Procedures and Content Discussion for Teachers

DAY ONE

OVERVIEW OR SUMMARY OF LESSON

On the first day of the science strand of "The River" curriculum, students begin to think about the importance, as well as the scarcity, of fresh water supplies. They will also be introduced to the concept and practice of science journals. Handout #1 "Keeping A Science Journal" suggests a possible format and procedure for keeping journals. Before beginning this curriculum, it is important for science teachers to decide how they can best utilize journal writing activities for their particular classes.

PROCEDURES

1. Introduce students to the science journals that they will be using throughout "The River" study. Remind them that the journal will be used every day. Begin this lesson by asking students to make their first entry in the journal answering two questions: (A) What is water? and (B) Why is water important in my life? (Their response to (B) might take the form of a free-write: for a specified length of time they write quickly, free-associating without stopping.) If Handout #1 "Your River Science Journal" is appropriate for your class, you might hand it out at this time.

2. Break the class into groups of 3-5 students. Give each group a copy of Handout #2 "The Distribution of Water. "Using 10 m lengths of rope, ask each group to make calculations and mark their ropes as directed. Afterwards, have students write in their journals -- what was the activity about and what did they learn from it? Then discuss the results of the experiment.

3. Give each student a copy of Handout #3 "My Family's Water Use" (or make a transparency of the handout). Explain how to make a similar chart in their journals. Explain that each person is going to measure and record his or her family's water use for the following three days. Discuss the instructions. (On the fifth day of the curriculum, the class will compare their audits and discuss water use.)

ALTERNATIVE OR SUPPLEMENTAL ACTIVITY

Rather than using a rope to demonstrate the amount of available fresh water on earth, you may choose to use a 1-gallon jug of water: if so, the available fresh water supply would measure just over a tablespoon -- less than half of 1% of the total.

CONTENT DISCUSSION:

After student groups have completed their task of measuring a rope and making a journal entry, a class discussion on the availability of water naturally follows.

Here are some points you may want to touch upon:

• Since 99.2% of all the water on Earth is found in oceans or ice caps and glaciers, many people have experimented with ways to make these sources useable for agriculture, direct human consumption, or other purposes. The job of a desalination plant, for example, is to remove salt from sea water. This provides a source of fresh water for drinking and personal needs, but it is generally too expensive for large quantity uses such as agriculture. At present, it costs between $2 and $3 to desalinize 260 gallons of water. In the U.S., the average person uses about 86 gallons per day. Our desalination methods are not yet economically feasible for large-scale consumption such as agriculture or industry.

• There are also schemes afoot for capturing fresh water from glaciers and ice caps -- for instance, towing icebergs into water-scarce seaports.

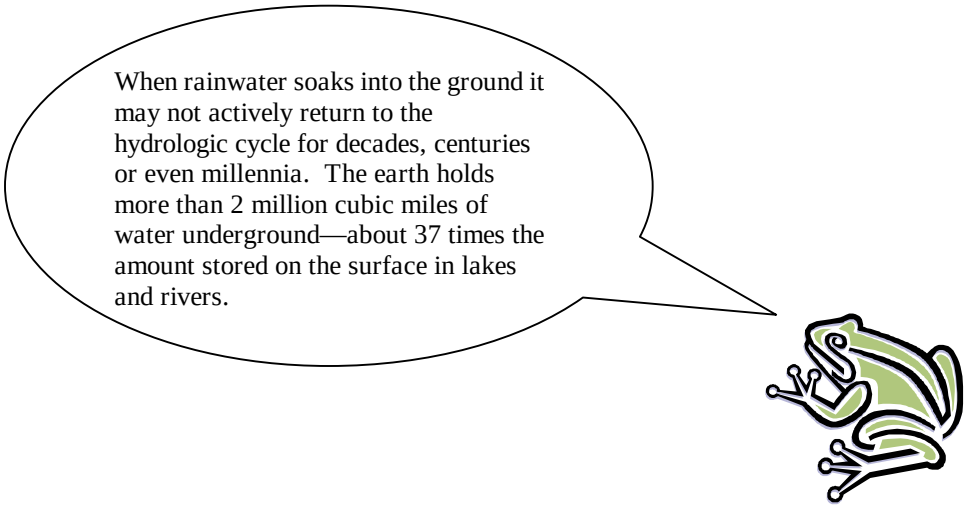
• Scientists have many ideas for conserving water. One is a known evaporation inhibitor for large surface bodies of water. The safety and effectiveness of this technological fix is presently being tested.

• Of the 0.8% of water that is not trapped in glacial structures or in a saline state in oceans, we are still faced with the challenge of desalinizing inland seas and salt lakes.

• Many nations have tried to cause more rain to fall over their regions -- through cloud seeding and other weather modifications. So far, these methods have met with limited success.

• Not all ground water is useable, either. Much of the water beneath us is either too saline or difficult to reach. In arid and semi-arid regions of the world, more water is being pumped from the ground than is being recharged from rains and surface water. This means that fresh water is likely to become increasingly scarce for future generations.

• Nor is fresh water on the earth's surface evenly distributed. When compared with other major rivers of the world, for instance, the Rio Grande carries only a tiny amount of water. And yet the Rio Grande remains a major source for New Mexico's fresh water needs -- not the least of which is agriculture.(In 1990, agriculture used 78.8% of fresh water drawn from surface and ground water in NM; public and private water supplies used 7.9%; mining and power used 3.4%; livestock, commerce and industry used 1.2%; and evaporation accounted for 12.3%.)



Handout #2

THE DISTRIBUTION OF WATER ON EARTH

Water, water, everywhere -- but it can be tough to get a drink!
Even though nearly 3/4's of the Earth's surface is covered with water, much of it is not available for human use. Here is where water on Earth is found, and how much:

oceans	97.2%
icecaps and glaciers	2.0%
ground water	0.62%
freshwater lakes	0.009%
inland seas & salt lakes	0.008%
atmosphere	0.001%
all rivers	0.0001%

In order to visualize how much water is available for human use, try the following:

1. Have someone in your group measure a 10 meter section of rope.

2. Knowing that there are 10 millimeters (mm) in 1 centimeter (cm) and 100 cm in one meter, calculate how many millimeters (mm) there are in your 10 meter (m) rope.

3. To show what volume of the Earth's water is located in oceans, calculate, in mm, how far down the rope 97.2% would be. Make a fine mark there, or tie a piece of colored yarn at that spot. If the rope represents all the water on Earth, the rope up to your mark equals the salty water of the oceans!

4. Starting at the 97.2% mark, determine the amount of water found in ice caps and glaciers-- 2.0% of all the Earth's water -- by making the appropriate measurement in mm on the rope. Once again, make a thin mark or tie a fine thread there. At this point, 99.2% of the rope (the earth's water) is spoken for. This leaves only 0.8% of the length of the rope to account for the rest of the water on Earth.

5. Using the same technique, find the length of the rope which represents water that is not visible -- ground water -- a mere 0.6%. Go on to figure the length of rope representing water contained in clouds and in what we call the atmospheric humidity -- 0.001%.How much of the rope is left? Only 0.0001%! This tiny percentage is found in what we call rivers and streams.

Handout #3

MY FAMILY'S WATER USE

On the chart below, mark how many times you completed each activity for each of the three days:

Activity	Day1	Day 2	Day 3	Family Daily Av.
Bathe				
Shower				
Wash hands / wash face				
Brush teeth				
Drink water				
Run washing machine				
Wash dishes				
Water garden & lawns (min.)				
Flush toilet				

After you complete your 3-day water audit, discuss the results with members of your family. See if they think they used about the same amount of water as you used for personal functions. Then, averaging your collective uses (e.g., loads of wash, watering lawn, etc.) estimate the total daily water use for your family for each activity.

Calculate the number of times (estimated) your family performs each activity during a week and put the total in the first column of the chart below. Finally, multiply the number of times per week that your family performed each activity by the average amount of water used for each activity. Then add the totals to estimate your family's weekly water use.

Activity	Average amount	Times per week	Total
Bathe	36 gallons	(x)	=
Shower	25 gallons	(x)	=
Wash hands / face	2 gallons	(x)	=
Brush teeth	10 gallons	(x)	=
Drink water	1 / 4 gallon	(x)	=
Run washing machine	60 gallons / load	(x)	=
Wash dishes	11 gallons	(x)	=
Water gardens & lawns	10 gall / min	(x)	=
Flush toilet	7 gallons	(x)	=
Other	(estimate)	(x)	=

Total for Week: _____gallons

Extra detective work: If your family receives a water bill that tells how many gallons a month you have used, compare the bill with your total on your water use above. If the total usage is very different, can you think of reasons why? Discuss them with your family.