 3 | 4 |
| 6. Water is a very active and mobile resource. It is hard to capture and keep it where it is wanted or to keep it out of places where it is not wanted. | 1 | 2 | 3 | 4 |
| 7. Water readily dissolves and carries away a wide range of substances, and it picks up and carries in "suspension" particles of solid material. | 1 | 2 | 3 | 4 |
| 8. Many aspects of water conditions and behavior are not readily apparent. | 1 | 2 | 3 | 4 |
| 9. All phases of the "hydrologic cycle" are closely and complexly interrelated. | 1 | 2 | 3 | 4 |

B. Understanding the Uses of Water and Its Importance to Man

- | | | | | |
|------------------------------------------------------------------------------------------------------|---|---|---|---|
| 1. Water is indispensable for plant and animal life and varies with climatic conditions. | 1 | 2 | 3 | 4 |
| 2. Water takes its place along with soil and sunlight in making the earth yield to the needs of man. | 1 | 2 | 3 | 4 |
| 3. Water has various recreational values. | 1 | 2 | 3 | 4 |
| 4. Water acts as a powerful natural force with potential good or harm to man. | 1 | 2 | 3 | 4 |

- | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 5. Demands for water are increasing at a greater rate than the population growth. | 1 | 2 | 3 | 4 |
| 6. The supply and availability of water at any given locality is variable and does not always equal the demand. | 1 | 2 | 3 | 4 |
| 7. Water gives varied and repeated services. | 1 | 2 | 3 | 4 |
| 8. In any location, the ease of water's availability tends to influence the use that is made of it. | 1 | 2 | 3 | 4 |
| 9. The wisdom and foresight with which a water resource is used may importantly influence the extent to which it can be used. | 1 | 2 | 3 | 4 |
| 10. The usefulness of water at any location may depend importantly on how adjoining and upstream lands are used. | 1 | 2 | 3 | 4 |
| 11. Consumptive use of water is increasing and creating shortages for other purposes. | 1 | 2 | 3 | 4 |

C. Understanding Problems and Techniques of Management

- | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 1. Control of pollution is an essential aspect of water management. | 1 | 2 | 3 | 4 |
| 2. Certain land management practices help to reduce the flood waters and silt that small streams empty into rivers and lakes. | 1 | 2 | 3 | 4 |
| 3. Transporting and storing water to meet increasing needs require expensive management techniques. | 1 | 2 | 3 | 4 |
| 4. The increasing demands for water and the conflicting uses of water require cooperation and coordination among water users. | 1 | 2 | 3 | 4 |
| 5. Stabilization of flow of streams and the levels of lakes enhance their usefulness. | 1 | 2 | 3 | 4 |
| 6. Flood control involves many different types of management techniques. | 1 | 2 | 3 | 4 |
| 7. Complete management of water is seldom feasible except on a very small area. To a large degree, we must adapt our water uses to natural conditions of water. | 1 | 2 | 3 | 4 |
| 8. Safety problems increase as more people use water for recreation. | 1 | 2 | 3 | 4 |

D. Understanding Policy and Administrative Techniques

- | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|
| 1. Water resources are so important and the problems are so complex that much study and research are necessary. | 1 | 2 | 3 | 4 |
| 2. Because water resources recognize no state, county, township, or municipal boundaries in their occurrence and travels, it is important that all units of government be given maximum opportunity for cooperating to solve mutual water management problems. | 1 | 2 | 3 | 4 |
| 3. When state water rights legislation is agreed to be necessary, the basic common law principles that now govern must be considered. | 1 | 2 | 3 | 4 |
| 4. In planning expanded water use, it is important for all groups that may be affected by that expansion to participate and cooperate in the planning. | 1 | 2 | 3 | 4 |
| 5. Good public understanding of water resource problems, possible solutions, and management are extremely important. | 1 | 2 | 3 | 4 |

We invite your comments and suggestions. Please use an additional sheet if necessary.

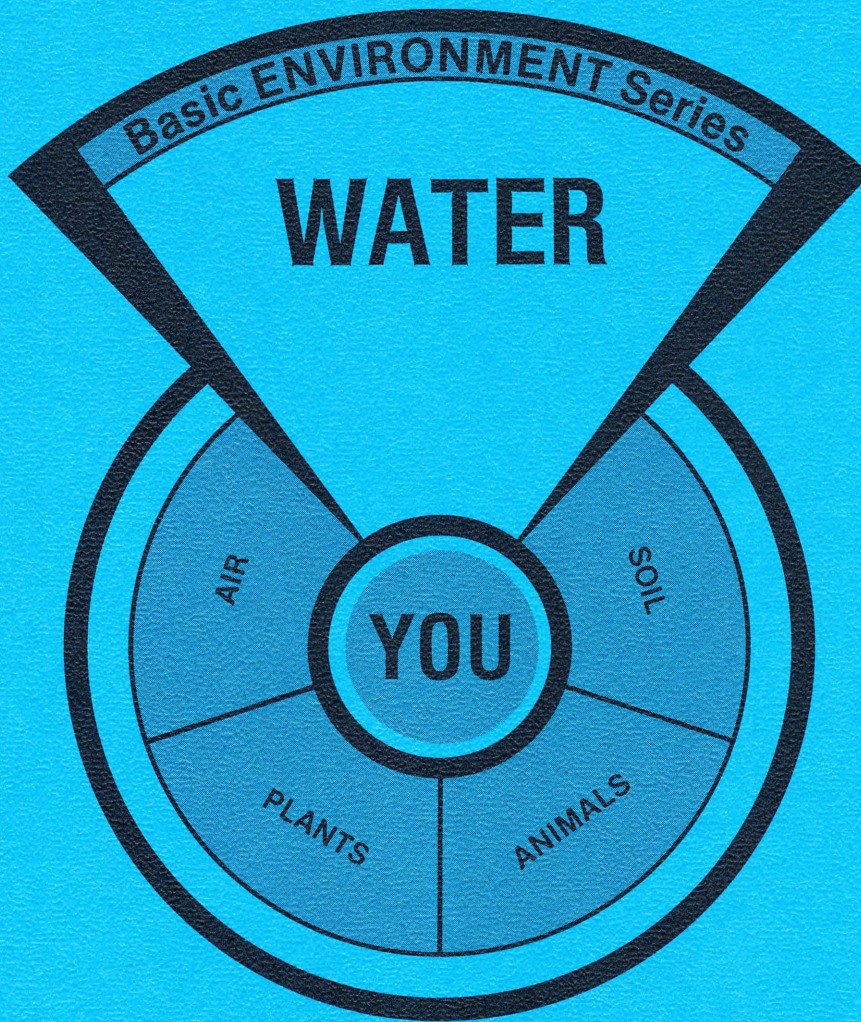
SELECTED REFERENCES

- The Living Waters and Suggestions for Teachers*. U.S. Department of Health, Education and Welfare, Washington, DC 20402
- The Wonder of Water* (cartoon booklet) with accompanying Teacher's Guide. Soil Conservation Society of America, 7515 N.E. Ankeny Road, Ankeny, IA 50021

ADDITIONAL MATERIALS — FILMS, SLIDES, PUBLICATIONS

- Environmental Protection Agency (Region V), One North Wacker Drive, Chicago, IL 60606
- Michigan Department of Natural Resources, I and E Division, Mason Building, Lansing, MI 48926
- Michigan United Conservation Clubs, P.O. Box 2235, Lansing, MI 48911
- National Wildlife Federation, 1412 16th Street, N.W., Washington, DC 20036
- Kellogg Bird Sanctuary, Environmental Education project, Augusta, MI 49012
- National Audubon Society, 1130 5th Avenue, New York, NY 10028

Write to any of the above to request their catalogs of available materials dealing especially with WATER and associated problems.



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