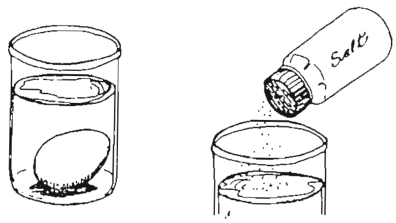
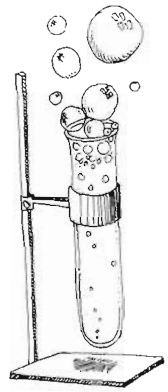


Learning Activities for
Youth Groups, Age 10-15

WATER INSPECTORS

Examining H_2O



CASEC
California Aquatic Science Education Consortium

University of California
Agriculture & Natural Resources
Publication 21609

WATER INSPECTORS

Examining H_2O

These materials were developed by the California Aquatic Science Education Consortium

Project Director
Willis D. Copeland
Graduate School of Education
University of California, Santa Barbara

Primary Author/Editor
Jill Shinkle

The initial formation of the California Aquatic Science Education Consortium (CASEC) in 1990 was undertaken by the Graduate School of Education at the University of California at Santa Barbara with funding provided by the National Science Foundation. In 1995, CASEC moved to the Department of Human and Community Development at the University of California, Davis with the 4-H Youth Development Program taking leadership for its ongoing activities.

The mission of CASEC is to promote a greater scientific literacy, a more thorough understanding of the value and workings of freshwater and marine ecosystems, and an enhanced awareness of scientific, environmental and policy aspects of California water issues. CASEC continues as part of the Division of Agriculture and Natural Resources Science, Technology, and Environmental Literacy Workgroup in the development, and evaluation of community-based aquatic science literacy projects.

*Dedicated to
the youth of California
and their care of the earth.*

CASEC
California Aquatic Science Education Consortium

University of California
Agriculture & Natural Resources
Publication 21609

California Aquatic Science Education Consortium

Department of Human and Community Development
University of California
Davis, CA 95616
(530) 752-8824

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For information about ordering this publication, contact

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University of California Davis

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Introduction

Whether we are in wet years or dry, whether we live in a cool moist climate or a hot and dry one, water continues to be one of our most basic concerns. The largest component in our own bodies is water; we could not live for even a few days without it. Our drinking water is precious to us, almost as precious as life itself.

Although two-thirds of our earth is covered with water, only a very small portion of it is available to us for drinking, watering our plants, washing ourselves or raising our food. Over 97% of the earth's water is found in the oceans and is unusable because of its salinity. Of the almost 3% which is fresh water, almost all is locked in the polar caps, glaciers or in groundwater too deep in the earth to reach. The remainder, only about one-third of one percent (.34%), is found in lakes, streams, and wells and therefore accessible to us. And what of this remainder? Shouldn't we all understand the nature of this scarce commodity which is so essential to our lives?

An opportunity to learn. The necessity for access to adequate fresh and clean water for the population is a problem that presents many intriguing issues for young people to study. This problem must engage the thoughts of all concerned citizens, and it provides an excellent setting for citizenship training. The scientific principles that must be brought to bear as one attempts to understand the characteristics of fresh water are also valuable lessons. Specifically, the set of activities in this package is designed to:

1. Teach basic scientific concepts related to the physical characteristics of water. These concepts include taste, salinity, temperature, hardness, and clarity.

2. Involve youngsters in the active practice of doing science, including constructing scientific instruments and using them to measure and describe water.

"Doing" Science

Science is more than learning facts about the physical and natural worlds. Scientists do things that help them discover and understand. The *California Science Curriculum Framework* suggests eight separate kinds of thinking processes that characterize the scientific enterprise. These are:

- Observing
- Communicating
- Comparing
- Ordering
- Categorizing
- Relating
- Inferring
- Applying

Studying science should emphasize these same processes of *doing* science that practicing scientists use. Science students need the opportunity to go beyond the simple study of what scientists have learned. These students need the experience and practice of *doing* science as scientists do it.

The various activities in this package engage youngsters in the thinking processes and actions typical of those used by scientists. The young participants have the opportunity to organize and classify data, predict outcomes, verify their predictions, collaborate with others in the pursuit of solutions, and create new and different approaches to doing common things. Each activity description in this guide contains science exercises and identifies the particular thinking processes that youngsters will use to carry them out.

Increased Understanding of Water and Its Characteristics

The primary focus of this collection of activities is to acquaint youngsters with some key characteristics of water, including salinity, clarity, temperature, hardness, and even taste. The activities both help learners to understand these characteristics and to measure them in a purposeful, dependable, and therefore rather scientific, manner. Further, being able to make measurements of such characteristics, the learners are also then able to make predictions and check to see if their predictions are valid. All of these thought operations are central to scientific study. They also can be great fun.

Many of the activities in this set also move youngsters beyond "learning about." Their intent is to involve them in the "doing." Youngsters can move out of their homes and club rooms and into the field where they take samples, measurements, and inventories and thus apply their growing understanding of water to the real world.

Which Activities to Use

For the most part these are all independent activities, not designed to be used in any particular order. However, some may be more appropriate to use at the start of your work on water while others can serve as culminating activities. Further, some activities require the use of instruments that are constructed in another activity that should precede them. Specifics of these combinations include:

- Activities #1, #2, and #9 are more "experiential" in nature. Most users of this package find that they serve best as either introductory or concluding activities.

- Activity #4 requires the use of a water sampler which youngsters make in Activity #3. These activities should be linked.

- Activity #5 might also make use of a water sampler if the leader wished to collect samples from an estuary which might have water of different salinity at different depths. If this is the case, it should also be linked to Activity #3.

What to Expect

Each activity presented in this book begins with a question to be answered, a summary, and a list of materials needed for the activity.

The "Instrument Panel"

At the upper left of each activity sheet is a shaded box with specific information about the activity that can be viewed quickly. This includes:

- An estimation of the activity's <u>Academic Demand</u>. Some activities require considerable thought and analysis on the part of youngsters. Others are less intellectually demanding.

- An estimation of the <u>Physical Exertion Required</u> by the activity. Some activities require considerable movement or exertion to complete, while others are quieter activities that may require less physical effort.

- A suggestion for the <u>Number of Participants</u> and how to group them most appropriately for the activity. Some activities may require a large group, while others are best accomplished by individuals working alone, in pairs, or in small groups. The following symbols signify different groupings:

   = Youngsters working individually

   = Youngsters working in pairs or small groups

   = Youngsters working in large groups

Note that it is often possible to use more than one grouping method with the same activity.

- An approximation of the <u>Time Needed</u> for the activity. All of the activities in this package require sessions of less than one hour to complete. Some activities may take less time while a few require multiple sessions. Estimates are given to the nearest quarter hour.

- A suggestion as to the <u>Setting</u> that would be most appropriate for the activity. Two settings are presented:

   = The home or club room

   = The out-of-doors

  Some activities may be accomplished in either setting.

Question

The topic of the activity is presented in question form so that youngsters might more easily see that their task, like that of practicing scientists, is to seek answers for themselves, not merely to learn answers acquired by others.

Summary

A one- or two-sentence summary of the activity is presented as an overview. This should assist the leader in selecting activities and in planning for their use.

Materials

Each activity requires certain materials, many of which are included in this package. For example, most activities make use of task cards and data sheets that can be photocopied and distributed to the youngsters to guide them through the activity. Additionally, some activities require items that generally can be found around the home. All necessary materials are listed in this guide.

Purpose

Particular educational goals for each activity are listed in this guide to assist leaders in planning and executing the activity.

Activities

The learning actions of each activity are presented as a series of steps to be directed by the leader. These actions are often mirrored or elaborated on the Task Cards used by the youngsters. It is important to recognize that the activities are presented as suggestions. Individual group leaders should feel free to make alterations that they think might improve the experience for their particular group.

Keys to Success

This section offers suggestions derived from past experience that might help the group leader derive the maximum benefit from each activity.

Use by Youth Groups

The activities in this package have been designed to fit comfortably into a wide variety of educational programs offered by youth-service agencies. Below are specific suggestions concerning how they might be used in particular organizations.

Boys and Girls Clubs of America

These learning activities may be used as a guide for club activities in environmental education, one of the six core services provided by the Boys and Girls Clubs programs. The activities may also complement individual clubs' existing programs in recycling, conservation, or marine science.

Girl Scouts

Within the Junior Girl Scout Program, these learning activities can be used for:

- Working toward badges in the World of Today and Tomorrow (Science in Action; Water Wonders) or in the World of the Out-of-Doors (Eco-Action; Outdoor Surroundings).

- Participating in the Contemporary Issues Program, "Earth Matters," and earning the participation patch.

- Participating in environmental badge activities at Girl Scout summer day camp or long-term camp.

- Developing activities, under the Council Patch Program Plan, that involve community improvement projects and investigative and hands-on environmental awareness activities for a troop or council-wide event.

4-H Youth Development Program

These learning materials incorporate the science processes and the learning cycle method of instruction. The materials can be used by adult volunteer and teen leaders working with youth 10-15 years of age involved in 4-H projects focusing on environmental science as well as marine and freshwater science projects. The materials include activities to prepare the youngsters for their experience, on-site activities, and debriefing activities. In addition, individual activities can be led by teens at summer and day camps, fairs and other public events, used as a basis for 4-H demonstration projects, and National 4-H week events.

Camp Fire

These activities complement several projects in the Camp Fire Adventure, Discovery, and Horizon programs, including:

- Try-Ad projects and Action Crafts.
- Torch Bearer projects in Environmental Issues or Special Interest.
- Components for the national Project Good Earth.
- As one of the three issues explored in an individual's WoHeLo Medallion project.

The curriculum can also be used in resident and day camp programs located near beaches, lakes, and rivers.

Resources: Field Guides

National Audubon Society Field Guide to Northern American Fishes, Whales, and Dolphins, New York: Alfred A. Knopf.

National Audubon Society Field Guide to Northern American Insects and Spiders, New York: Alfred A. Knopf.

National Audubon Society Field Guide to Northern American Reptiles and Amphibians, New York: Alfred A. Knopf.

Pond Life: A Golden Guide, Golden Books, New York.

Resources: Other Materials

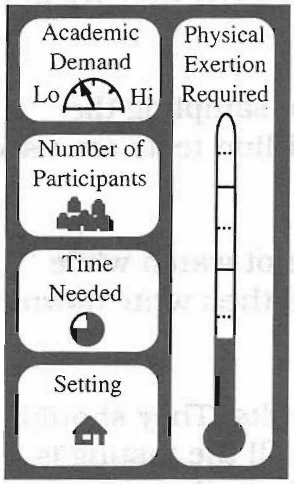
California State Environmental Education Guide, Alameda County Office of Education, 313 West Winton Avenue, Hayward, CA 94544. (510) 670-4157.

Dipping Into Creeks, a curriculum with an excellent Adopt-a-Stream packet, $15 (suggested donation). *Creek Life & Creek Ecology: A Quick Guide,* $5.00 (suggested donation). Available from the Sacramento Chapter of the Urban Creeks Council, 4855 Hamilton St., Sacramento, CA 95841. (916) 482-8377.

"Exploring the Pond Community," *Sea Sampler: Aquatic Activities for the Field and Classroom — Elementary,* South Carolina Sea Grant Publication, NSGD#: SCSGC-E-85-001. May be downloaded from the internet at <www.nsgo.seagrant.org>.

Project Water Science, Water Education Foundation, 717 K Street, Suite 317, Sacramento, CA 95814. (916) 444-6240. Online at <www.water-ed.org>.

TASTE TEST: IS BOTTLED BETTER?



QUESTION: What kind of water do you think tastes best?

SUMMARY: Youngsters participate in a "blind" taste test in which they sample water taken from various sources and evaluate it for taste.

MATERIALS:
- A variety of noncarbonated, chilled, drinking water (look in the grocery store for various brands, and use tap water as one source)
- Cups with masking tape for labels
- Soda crackers to eat between taste tests
- Score Card (included) and pencils

PURPOSE:

To help youth:

1. Understand that water from different sources may taste quite different because of the variations in dissolved minerals and other substances in the water.
2. Understand that certain qualities, such as taste, are called "subjective" because they depend on people's impressions and cannot be measured exactly.
3. Understand that, in a test to measure a subjective quality such as taste, a procedure of "blind" sampling by a panel of judges working independently can be used to reduce the possibility of bias affecting judgement.
4. Practice observing and recording the results of a test in a manner that would allow conclusions to be drawn.

BACKGROUND

There are a variety of dissolved minerals and other substances in every glass of drinking water. Although these substances in the water are not visible, they definitely affect its taste. Drinking water in many places in California has a much higher than average dissolved mineral content. If there is a high level of dissolved minerals we say that the water is "hard." Hard water often has high levels of calcium and magnesium which cause the water to taste somewhat chalky. Many Californians choose to drink bottled water rather than tap water. But is bottled water really better tasting? In one taste test, chilled tap water from the Los Angeles Department of Water and Power was consistently rated higher than many expensive bottled waters. Some bottled waters are simply filtered tap water for which consumers pay a very high price. And bottled water is not necessarily healthier than tap water. Personal preference is the most important factor in determining which water is best tasting, perhaps being influenced by the type of water the individual grew up drinking. In this activity, a "blind" taste test is used, meaning that those sampling the water will not see the brand or type of water that they are sampling.

Activity:

1. Discuss why people drink bottled water (e.g., they think its healthier, they think it tastes better, it's the popular thing to do).

2. Explain that this will be a "blind" taste test, meaning that those sampling the water won't get to see what type of water it is they're drinking. Blind tests are used so the results will not be affected by people's expectations.

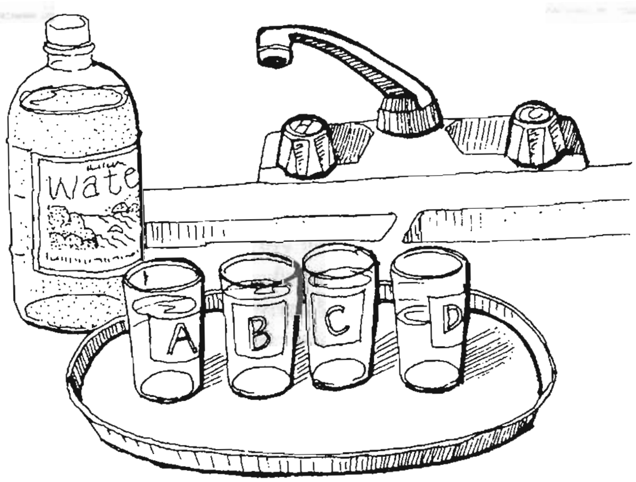
3. Have certain members set up the taste test for others who will not watch while they're setting it up. Have them label each cup with a letter and then write down the water sample that went into each cup.

4. All members should use the Score Card to record their own results. They should use the ratings Key to assign each water sample a score. When all the tasting is finished, they should each rank the samples from 1 (best) to 5 (worst).

5. Average the results for each type of water. Discuss the taste test results. Discuss the results as they compare to the cost of each type of water.

Keys to Success:

Look for examples in which judgments were all the same or were very different. Focus the discussion on why these extremes might have happened.



Adapted from Water Education Foundation, *Project Water Science*.

Task Card # 1

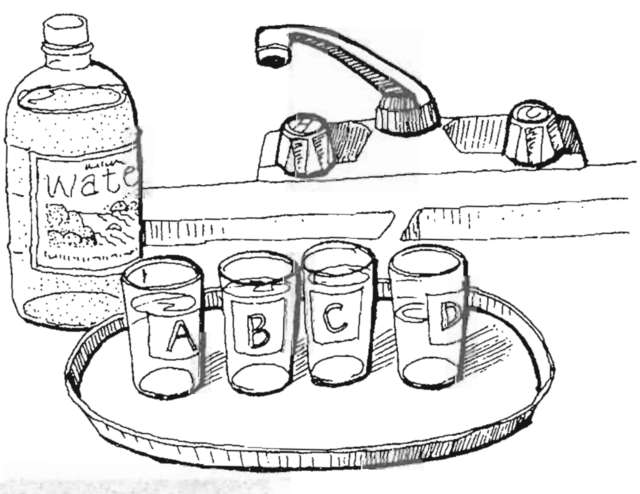
Taste Test: Is Bottled Better?

Question: What kind of water do you think tastes best?

Background: There are many dissolved minerals and other substances in every glass of drinking water. Although these substances in the water are not visible, they definitely affect its taste. Drinking water in many places in California has a much higher than average dissolved mineral content. If there is a high level of dissolved minerals we say that the water is "hard." Hard water often has high levels of calcium and magnesium which causes the water to taste somewhat chalky. Many Californians choose to drink bottled water rather than tap water. But is bottled water really better tasting? In one taste test, chilled tap water from the Los Angeles Department of Water and Power was consistently rated higher than many expensive bottled waters. Some bottled waters are simply filtered tap water for which consumers pay a very high price. And bottled water is not necessarily healthier than tap water. Personal preference is the most important factor in determining which water is best tasting, perhaps being influenced by the type of water the individual grew up drinking. In this activity, a "blind" taste test is used, meaning that those sampling the water will not see the brand or type of water that they are sampling.

Activity:

- Set up the taste test. Members who will take the taste test should not watch while it is set up. Label each cup with a letter and write down the water sample that went into each cup.



- Use the Score Card to record your own results. Use the ratings Key to assign each water sample a score. When all the tasting is finished, rank the samples from 1 (best) to 5 (worst).

- Average the results for each type of water. What were the taste test results? How are the results related to the cost of the water?

Taste Test: Is Bottled Better?

SCORE CARD

Water Sample	Score	Rank
A		
B		
C		
D		
E		
F		

My Comments:

KEY

1= great tasting

2= very good

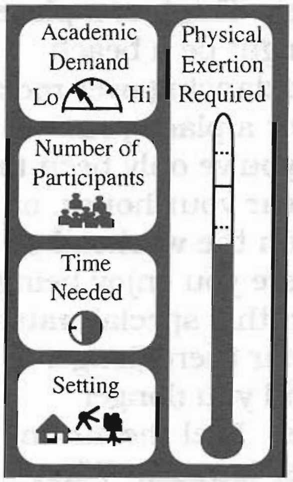
3= passable

4= not very good

5= really awful

Activity # 2

Remembering Water & Water Charades



Question: What are some of the reasons water is important to humans and other animals?

Summary: Youth group members use their imaginations to develop a mental picture of a place where water is important and then play a charades game with situations involving water.

Materials: The list of charade scenes (included) cut into individual strips

Purpose:

To help youth:

1. Exercise their imaginative powers in the development of a mental picture.
2. Develop their confidence in speaking to a group about their own imagined experiences.
3. Increase their awareness of the variety of ways in which water is important to their lives and the lives of others.

Background

Without water, life on earth would not be possible. Its importance to human survival, and to the survival of plants and animals, cannot be overstated. Our bodies are 80 percent water; our earth's surface is 75 percent water. Water is a critical component of everything we eat and drink and of almost every human activity. We use water for industry, agriculture, transportation, and energy production. We also use water for recreation and relaxation. People enjoy being around oceans, lakes, and rivers so much that just being near a body of water seems to have a positive emotional effect.

Activity:

1. Have students close their eyes, assume a relaxed position, and listen while you lead them through the following guided imagery experience of a water environment they have been to or can imagine. When reading the following script, or your own variation, be sure to leave plenty of time for students to experience their images. In the script, a pause of about 10 seconds is indicated by "(pause)"; ellipses, ". . .", indicate a shorter pause of a couple of seconds.

"Close your eyes and take a slow, deep breath. Let the breath out slowly and relax your entire body . . . Take another slow . . . deep breath . . . Hold it . . . now exhale (pause). Think of a place that is special to you that has water . . . . It might be a beach with breaking waves . . . or a river or a stream dancing over rocks . . . It might be a place you only visited once, or a place you spend a lot of time . . . Or it might be a place you've only been to in your imagination . . . It might be a place near your house, or your neighborhood, or a place you've been to on the weekend or on vacation . . . Wherever it is, it's a place where you enjoy being (pause). Think about what it feels like to be in this special water place (pause). Think about the sounds you hear there (longer pause). Think about the things you see around you (longer pause) and the smells you smell (longer pause). Feel the air on your face (pause). Take a long look at the water (pause). What does it look like? Sparkling . . . rough or calm (pause). How do you feel being here? (long pause) Take one long last look at the scene. Now, remember what you see and feel . . . Now, slowly, after a few more seconds . . . or when you are ready . . . open your eyes."

2. Encourage some of the youngsters to describe their places. Discuss people's emotional responses to water environments: why people seem to enjoy being near water.

3. Introduce the charades game by explaining that each of the scenes that will be acted out expresses a way that water is important to people or other living things. Have the youngsters form pairs, and give each pair one of the strips of paper with a scene described on it. Allow a few minutes for them to prepare their charade. Take turns acting out and guessing the charades. Encourage the pairs to come up with another charade to act out for the group.

4. As a follow-up, discuss the fact that clean water is a basic survival need. Discuss ways we might hurt other living things, either by mistake or on purpose, by dumping things into the water.

Keys to Success:

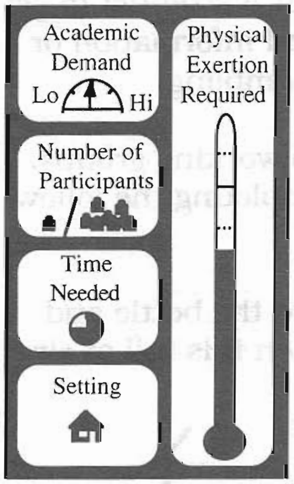
Establishing a quiet and comfortable setting for the guided imagery experience is important. Group members should feel safe; encourage them to accept without criticism the scenes that others share.

Adapted from the *California State Environmental Education Guide*, Alameda County Office of Education, and the *Earth Day Handbook*, State of California, Department of Health Services

Charade Scenes

Water making a thirsty animal happy	People swimming in a lake
Watering a plant	Children stomping in a puddle
People rafting down a river	People ice skating
Someone crossing a river by jumping from rock to rock	Taking a shower
A school of fish swimming	Brushing your teeth
Drinking a glass of cold water when you're really thirsty	Sprinklers watering a lawn
Birds in a birdbath	Fishing off a pier
A beaver damming a river with logs	Deer coming to a brook for a drink
A bear fishing for trout in a stream	A baby taking a bath

Make Your Own Meyer Water Sampler



Question: What's the best way to get a water sample at a specific depth or location?

Summary: Each group of youngsters constructs a Meyer Water Sampler that will later be used to take water samples for water quality tests.

Materials: For each group:

- 16-oz glass bottle (i.e., soft drink bottle)
- Cork to fit the bottle, size xx8
- Eye screw, size 10/24
- Strong, thin nylon cord (e.g. parachute cord) approximately 50 feet long
- A rock large enough to pull the bottle under water when it is full of air
- One leg of an old pair of panty hose
- A ruler or meter stick
- Colored yarn

Purpose:

To help youth:

1. Understand that qualities of water, such as temperature, salinity, and dissolved oxygen, may vary at different depths in the same body of water.
2. Understand the principles on which the Meyer Water Sampler works.
3. Practice contributing to the progress of a group engaged in a cooperative project.

Background

In order to accurately test aspects of water quality, such as temperature, dissolved oxygen, or salinity, it is often necessary to take a sample of the water in a specific area or at a certain depth. A device called the Meyer Sampler allows scientists to obtain a sample of water from a precise location or depth. It works by being lowered into the water with a cork in place to the desired depth, measured by knots tied at regular intervals along a line attached to the sampler. The line is then given a sharp tug to dislodge the cork, allowing water to flow into the sampler. It is then carefully hauled to the surface with the water sample from a specific depth inside.

Activity:

1. Elicit ideas from the youngsters on why it might be necessary for a scientist to get a sample of water from a specific depth. Refer to the background information or your own knowledge to discuss some of the purposes of water sampling.

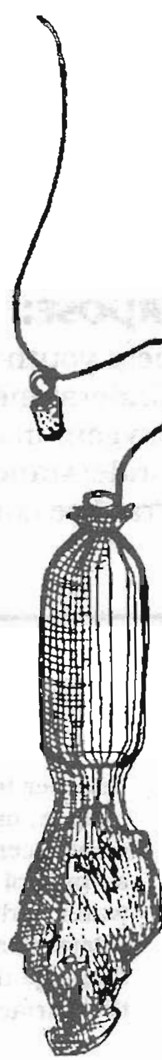
2. Pass out Task Cards and materials to the members divided into working groups. Circulate among the groups and assist them if necessary in completing the following steps to construct and test their Meyer Samplers.

   - Use one leg of an old pair of panty hose as a net that will hold the bottle and rock. The rock should be heavy enough to sink the bottle when it is full of air.

   - Tie a knot around the neck of the bottle with the open ends of the panty hose and then connect a line of approximately 40 feet (or longer if you will be working in very deep water) to this knot. Also fasten a cork to the line, as shown in the drawing, using the eye hook and another small piece of line.

   - Tie knots in the cord at five-foot intervals and insert colored yarn in the knots, so you will be able to see at what depth the water samples are obtained.

   - In a trash can full of water, test the sampler to make sure the cork comes out when the cord is given a sharp tug. Put the cork in the bottle, lower the sampler until it is totally submerged in the water and give the cord a sharp tug. You will need to stand on a chair to do it. If the cork does not come out, tie the cork's string in a different location and try again.



3. When all the groups are finished, perhaps discuss arrangments for a field trip to a location where you can conduct Activity #4 using your Meyer Samplers.

Keys to Success:

The weight in the toe of the panty hose must be sufficient to sink the bottle when it is full of air, but not so heavy that it becomes unwieldy. A 16 oz. bottle is sufficient; a larger one requires more weight to sink and is heavier when it is full of water. The bottle should be glass; plastic ones may be crushed by water pressure.

Task Card # 3

Make Your Own Meyer Water Sampler

Question: What's the best way to get a water sample at a specific depth or location?

Activity:

1. Use one leg from an old pair of panty hose as a net for the bottle and the rock. The rock should be heavy enough to sink the bottle when it is full of air.

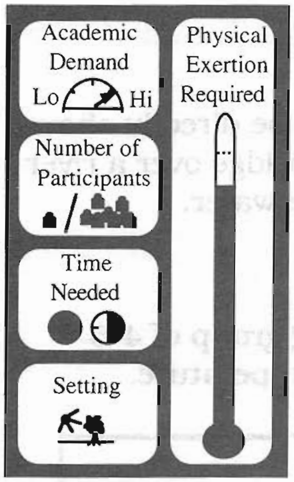
2. Tie a knot around the neck of the bottle with the open ends of the panty hose and then connect a line of cord (approximately 40 feet) to this knot. Also, fasten a cork to the line, as shown in the drawing, using the eye hook and another small piece of line.

3. Tie knots in the cord at five-foot intervals and insert colored yarn in the knots, so you will be able to see at what depth the water samples are obtained.

4. In a trash can full of water test the sampler to make sure the cork comes out when the cord is given a sharp tug. Put the cork in the bottle, lower the sampler until it is totally submerged in the water and give the cord a sharp tug. You will need to stand on a chair to do it. If the cork does not come out, tie the cork's string in a different location and try again.

Activity # 4

Water Temperature at Different Depths



Question: How is water temperature related to depth?

Summary: Youth group members use Meyer Samplers to obtain water samples at various depths and then record, graph, and analyze the temperature of the samples.

Materials: (One per group of 4-6 members):

- Thermometer
- Meyer Sampler, with calibrated cord marked every five feet. (Instructions to make Meyer Sampler in Activity #3)

Background

Many aquatic plants and animals have narrow ranges of temperature tolerance. A change in water temperature, due either to humans or to natural causes, can hinder their ability to reproduce or survive. Warm water run-off from factories or power plants — even if it is clean warm water — is called "thermal pollution" and can harm aquatic life. Water temperature also fluctuates naturally due to seasonal events, such as rainfall and air temperature. Water generally gets colder as it goes deeper, and it often gets colder at a fairly consistent rate. However, sometimes there is a dramatic drop in temperature at a specific depth; this is called a "thermocline."

Scientists are concerned about water temperature, and temperature at specific depths, because temperature helps indicate the health of the ecosystem. When a thermocline exists, it generally traps warmer water above and cooler water below a certain depth in the water, and prevents the water from circulating nutrients and oxygen to all levels throughout the body of water. Also, when the temperature of any body of water increases, the amount of bacteria in the water tends to increase, and the amount of dissolved oxygen in the water decreases. This series of events could lead to an environment in which many aquatic species could no longer survive. At a power plant near Holbrook, Arizona, scientists were asked to do a temperature profile of a small lake whose waters were used to cool the power plant. Their job was to find out how the fish and other organisms living in the lake would be affected by the power plant doubling its warm water output into the lake. To help make their assessment, they recorded temperatures at various locations, and specific depths, using a sampling device similar to a Meyer Sampler.

Purpose:

To help youth:

1. Understand that qualities of water such as temperature may vary at different depths in the same body of water.
2. Practice performing a measurement task so that the results are dependable.
3. Practice observing and recording the results of a test in a manner that would

allow conclusions to be drawn.

4. Practice making a prediction and then performing an experiment to determine if their prediction is correct.

Before the Activity:

1. Choose a location to conduct the activity. Members will need to be directly above the water they are sampling, so good locations would be a low bridge over a river or pond, a dock or float in a lake or harbor, or a boat out on the water.

Activity:

1. Distribute Task Cards and the Meyer Samplers to each working group of 4-6 members. Discuss the following suggestions for taking water temperature.

> **Suggestions for Taking Water Temperature**
>
> - Take the temperature immediately after pulling up the sample of water in the bottle.
> - Shade the thermometer from the direct rays of the sun.
> - Put the bulb of the thermometer in the water in the bottle and wait at least one minute.
> - If possible, read the thermometer while the bulb remains in the water. Otherwise, read it immediately after taking it out.

2. Discuss briefly the following procedures for carrying out the activity, and then move among the groups to help them whenever necessary with the steps.

    - Measure the surface temperature of the water. Record the temperature in the Lab Notebook section.

    - Predict what the water temperature will be at the same location you took the surface temperature, but at three different depths. Choose three depths at which to take samples and write your predictions in the Lab Notebook section.

    - Lower the Meyer Sampler into the water with the stopper in place. When it is at the desired depth, jerk the cord to uncork the bottle. Wait a few seconds for the bottle to fill. Carefully haul the bottle to the surface and insert a thermometer. Record the actual temperature next to your predicted temperature and then plot it on the graph.

- Repeat the same procedure at the same location but at different depths, hauling up a sample, taking the temperature, and then recording it on the chart and graph. If you are conducting this experiment in water over 50 feet deep, take more than three depth samples, perhaps sampling every 10 feet.

3. When all the groups are finished, discuss the differences between their predicted temperatures and the actual temperatures and help with any difficulties plotting the temperatures on the graphs. Did the temperature decrease steadily as the samples got deeper? Was there a depth where the temperature dropped more dramatically? If so, discuss thermoclines (see Background section). Why is the temperature cooler at deeper depths? Is this always the case?

KEYS TO SUCCESS:

Safe and easy access to a suitable body of water is crucial to success of this activity.

Adapted from Water Education Foundation, *Project Water Science.*

Task Card # 4

Water Temperature at Different Depths

Question: How is water temperature related to depth?

Activity:

1. Measure the surface temperature of the water. Record the temperature in the Lab Notebook section.

2. Predict what the water temperature will be at three different depths below the place where you took the surface temperature. Choose three depths at which to take samples and write your predictions on the Lab Notebook page.

3. Lower the Meyer Sampler into the water with the stopper in place. When it is at the desired depth, jerk the cord to uncork the bottle. Wait a few seconds for the bottle to fill. Carefully haul the bottle to the surface and insert a thermometer. Record the actual temperature next to your predicted temperature and then plot it on the graph.

4. Repeat the same procedure at the same location but at different depths, hauling up a sample, taking the temperature and then recording it on the chart and graph. If you are sampling in very deep water (over 50 feet), take more than three samples, perhaps sampling every 10 feet.

5. Compare your actual measurements to your predictions.

Suggestions for Taking Water Temperature

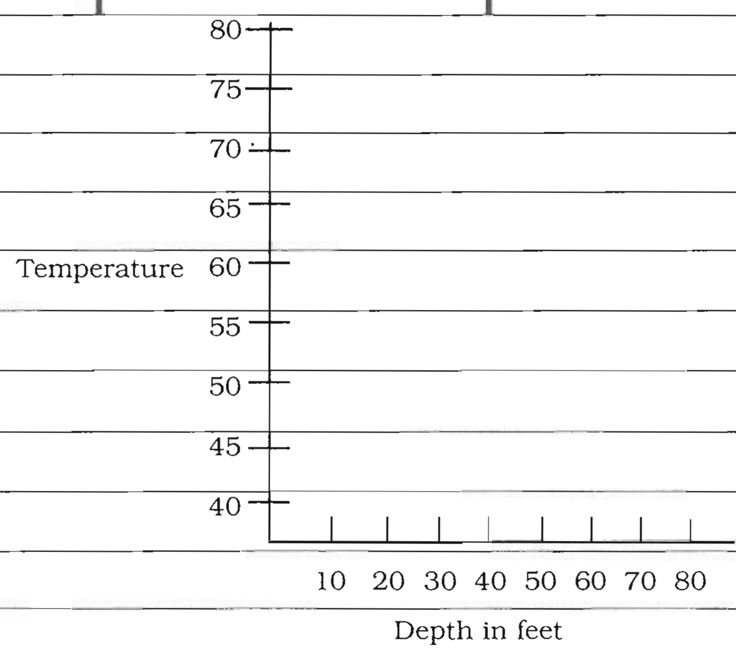
- Take the temperature immediately after pulling up the sample of water in the bottle.
- Shade the thermometer from the direct rays of the sun.
- Put the bulb of the thermometer in the water in the bottle and wait at least one minute.
- If possible, read the thermometer while the bulb remains in the water. Otherwise, read it immediately after taking it out.

Water Temperature at Different Depths

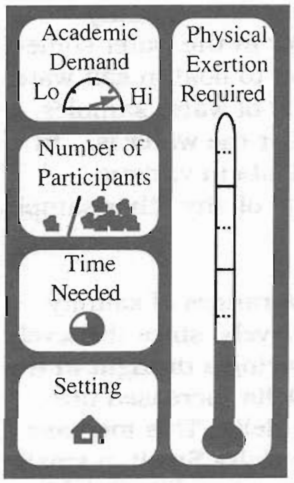
Date:

Location:

Depth	Predicted Temperature	Actual Temperature
Surface	N/A	
______ feet		
______ feet		
______ feet		



Measuring the Salinity of Water Samples



Question: How can you tell how salty water is?

Summary: Youth group members construct a hydrometer from commonly available materials and use it to measure the salinity of a sample of water.

Materials:
- Ruler
- Pencil
- Masking tape
- Screwdriver and pliers
- Tablespoon and teaspoon
- 1 pound of table salt
- Measuring cup marked in ounces
- Fine point permanent marking pen
- Lab Notebook page (included)
- Four plastic cylindrical water bottles, approximately 1-quart size, such as Evian or Arrowhead. Cut a portion of the top off of these with a razor blade or scissors, so the remaining container is approximately 8-1/2 inches tall and will hold 40 ounces of water.
- Two 40-ounce water samples from a river or ocean (optional)

Purchase the following at a hardware store:
- Plastic screw anchor, 7/8 inches long and #8-#10 size
- Sheet metal screw, 5/8 inches long and #8 size
- Tube of waterproof silicone, waterproof glue, or other waterproof sealant
- 1/4-inch dowel

Purchase at an aquarium store:
- 6-inch piece of plastic aquarium tubing, with a 5/16-inch outside diameter

Optional materials for demonstration:
- Jar with water
- Egg
- Shaker of salt

Purpose:

To help youth:
1. Understand that the buoyancy of an object is related to the salinity of the water in which it floats and that this characteristic can be used to measure water's salinity.
2. Understand that the salinity of water varies across types of water bodies, e.g., estuaries, bays, rivers, and marshes, and may vary within one body of water.
3. Practice using graphs to represent numerical data.
4. Practice contributing to the progress of a group engaged in a cooperative project.
5. Practice performing a measurement task so that the results are dependable.

Background

The term "salinity" refers to the amount of salts and other dissolved solids in water. Salinity affects the buoyancy of objects in the water: the saltier the water is, the higher in the water something floats. An excellent example of this is that it is much easier for a person to float in salt water than fresh water. A device called a hydrometer is used to measure the salinity of water samples. It works on a very simple principle: the higher in the water it floats, the saltier the water is. In this activity a graph is created by plotting exactly how high the hydrometer floats in various concentrations of salt water. This graph is then used to determine the salinity of any other sample of water.

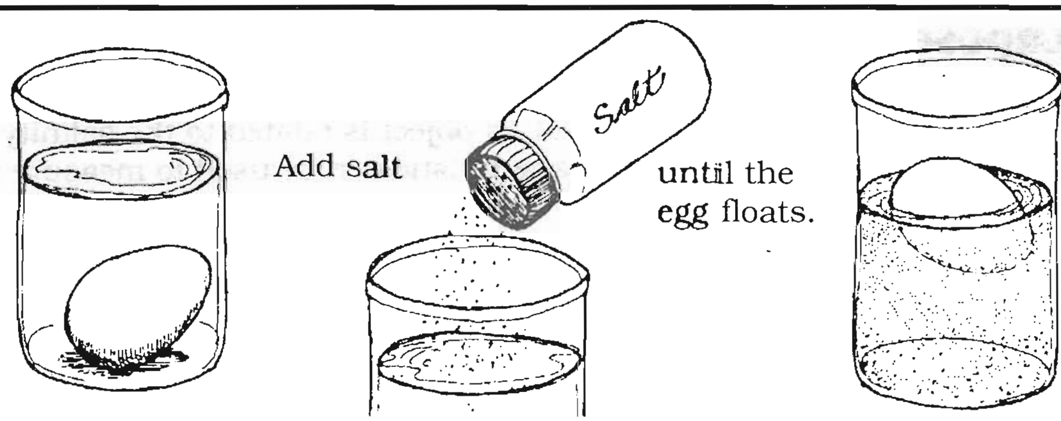
Scientists are concerned about salinity because many organisms have narrow ranges of salinity tolerance. Estuaries and deltas are areas where scientists often test salinity levels, since the levels can fluctuate so much due to river flow and tidal conditions. For example, during a drought in the late 1970's and early 1980's, salinity in the Sacramento-San Joaquin River Delta increased dramatically because so little fresh water was flowing through the rivers into the delta. This increase in salinity had an impact on the organisms that lived there, most notably the Delta Smelt, a small, once abundant, fish that is an important part of the food chain and whose numbers dropped 90 percent during the years of drought. Scientists also measure salinity when they are concerned about salt water intrusion into fresh water systems. When fresh water is pumped out of the ground, sometimes salt water may seep in to take its place, making the water undrinkable.

Activity:

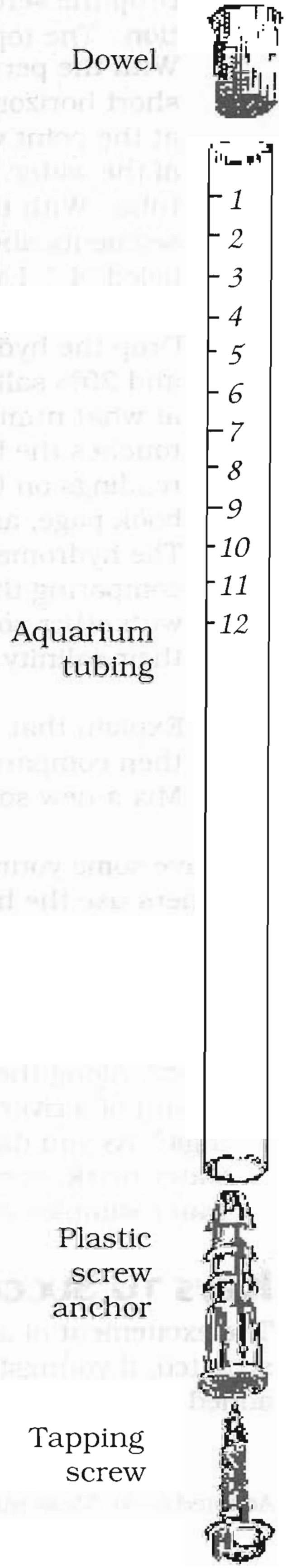
1. Ask for the members' ideas about why it might be necessary for a scientist to find out the degree of saltiness in a water sample (i.e., to see if certain organisms can live there or to see the relative mixture of fresh and sea water in a bay or estuary.) Explain the term "salinity" (the amount of salts and other dissolved solids in water).

2. Ask if anyone remembers the experience of finding it easier to swim and float in the ocean than in a lake. Why is that so? Explain that the dissolved salts in ocean water make the water more dense. This density helps to keep the body afloat more easily than does fresh water. Explain that everything floats more easily in salty water, including the hydrometer used in this activity. The saltier the water, the higher-up something will float; the less salty the water, the lower in the water it will float. To demonstrate that salinity helps things float, you may want to conduct the demonstration depicted below.

Put an egg in a glass of water.



3. Construct the hydrometer as outlined in the Help Box. (You may want to have the hydrometer ready before the meeting to save time; otherwise have members construct it at the meeting).



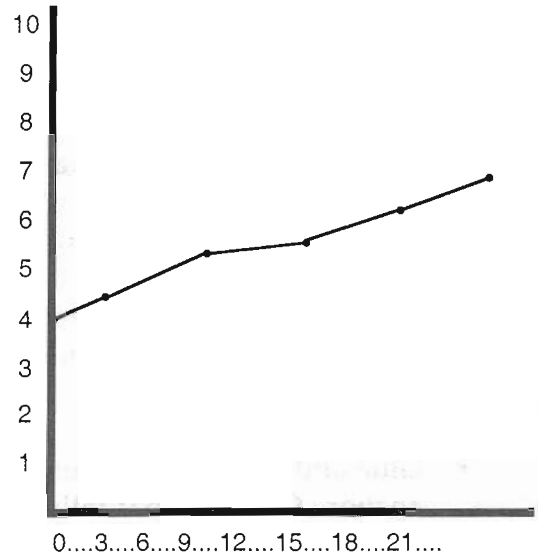
HELP BOX

Constructing the Hydrometer

- Cut a 6-inch piece of 5/16-inch plastic aquarium tubing.
- Sand or grind the protrusions off the plasic screw anchor, if necessary, so it can be inserted into one end of the plastic tubing.
- Glue and insert the tapping screw into the plastic screw anchor. Glue and partially insert the plastic screw anchor (with screw attached) into the plastic tubing. Finish tightening the screw into the tubing, using the screwdriver and pliers, making sure there's enough glue to make a watertight fit.
- Cut a 1/2-inch piece of the 1/4-inch dowel and insert it into the opposite end of the plastic tubing and seal with glue, making it watertight.

4. Have members prepare the salt solutions for calibrating the hydrometer as follows:
   - Fill each of the four plastic bottles with 40 ounces (5 cups) of water.
   - To the first glass add no salt — 0% salt solution.
   - To the second glass add two level tablespoons salt — 3% salt solution.
   - To the third glass add six level tablespoons plus two teaspoons of salt — 10% salt solution.
   - To the fourth glass add thirteen level tablespoons plus one teaspoon of salt — 20% salt solution.
   - Stir the solutions until all the salt has dissolved. This may take awhile for the 10% and 20% solutions.
   - Label each solution by writing on masking tape that has been attached to the plastic bottle.

5. Have youngsters calibrate the hydrometer as follows:
   - Drop the screw end of the hydrometer into the glass containing 0% salt solution. The top of the plastic tubing should float an inch or so above the water. With the permanent marking pen, draw a short horizontal line on the plastic tube at the point where it just touches the top of the water. Label this line "4" on the tube. With the ruler, mark off 1/4-inch segments above and below the line labeled "4." Label those lines 0 - 12.



   - Drop the hydrometer into the 3%, 10%, and 20% salt solutions and note for each at what number the surface of the water touches the hydrometer. Record the readings on the graph on the Lab Notebook page, as in the example to the right. The hydrometer is now calibrated. By comparing the numbers on the graph with other solutions, you can determine their salinity.
   - Explain that now you can test any water sample by reading the hydrometer and then comparing it to the graph to determine the percentage of salt in the water. Mix a new solution and demonstrate how this is done.

6. Have some youngsters mix new solutions while others aren't looking and have the others use the hydrometer and the graph to determine the salinity.

7. (Optional) Test the water samples brought to the meeting for their salinity.

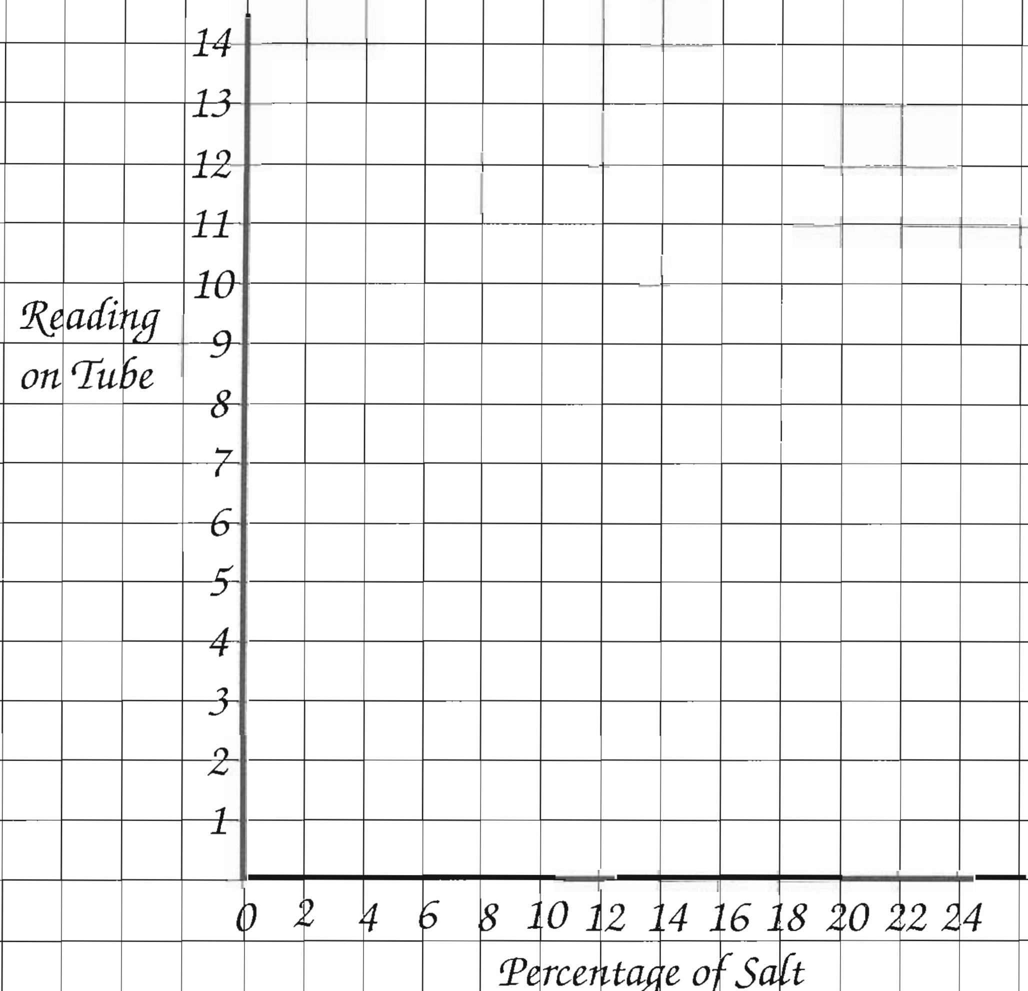
8. Discuss these questions: Would the salt concentration change as you go up a river? Along the coastline, does the salt concentration change as you near the mouth of a river? Does the time of year or the height of the tide affect the readings? As you dig holes on a beach between the current water line and the highest water mark, does the salt concentration change? At another meeting, field test water samples at a river or beach to answer some of these questions.

Keys to Success:

The excitement of a detective game can be achieved, after the hydrometers are constructed, if youngsters use them to find out how much salt others have secretly added to water.

Adapted from "Measuring Salinity," U.C. Cooperative Extension, 4-H Youth Development.

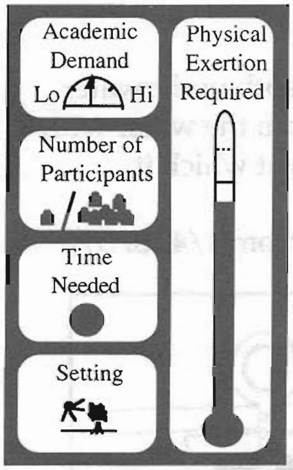
Measuring the Salinity of Water Samples



Instructions:

1. Place a dot where the 4 on the "Reading on the Tube" axis and the zero of the "Percentage of Salt" axis intersect. This is done because in the 0% salt solution, the 4 on the tube touches the surface of the water.
2. Put the hydrometer in the 3% salt solution and find what number on the tube touches the surface of the water. Put a dot at the intersection of that number on the "Reading on the Tube" and the 3 on the "Percentage of Salt" axis. Connect the first two dots.
3. Repeat step 2 for the 10% and 20% salt solutions.
4. Your hydrometer is now calibrated.

CLEAR OR MURKY?



QUESTION: How do we measure how clear water is?

SUMMARY: Youth group members take actual measurements of the visual clarity of a body of water and discuss the reasons why clarity might be an important quality useful in describing water.

MATERIALS: Secchi Disk (Purchase a disk at a local marine supply store or enlist a parent or a group of members to make one — see instructions in the Help Box.)

PURPOSE:

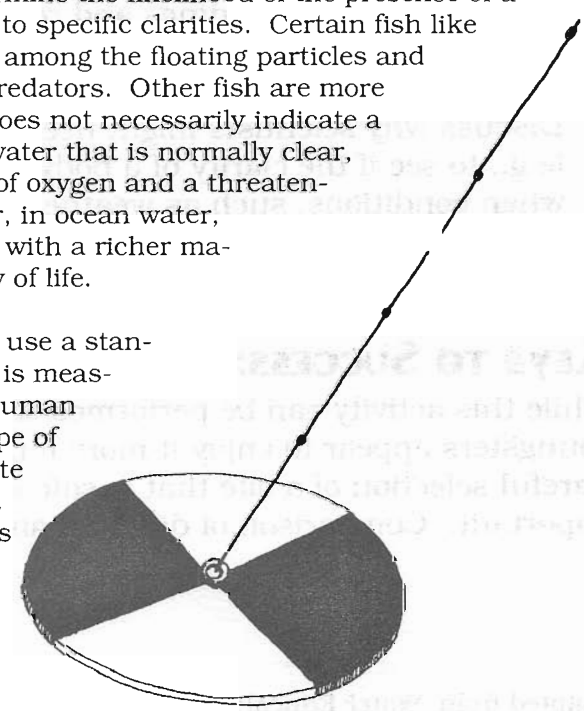
To help youth:

1. Develop an understanding of the operational definition of water clarity used by scientists.
2. Practice performing a measurement task so that the results are dependable.
3. Speculate as to what might cause variations in water clarity.

BACKGROUND

Scientists measure the clarity of water often to determine the likelihood of the presence of a specific organism. Different organisms are adapted to specific clarities. Certain fish like cloudy or "turbid" water, since there is plenty to eat among the floating particles and since they are more easily camouflaged from their predators. Other fish are more likely to be found in clearer waters. Clearer water does not necessarily indicate a healthier environment than turbid water. In fresh water that is normally clear, a decrease in clarity could mean a drop in the level of oxygen and a threatening situation to the organisms living there. However, in ocean water, cloudy rather than clear water is usually associated with a richer marine environment that supports an abundant variety of life.

When scientists want to measure water clarity, they use a standard measuring device called a Secchi disk. Clarity is measured by noting the depth underwater at which the human eye can still see the Secchi disk. In one study, a type of fish, *Genyonemus lineatus*, commonly called the White Croaker was being sought off the coast of California. Scientists were conducting a life history study of this important commercial and sport fish, and used a Secchi disk to determine areas in which the White Croaker was likely to be found.

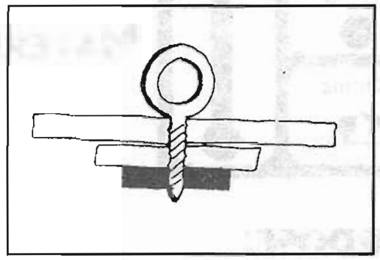


HELP BOX

Instructions for making a Secchi disk

The Secchi disk is used to determine water clarity by measuring the depth underwater at which the disk disappears from view. The disk is slowly lowered into the water with a line marked off with knots at regular distances to measure the depth at which it disappears from view.

Secchi disks can be purchased at marine supply stores or constructed from 1/4" or 3/8" marine-grade plywood or metal. The disk is circular and approximately 8 inches in diameter. Its upper surface is divided into four equal pie shapes, each painted alternately black and white with semi-gloss enamel paint. The under-surface is painted black. The center of the disk is drilled, and an eye bolt and fishing weight are attached. A line (approx. 40 feet) that has been accurately calibrated, by tying knots with a piece of colored yarn attached every 5 feet, is attached to the eye bolt.



Activity:

1. From a low bridge, dock, or boat, lower the Secchi disk into the water until it just disappears from view. Using the marks on the line, record the depth to the nearest foot at which it is no longer visible. Lift the disk and record the depth at which it reappears. The average of these two readings is the limit of visibility. Take at least three sets of readings and record each of them in the Lab Notebook section. Average your answers.

2. Discuss why scientists might need to use Secchi disks to determine water clarity (e.g., to see if the clarity of a body of water changes at different times of year or when conditions, such as weather, change; to determine the presence or amount of tiny organisms; to determine if ocean conditions are good for diving or working underwater).

Keys to Success:

While this activity can be performed with a commercially marketed Secchi disk, youngsters appear to enjoy it more if they use a disk they have built themselves. Careful selection of a site that is safe and offers water with moderately visibility is important. Comparison of different sites with different visibilities is most interesting.

Adapted from Water Education Foundation, *Project Water Science.*

Clear or Murky?

Trial One:

Depth at which disk disappears ________

Depth at which it reappears ________

The limit of visibility

(average of two depths) ___________

Trial Two:

Depth at which disk disappears ________

Depth at which it reappears ________

The limit of visibility

(average of two depths) ___________

Trial Three:

Depth at which disk disappears ________

Depth at which it reappears ________

The limit of visibility

(average of two depths) ___________

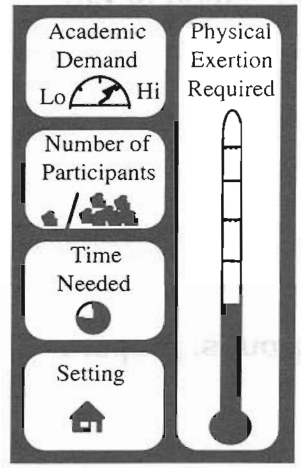
Average of all three limits of

visibility ___________

My comments:

Activity # 7

Water Density



Question: How can we determine which samples of water are more or less dense than others?

Summary: Youth group members create a procedure to test different samples to determine which is most dense.

Materials:
- Four glasses (at least 8 inches tall)
- Table salt
- Three colors of food coloring (red, blue, and yellow)
- Clear plastic drinking straws
- Measuring spoons

Purpose:

To help youth:

1. Understand the practical implications of varying water densities: water forms layers, with the most dense water in the bottom layer.
2. Understand that dense water will seek to move to a location below less dense water, if it is not already in that position.
3. Practice solving a problem by creating a procedure to compare samples of water, so that the procedure will yield a solution to a problem.

Background

Different samples of water may contain different amounts of dissolved minerals. The more dissolved minerals in a sample of water, the higher its density. A practical effect of differing water density is that bodies of water (a lake, pond, or the ocean) will contain different layers of water. Unless unusual conditions exist, the most dense water will be layered on the bottom; the least dense on the top.

When fresh water flows from a stream into the ocean, the water does not mix equally, but is layered with fresh water on top, salty water underneath. Animals and plants that prefer a certain level of salinity will seek to travel in the layer most comfortable for them. Fishermen are most successsful when they use this information to fish for the specific types of fish that live in deep or shallow waters. Scientists who try to encourage the growth of a particular fish population must not depend simply on measurements of salinity at the surface; they must take samples at various depths to verify that water of proper salinity exists in some layer in the body of water.

ACTIVITY:

Preparation

1. Mix four solutions of water and table salt, each containing 1/2 gallon of tap water and an amount of salt as follows:

Solution	Amount of Salt	Food Color
#1	none	yellow
#2	1 tablespoon	green
#3	2 tablespoons	red
#4	4 tablespoons	blue

   If you wish to have the youth group members work in small groups, prepare one set of glasses and water for each 4-6 people.

Demonstration

2. Either perform the following demonstration or ask one youngster to do it:
   - Holding a finger over the top of a drinking straw, insert it into the blue glass so that the bottom of the straw reaches halfway to the bottom of the glass. Remove your finger from the top of the straw, allowing air to escape and blue water to flow into the straw. Replace your finger and remove the straw from the water. Blue water will stay in the bottom half of the straw.
   - Using the half-filled straw, repeat this procedure with the yellow water.
   - Gently remove the straw from the yellow water and hold it so everyone can observe.

3. Ask the youngsters to describe what they see. (They should note that the blue water gradually "moves down" to mix with the yellow, forming a green mixture.)

4. Repeat the above procedure, this time sampling the yellow water first and then the blue so that the yellow is on top of the blue in the straw.

5. Again ask group members to describe what they see. (The two colors will remain unmixed, with the blue on the bottom.)

Discussion

6. Ask for guesses as to why the colors blended together in one instance but not the other. (Group members may offer a variety of guesses.) As a hint, ask one person to taste the blue and yellow waters by dipping a fingertip into each and touching it to their tongue. (They should note that the blue is salty and the yellow is not.)

7. Point out that the only difference between the two waters is that one contains some salt. Explain that the presence of salt, a dissolved mineral, in the water makes the water more **dense** and that denser water is "heavier" and settles toward the bottom, underneath less dense "lighter" water.

Exploration

8. Present the following problem:
   "Each sample of water in these four glasses contains a different amount of dissolved salt. That means that each has a different density. Your task is to determine the order of the waters from least salty to most salty."

9. Allow the youngsters to work with the waters. They should be encouraged to talk and plan a procedure for comparing the waters, use that procedure, and then record their results on the Lab Notebook page provided.

Optional Activity

10. Ask the youngsters to create a "rainbow" straw which holds all four waters in bands that do not mix. What happens when the straw is inverted?

Discussion

11. When all have finished, gather youngsters together, ask them to report their conclusions and compare results.

Keys to Success:

Youngsters should have the opportunity to work out their own procedures for comparing the waters. Helpful hints might be provided, but only after they have struggled for a while and tried different, non-productive solutions.

Water Density

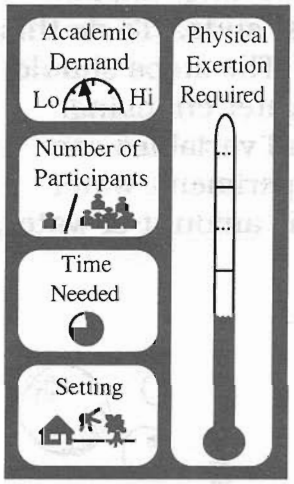
Color of Water

Light
(Not Dense)

Density of Water

Heavy
(Very Dense)

Soap Suds Scientists



QUESTION: Can we determine which water samples are "harder" or "softer" than others?

SUMMARY: Youth group members make predictions about the relative hardness of different samples of water and then test these predictions by performing an experiment which uses sudsing as an indicator of water hardness.

MATERIALS: For each group of 4-6 members:

- Four small jars with lids
- Liquid dishwashing soap, such as Ivory (not detergent, such as Dawn)
- Water samples: distilled water, tap water, bottled water, salt water (add 1 T. salt to 20 ounces of water)
- Markers and tape for labeling the jars
- Eye dropper
- Task Card # 8 (included)

PURPOSE:

To help youth:

1. Practice and understand the importance of controlling all relevant variables when performing a scientific experiment.
2. Understand the concepts and characteristics of "hard" water and "soft" water.
3. Practice observing and recording the results of an experiment in a manner that would allow conclusions to be drawn.
4. Practice making a prediction and then performing an experiment to determine if their prediction is correct.

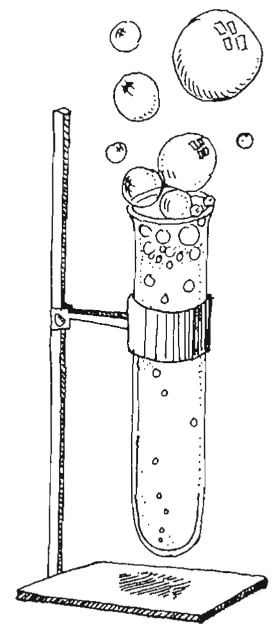
BACKGROUND

One of the characteristics of water is its hardness. Hardness refers to the amount of minerals, such as calcium and magnesium, dissolved in the water. Hard water has a high concentration of dissolved minerals and is often good tasting, yet not very good for washing. When washing, the calcium and magnesium in the water bind onto part of the soap molecule and inhibit its ability to form suds and clean. When water is "softened," salt is added to replace the calcium and magnesium. This soft water forms better suds and is better for cleaning, but often does not taste as good as hard water and may be less healthy to drink due to the high concentration of salts.

Activity:

1. Discuss briefly the information in the Background section about what makes water "hard" or "soft" and why hard water is not very good for cleaning. Explain that this experiment will test which type of water makes the best suds. To do this, a series of steps will be completed with different types of water. The steps should be done exactly the same way each time, with only the type of water changing. Discuss briefly how scientists perform experiments by holding all variables constant, except for the one variable that is being tested. In this experiment, water will be the one variable that will change; the amount of soap, the amount of water, and how much the jar is shaken will all remain the same.

2. Ask the group members to predict which water will be hardest or softest: distilled, tap, bottled, or salt water. Have them record their predictions on Task Card #8.



3. Instruct the members to follow instructions on Task Card #8 and conduct the following steps:

   A. Fill a jar half full of distilled water. Add 1 drop of liquid soap, cover with lid, and shake 5 times. Continue adding drops of soap, one drop at a time, and then shaking 5 times, until you have lasting suds. Lasting suds are those that don't pop and disappear quickly. Record the number of drops needed to produce lasting suds.

   B. Repeat procedure exactly the same way with other water samples. Use a clean, labeled jar for each sample. Record the number of drops needed to produce lasting suds.

4. Discuss results. Is your tap water hard or soft? Which type is the hardest water? Which type is the softest water? What kind is best for washing clothes? Were your predictions correct?

5. Discuss the experiment. What were the variables that were controlled? (Soap, amount of water, amount of shaking). What was the variable that was changed? (Type of water). What different procedures might be used to get similar results? (Drop soap into all samples of water at the same time, shake them all at the same time, for the same amount of time, and then note differences in suds).

Keys to Success:

Group members should understand that their results will be undependable if they are not careful in controlling the relevant variables (amount of soap, water, and shaking). It is not appropriate to praise or reward those who made correct predictions about which water is hardest. The most important thing is to make predictions and then test them. When testing an incorrect prediction you still learn.

Adapted from Water Education Foundation, *Project Water Science.*

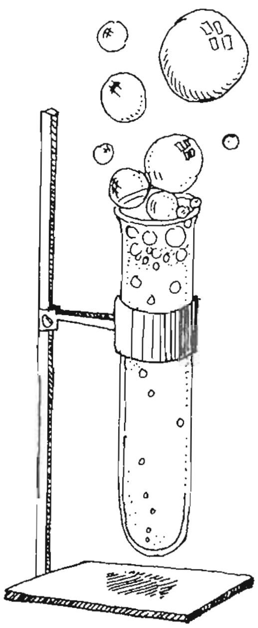
Task Card # 8

How Do You Like Them Suds?

Testing Water Hardness

Question: How hard is our tap water?

Activity:



1. Of distilled, tap, bottled, and salt water, which type do you predict is the hardest and which do you predict is the softest? Record your predictions below.
2. Fill a jar half full of distilled water. Add 1 drop of liquid soap, cover with lid, and shake 5 times. Continue adding drops of soap, one drop at a time, and shaking 5 times, until you have lasting suds. Record below the number of drops needed to produce lasting suds.
3. Repeat the procedure with other water samples, keeping everything exactly the same except for the type of water. Use a clean, labeled jar for each sample. Record the number of drops needed to produce lasting suds.
4. Discuss results. Is your tap water hard or soft? Which type is the hardest water? Which type is the softest water? What kind is best for washing clothes? Were your predictions correct?

Your predictions:

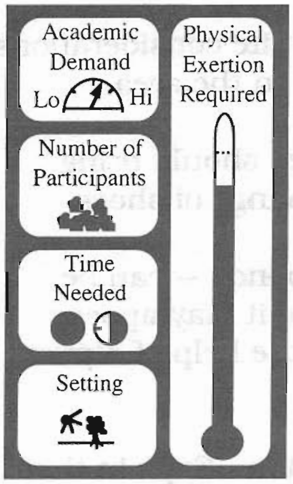
Which type of water is the softest and will make suds the quickest?

Which type of water is the hardest and will take the longest to make suds?

Your observations:

Distilled Water		*drops*
Tap Water		*drops*
Bottled Water		*drops*
Salt Water		*drops*

IN SEARCH OF AQUATIC LIFE



QUESTION: What kind of plants and animals live in an aquatic environment such as a stream, pond, or beach?

SUMMARY: Youth group members carefully explore an aquatic environment to collect and examine life found there.

MATERIALS:
- Dipnets (purchase at least one for every 3-5 members at an aquarium store, drug store, or nature store)
- Collecting jars or buckets
- Large plastic sheet, to sort through the material brought up by the nets
- Microscopes or magnifying lenses (optional)
- Pencil & paper or notebooks (optional)
- Field guides (optional) to ponds or streams (See the Resources list in the Introduction.)

PURPOSE:

To help youth:
1. Become aware of the variety of animals that live in an aquatic environment.
2. Develop a respect for preserving the lives of even small creatures by handling them carefully and returning them unharmed to their habitats.
3. Practice the skill of classifying animals by physical characteristics.
4. Develop the ability to access information about animals by referring to a field guide.

BACKGROUND

All aquatic environments — even a small pond or creek — can harbor a wide variety of plant and animal life. Within these environments are specific locations, called habitats, where certain organisms are likely to live. There are seven basic habitats found in an aquatic environment. They are: (1) the shore around the water, (2) the area above the water's surface, (3) the surface of the water, (4) the water itself, (5) the water's floor, (6) underneath the water's floor or buried in the mud, sand, or rocks of the bottom, and (7) exposed surfaces near the water, such as a dock, pilings on a pier, or the surfaces of leaves. All plants and animals assocated with a body of water will live in one or more of these habitats.

ACTIVITY:

Before the field trip:

1. Leaders should visit and select an appropriate area for study. Site considerations should include stability of the banks and diversity of life found in the area.

2. Gather the materials, and review with youngsters the items they should bring, such as old clothes, insect repellant, sunscreen, hats, and a change of shoes.

3. Discuss how all aquatic environments -- even small creeks or ponds -- can be home to a wide variety of plants and animals. Upon first glance it may appear that not much is there, but with careful exploration, and with the help of dipnets and magnifying glasses, a variety of organisms can be found.

4. Describe the seven habitats mentioned in the Background section. Explain that at this body of water, they will be searching each of these habitats for aquatic life.

At the pond: (This activity has two important components, collection and examination. Be sure to allow time for both.)

<u>Collection activities</u>

1. Hand out and discuss Lab Notebook sheets (included). Explain the categories and encourage youngsters to fill the sheets out as they collect organisms.

2. Remind the group members about the seven habitats: the shoreline; above the water's surface; on the water's surface; in the water; on the water's floor; buried in the mud, sand, or rock at the bottom; on exposed surfaces near the water. Encourage members to look for several examples of life in each habitat.

3. Demonstrate proper collection procedures.
   - Use caution around the pond's edges.
   - Use a back-and-forth motion around the edge of vegetation, or dip to the bottom of the pond.
   - Dump out materials onto the plastic sheet.
   - Put living creatures into jars or buckets of water.
   - Handle the living things gently.

4. Divide the youngsters into small groups, so that each group has a dipnet.

5. Remind them to sort carefully through their finds. Many of the creatures are small and may be easily overlooked.

6. Stop sampling before time or enthusiasm runs out. Leave plenty of time for examining and sorting.

Examination activities

1. Encourage youngsters to look at the collected organisms through the magnifying lenses. Have them find the mouth parts, the legs, or other features that help the animal move. Ask them to speculate about what the organism eats or is eaten by.

2. Finish filling out the Lab Notebook sheets, drawing, and counting the number of each type of plant and animal collected. Use your own names for identification (e.g., small round plant, white snail) or find their proper names in a field guide.

3. When finished, carefully return the creatures to the pond.

Keys to Success:

Careful selection of the body of water to be explored is crucial, both in order to assure safety of the youngsters and to assure that a sufficient variety of organisms will be found. It is also important to emphasize protecting the creatures during collection and examination and returning them unharmed to the pond.

Adapted from "Exploring the Pond Community," *Sea Sampler: Aquatic Activities for the Field & Classroom - Elementary*, South Carolina Sea Grant Publication, NSGD#: SCSGC-E-85-001. May be downloaded from the internet at <www.nsgo.seagrant.org>.

In Search of Aquatic Life

Name (proper name or name you give it)	*Description*	*Number Found*	*Habitat(s) Where Found*	*Drawing*

Habitats to Explore

1. *the shore*
2. *in the air above the water's surface*
3. *on the surface of the water*
4. *in the water*
5. *the water's floor*
6. *buried underneath mud or rocks on the bottom*
7. *on exposed surfaces near the water, such as rocks, pilings of a dock, or surfaces of leaves*