ICE IS N"ICE"!!

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Observe and describe, orally or in writing, the different forms of water on the surface of the Earth;

2. Measure to find the approximate size of an iceberg using a familiar standard (cm ruler);

3. Estimate, orally or in writing, and measure the amount of ice that floats above the surface of the water and below the surface of the water;

4. Give an oral or written definition of the terms: air, clouds, float, freeze, gas, iceberg, liquid, snow, solid, and water.

SUBJECTS:
Science, Math, Language Arts, Social Studies, Music

TIME:
1 hour

MATERIALS:
1 cm ruler per student
1 pencil per student
1 picture of iceberg per student
1 irregular-shaped block of ice (prepared 1 or 2 days in advance) - gallon size freezer bag for the iceberg
Enough cool water to fill an aquarium 2/3 full
clear aquarium
strips of white paper 25 cm x 1/2 cm (optional)
scissors
water
2 quart-size resealable plastic bags
Icebergs by Jane Elliott
overhead projector
water color markers
transparency

BACKGROUND INFORMATION

Concept: About three-fourths of the Earth's surface is covered with water. About one-tenth of the Earth's surface is covered with solid water or ice. Most of the water on the Earth is a liquid. Some places on the Earth are very cold. The water in these cold places is always frozen. We call water that is frozen either "ice" or "snow." Ice floats on water because it weighs less than water.

The Earth is a unique planet in the solar system because it is the only one on which large amounts of water exist in the liquid form. Without this water, life as we know it could not exist on the earth. It is estimated that about 10% of the Earth's surface is covered with ice. It is estimated that if the earth were a "smooth ball," and if all the ice in the polar caps were to melt, the entire earth would be covered by a layer of water more than 3 km deep.

When ice from the polar regions pushes out into the oceans, large chunks break off to form icebergs. About 9/10 of an iceberg is submerged. For every cubic meter of ice above the water, there are about 9 cubic meters of submerged ice. An iceberg (or an ice cube) floats because ice is less dense than water.

Terms

Write/introduce the following terms on individual "snowflake" cutouts to make a "snowstorm" of vocabulary words on board.

Water	Freeze	Air	Gas
Snow	Float	Liquid	Solid
Iceberg	Clouds		

ADVANCE PREPARATION

A. Gather materials from list.

B. Freeze some water in a gallon-sized plastic bag to produce an irregular-shaped ice block.

C. Make transparency of word web.

PROCEDURE

I. Setting the stage

A. Write the word "ice" on the word web (use overhead) with water color marker. Brainstorm words that begin with the word "ice." Ex: iceberg, ice cube, ice cream, ice storm, ice cap, ice age, etc. Put on the word web after defining or describing each.

B. Read a book about icebergs such as: Icebergs by Jane Elliott.

II. Activities

A. Show a picture of an iceberg. Have children name the kinds of matter they see.
Solids - ice; snow Liquids - oceans; clouds

B. Show a picture of an iceberg. Have children estimate how tall the iceberg is. List estimates on chart on board.

C. Show a picture of an iceberg. Have children use a cm ruler to measure the height of one of the people exploring the iceberg. Compare that person's height with the height of the iceberg from water level to the highest point. (How many "people" tall is the iceberg?) Record on picture. (May want to do as a whole group activity with Kindergarten).

*If you have no cm rulers or children are too young, use strips of paper (25 cm x 1/2 cm) and have children mark the paper at intervals that are one person high. Count the intervals to see how many "people" tall this iceberg is.

D. Put cool water and the irregular-shaped ice block into aquarium. Children compare the floating ice with the iceberg in the picture.

E. Measure to see how much of the ice block is above/below the water's surface. Use a ruler to do this. Record on "Iceberg Recording Sheet."

III. Follow-Up

A. Make subtraction facts to find the difference of each child's estimate (in Activity B) with the actual height of the iceberg.

Example:
Johnny 6 people tall
Tom - 4 people tall
2 people tall (difference)

Compare using terms "more","less","equal to." Write comparison statements.

Example:

Johnny		Tom
6 people tall	>	4 people tall

IV. Extensions

A. Fill a quart-sized plastic bag with a pint of water and freeze overnight. Remove the bag the next day. Discuss what happened to the water. Fill another quartsized plastic bag with a pint of water. Children hold the two bags and compare the weight of the ice vs the weight of the water. (Ice feels lighter. It is less dense and that is why it floats on water.)

B. Float an ice cube in a glass of water. Observe to see if more of the ice cube is above the surface of the water or below the surface of the water in the glass.

C. Use globe to locate areas with lots of ice/icebergs (polar caps). Use books from resources as references.

D. Sing the song, "Frozen Water" (see attached sheet).

RESOURCES

Cowcher, Helen, Antarctica, New York: Scholastic, Inc., 1990.

Elliott, Jane, Icebergs, The Wright Group: Applecross Ltd. (Publisher), 1994.

Williams, Geoffrey, Antarctica: The Last Frontier, Los Angeles: Price Stern Sloan, 1992.

Frozen Water

(Sung to the tune of “Frere Jacques”)

First Verse

When water freezes,
When water freezes,
It weighs less,
It weighs less.

It looks like it would sink and drop,
But it floats and bobs up on the top,

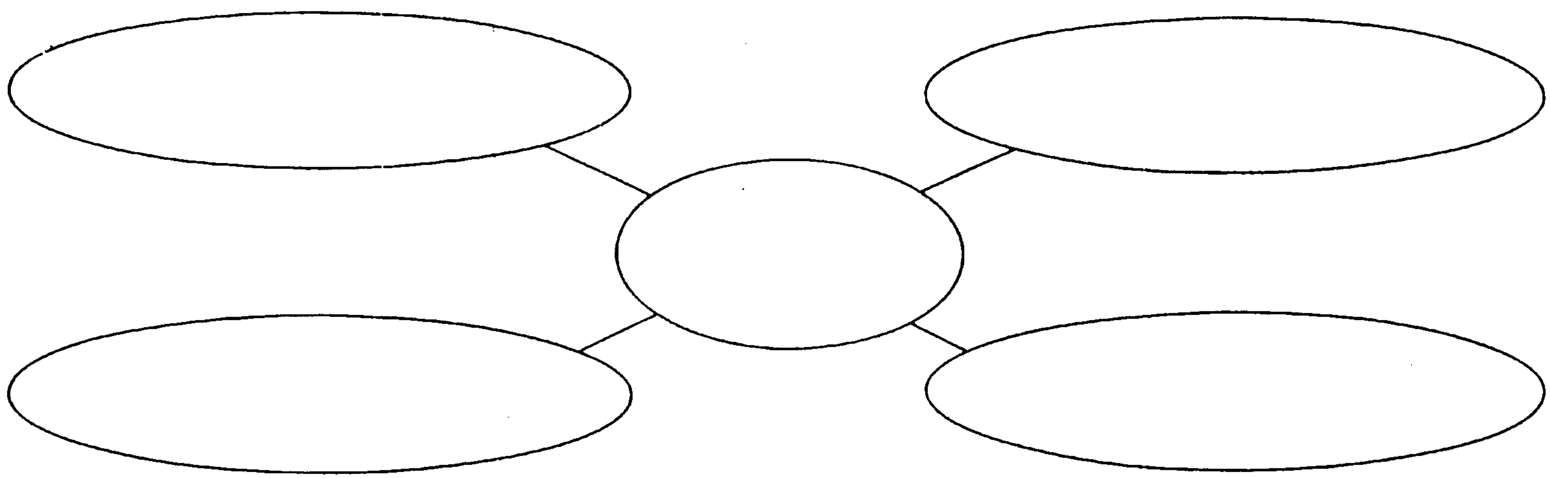
Of the water,
Of the water.

Second Verse

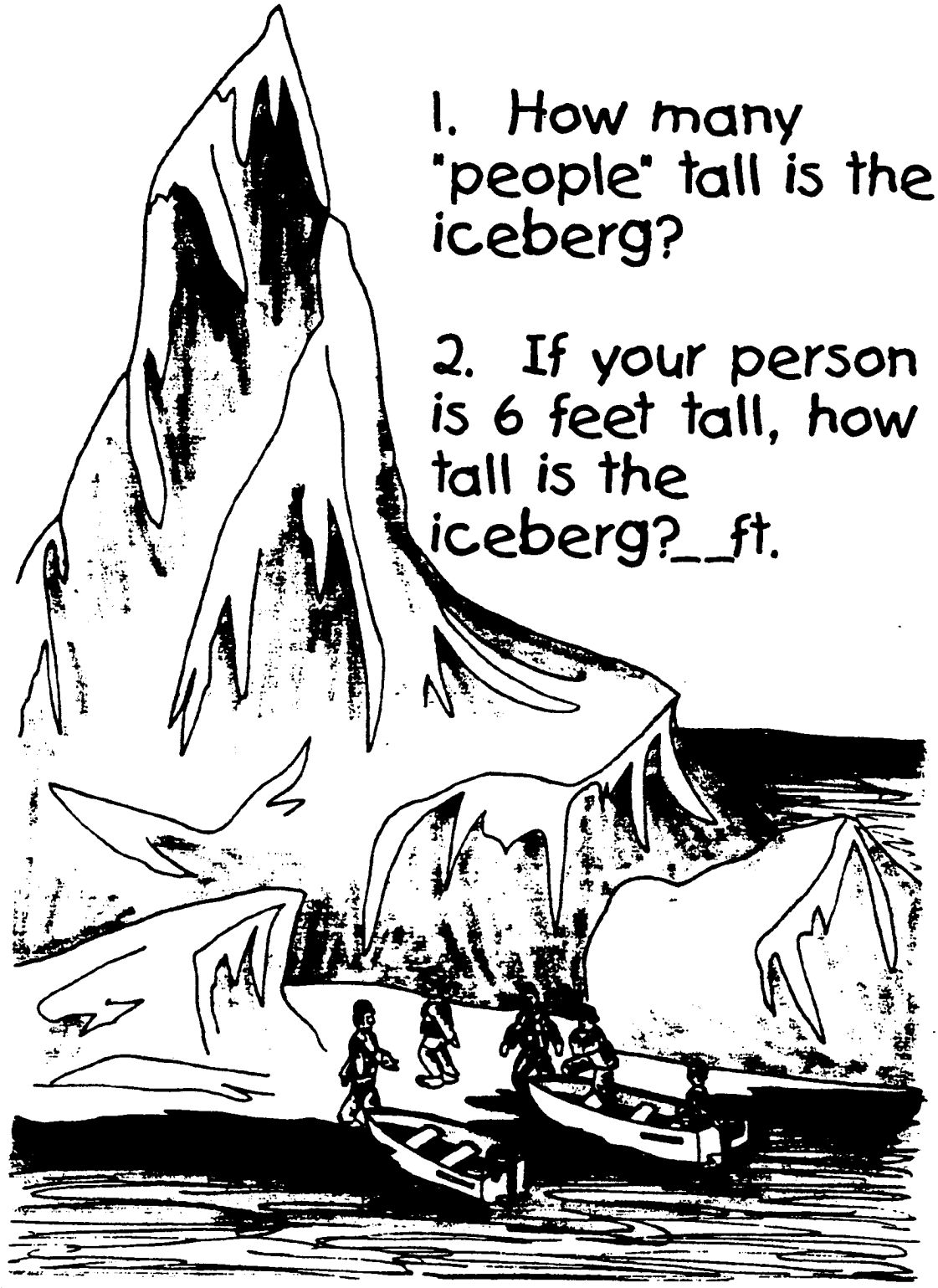
When water freezes,
When water freezes,
It’s less dense,
It’s less dense.

It looks like it would sink and drop,
But it floats and bobs up on the top,
Of the water,
Of the water.

WORD WEB



These people from Greenland are exploring an iceberg that broke from a glacier.



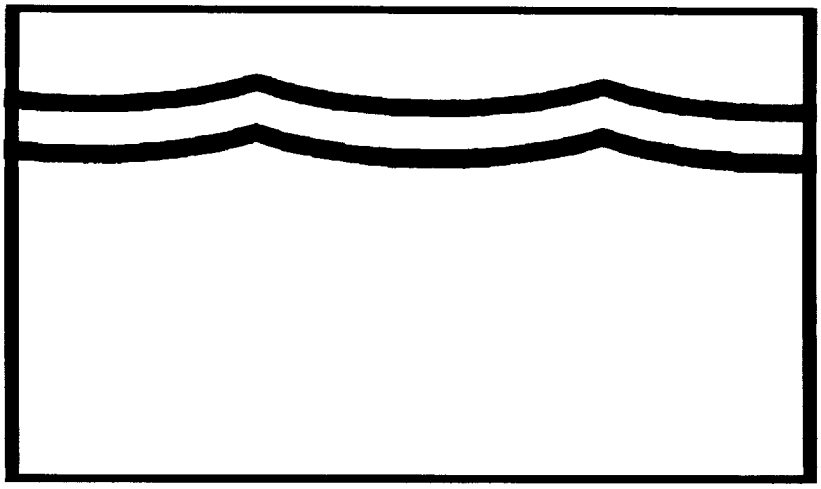
1. How many "people" tall is the iceberg?

2. If your person is 6 feet tall, how tall is the iceberg?__ft.

"ICEBERG" RECORDING SHEET

NAME_____

This is how the aquarium filled with water looks:



1. Draw a picture of the "iceberg" after it has been placed into the aquarium.
2. How much of the "iceberg" is above the water's surface?__cm
3. How much of the "iceberg" is below the water's surface?__cm

FLOATING CRITTERS

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Create an insect which will float and repel water;
2. Revise their creations, if necessary;
3. Write or give an oral description of their insect including the number of legs and major body parts; and
4. Give an oral or written definition of insect.

BACKGROUND INFORMATION

Many insects live on the water's surface, as well as above or below the water. These insects have special adaptations to help them float and resist water. An insect has six legs and three major body parts: the head, the thorax, and the abdomen.

Term

insect: animal having six legs and three major body parts.

SUBJECTS:
Science, Language Arts

TIME:
1 hour

MATERIALS:
assorted materials which will sink or float:
- pieces of polystyrene foam
- soft drink bottles/cans
- straws
- pipe cleaners
- plastic containers (margarine tubs)
- sponges
- wooden pieces
- fabric
- wiggle eyes

adhesives:
- glue
- tape
- staples
- hot glue (optional)

small pool filled with water (a large aquarium would work well, too)

ADVANCE PREPARATION

A. Have all materials freely available to students. It is very important to allow students to make mistakes. The teacher should be a facilitator, giving materials when necessary.

PROCEDURE

I. Setting the stage

A. Review the characteristics of an insect (three body parts and six legs.)

B. Look at pictures of water striders or other animals which dwell primarily on the water's surface.

C. Discuss their importance in their habitat, and their role in the food chain.

II. Activities

A. Explain to students that they have 30 minutes to create an insect which will float. At the end of 30 minutes, have students put the insects in the water to test them.

B. Allow students any or all materials; try not to guide or intervene except to help with insect characteristics.

C. Make students aware of time restraints.

III. Follow-Up

A. After 30 minutes, go outside and test students' insects. The ones whose insects sink may make adjustments and retest their insects.

B. Have students write a description of their insects and illustrate.

IV. Extensions

A. Language - Have students name their fictitious insects and write about them. Include what they eat, where they live, and their predators.

B. Math - Practice counting by two's by counting the pairs of legs on the insects.

THE WATER WINDOW

K-2

SUBJECTS:
Language Arts, Science, Math, Art

TIME:
30-40 minutes for two days

MATERIALS:
1 plastic gallon jug
150 copies of jug pattern
a piece of yarn long enough to form the largest possible circle on the classroom floor
a piece of yarn - 45" long
1 copy of "My Water Window" poem/art project per student

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. List, orally or in writing, at least three ways water can be conserved;

2. State, orally or in writing, the amount of water most Americans use daily; and

3. State, orally or in writing, the amount of water used by industry and agriculture.

BACKGROUND INFORMATION

On the average, every American uses about 150 gallons of water each day. Of that amount, only about 1/2 gallon is used for drinking. Some of this water is used for cleaning, watering plants and animals, and for recreation.

The demand for so much water sometimes causes water shortages. Everyone can help by conserving water. There are many ways to do this:

* Turn the water off while brushing teeth.
* Only wash full loads of clothes.
* Take showers instead of baths.
* Make needed repairs (fix drips!).
* Water outdoor plants and lawns in the early morning hours.
* Use a bucket and sponge to wash cars.
* Place a plastic bottle filled with water in the toilet tank.
* Use dishwashers instead of washing by hand.

Everyone should do his/her part to conserve the earth's precious supply of water.

ADVANCE PREPARATION

A. Gather the materials.

B. Fill the plastic jug with water, put a top on it and conceal inside a grocery sack.

C. Roll the long piece of yarn around a pencil.

D. Conceal the short piece of yarn in your pocket.

PROCEDURE

I. Setting the stage

A. Write "267,000,000" or the most current population figure on the chalkboard. Ask, "What is this number?" Say the number and have the children repeat it. Say, "That is the number of people who live in the United States of America. Every day almost every one of those people uses 150 gallons of water. This is <u>one</u> gallon of water." Show the gallon jug of water. "Do you think you drink that much water during one day? No, most people don't. But we do drink some water, so I'm going to write, 'We drink it' on this picture of a gallon jug. Let's think of some other ways people use water. (Remind students that factories/ industries use lots of water in making the things they use.) Each time we do, I'll write it on one of these jug pictures. How many jug pictures do you think I have? 150 Why do you think I have 150?" (That represents the amount of water most Americans use each day.) Continue listing ways people use water as long as interest is high. Spread the pages around the room to emphasize the amount of 150 gallons. Do as a whole group activity.

Optional - Punch holes in the gallon jug pages. Let the children illustrate the pages. Place them in a loose leaf notebook and continue (through the year) adding ways people use water until all 150 pages are complete.

II. Activity

A. Read "My Water Window" poem.

B. While the students watch, unroll the long piece of yarn as you walk around the room and say, "I'm going to make a circle with this yarn that represents all the water we have in the whole world." Finish the circle, then ask, "Do you think we have a lot of water in the world?"

"Now I am going to make another circle with this piece of yarn which will represent the amount of water we can actually use." Pull the 45" piece of yarn from your pocket and form a small circle in the middle of the large circle. Ask, "Do you think we have a lot of water to <u>use</u>?"

C. Ask students why we cannot use the rest of the water. If they cannot answer, help them understand the types of water that are "usable" (fresh, available, nonpolluted sources) versus those that are "unusable" (saltwater, fresh water locked in ice caps, and polluted water).

D. Read the poem again.

E. Show one of the window shutter pages. Read the poem again, pointing to each word. Encourage them to "read" with you.

F. Give directions:

"Inside the window shutters, the paper looks like a window. The tiny square in the corner represents the amount of water we can use. Color the square blue. Color the frame brown. On the rest of the window draw pictures of fish (and other sea creatures), boats, people swimming and other examples of water being used." The pages should be copied back-to-back so that when the shutters are folded and opened the frame is revealed.

III. Follow-Up

A. Arrange for one older student (per child) to accompany each of your students to different classrooms in the school to share their "Water Windows." The older child can read the poem and the younger child can show the "Water Windows."

IV. Extension

A. Let each child take home a "Water Conservation Family Contract" for the family to complete and sign as a homework assignment.

RESOURCE

"Clear Water Foundation Calendar", Clear Water Foundation, 444 N Capitol Street NW, Suite 330, Washington, D. C. 20001.

When I look through my
Water Window...

I see river water for fishing,
I see lake water for fun.
I see ocean water for
surfing,
We've got water by the ton!

But when I look a little
closer
For the part that we can
use,
I see we've only got a little;
If I waste it- we ALL lose!

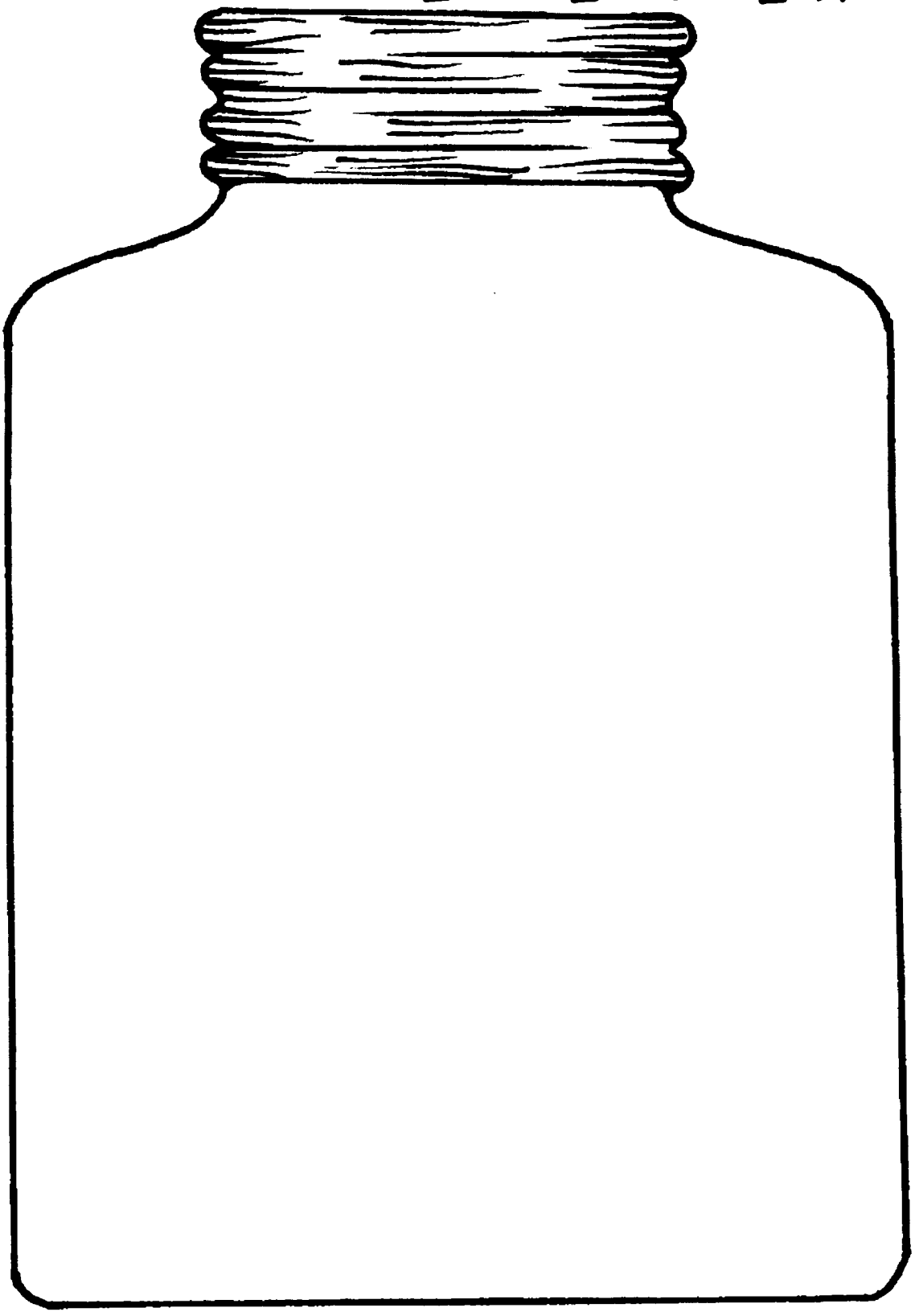
Beth Corum

Water Conservation Family Contract

We, the _____ family realize that our Earth's water supply is limited. We will do our part to conserve water in the following ways:

Each family member sign:

HOW DO WE USE WATER?



hrough my
WINDOW

ater for

ter for fun.
water for

ter by the ton!!

ok a little

that we can

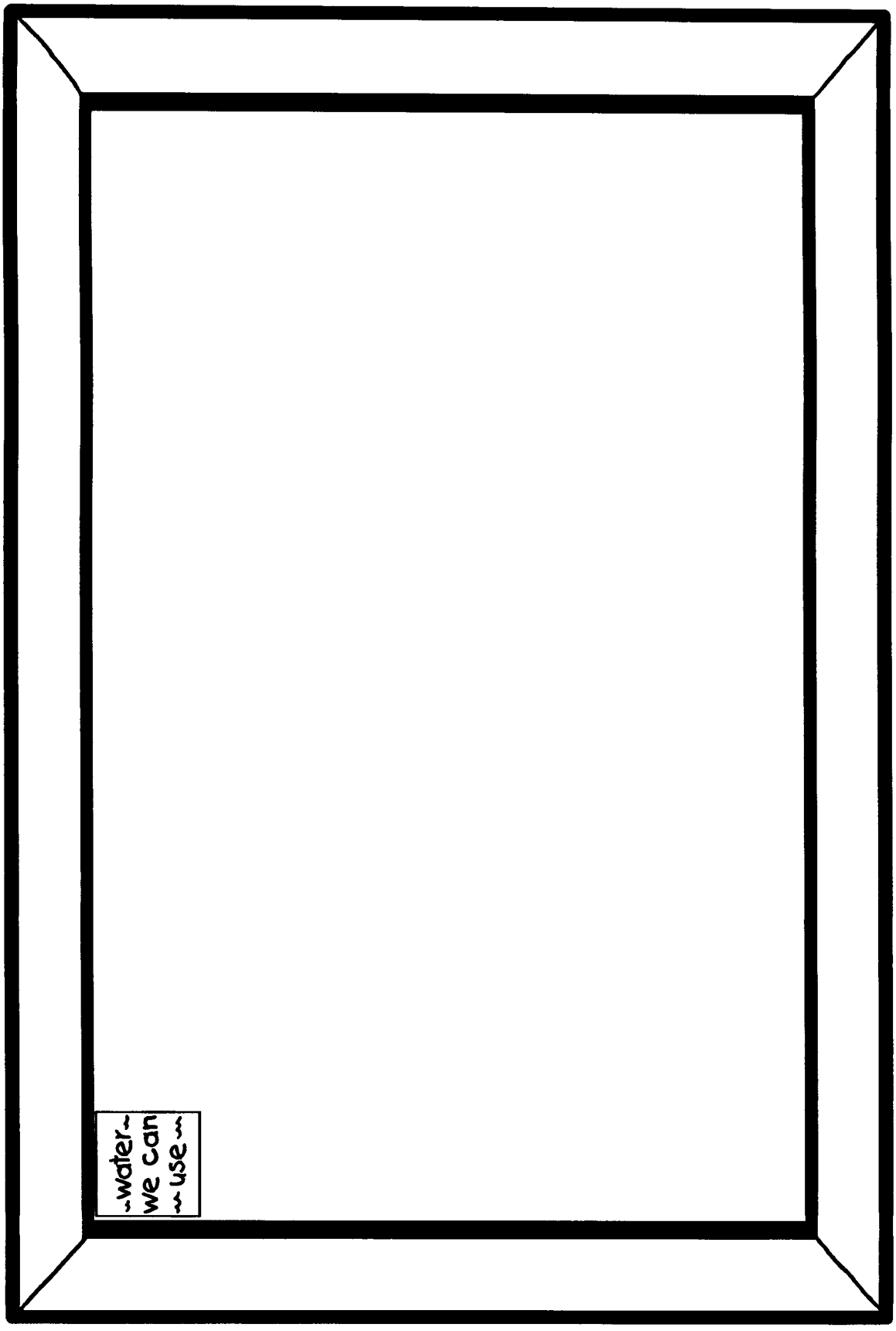
only got a

we ALL lose!

When I look
WATER

I see river w
fishing,
I see lake wa
I see ocean
surfing
We've got wa

But when I lo
closer,
For the part
use,
I see we've
little,
If I waste it-


~water~
we can
~use~

COUGHING CATFISH

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Illustrate a poem about the story;
2. Sequence, orally or in writing, a poem about the story;
3. Add paper catfish and write an equation; and
4. Give an oral or written definition of new terms: freshwater, freshwater degradation, and water pollution.

SUBJECTS:
Language Arts, Math, Social Studies

TIME:
45 minutes

MATERIALS:
poster board
3' fishing pole or 3/4" dowel rod
yarn or string
magnet
paper clips
sentence strips
lunch sacks
crayons
scissors

BACKGROUND INFORMATION

Lakes and ponds are important natural resources and, if managed properly, can be a renewable resource. They are home to many different plants and animals both in the water and along their banks. These plants and animals are as essential to ecology as freshwater is to the human race.

The United States has the highest freshwater usage in the world (over 340 billion gallons a day) for industry, agriculture, and domestic uses. In 1990, the EPA estimated that industry illegally dumped 7 million gallons of oil, 90,000 pounds of mercury, and 2,000 pounds of PCBs into the Great Lakes, which hold 1/5 of the world's surface freshwater supply. Many bodies of water in the United States are polluted to the extent that authorities have limited public consumption from them.

Both pollution and drought can cause freshwater degradation, leaving lakes and ponds without the ability to replenish themselves, killing fish and other aquatic life, and inhibiting plant growth. Degradation can cause abnormal algae growth which uses up the much needed oxygen in the water and eventually kills plants and animals. Even if pollution was completely stopped today, it would take decades to centuries for lakes and ponds to cleanse themselves back to normal levels for plants and animals to survive and replenish themselves.

Terms

freshwater: inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or groundwater.

freshwater degradation : freshwater that is either polluted or used up faster than it can replenish itself.

water pollution: water that has been made unclean for aquatic life and plants by dumping in foreign objects or liquids from human activities or natural processes.

ADVANCE PREPARATION

A. Make poster of poem, "Solution to the Pollution." Copy pictures from the story to help students with context clues.

B. Write each line of the poem on long strips of paper.

C. Make a fishing pole with yarn attached to one end of a dowel or stick and a magnet tied to the other end. Copy, color, and cut out the catfish page and place paper clips on one end of each card.

PROCEDURE

I. Setting the stage

A. Before reading the story, The Berenstain Bears and The Coughing Catfish by Stan and Jan Berenstain, discuss the front cover of the book with the students to determine prior knowledge about pollution. Ask what they think the bears are doing and what they think the story is going to be about. After reading the story, discuss with the students what the problem was and what the bears did about it. Ask them what they would do with their garbage. Encourage them to make up a clever saying like "Don't throw it, Bag-It!"

II. Activities

A. Copy the poem on poster board and display. Read the poem to the students pointing to each word as it is read. Reread the poem in an echo. After reading a line have the students echo it back.

Solution to the Pollution
by Donna Morgan

Brother Bear and Sister Bear went fishing one day,
And caught a coughing fish that wanted to say,
"There's no mistake in Grizzly Lake,
We need a solution to the pollution."

Now Brother Bear and Sister Bear had to agree.
That other folks in fishing boats had to see,
"There's no mistake in Grizzly Lake,
We need a solution to the pollution."

Other folks in fishing boats would have to pay
for throwing their pollution in the lake that way.
"There's no mistake in Grizzly Lake,
We need a solution to the pollution."

Brother Bear and Sister Bear were proud to be
A part of all the clean-up and felt victory.
"There's no mistake in Grizzly Lake,
They found a solution to the pollution."

B. Write each line of the poem on a strip of paper. Have different students illustrate one line each and match their illustration to the correct sentence. Have the class discuss the poem and place the poem in the correct sequence in a pocket chart or on a bulletin board along with their illustrations.

III. Follow-Up

A. Play Catch the Coughing Catfish. Using the fishing pole and the Catfish Cards, have the students fish over a puppet theater or into a large tub or even into a blue circle of construction paper to represent water. The student continues to catch fish until he catches the boot. Once the boot is caught the student stops and sorts his/her coughing catfish and regular fish then counts each one. Next, have the student complete a math sentence or equation on the "Coughing Catfish Math" page. After throwing their catch back into the water, students may continue to fish until all of the equations have been completed on the math page.

Different variations of the game can be played to accommodate the various math levels of students. Write numerals on each fish and have the student add or subtract the numbers on the fish caught and record the equation on the "Coughing Catfish Math" sheet. The fish can also be used for reinforcing number or color words.

IV. Extensions

A. Students will make a "Bag-It" game (or call it whatever the students discuss after reading the above story). Give each student a small lunch sack, preferably white, for easy coloring

or a blue sack to represent water. Have the students color lake animals and plants on the outside of the sack. Give each student a copy of the "Bag-It" game cards to color and cut out. Discuss with the students which of the items are pollutants and which are helpful to lakes and ponds. Help students to sort the pieces by putting all the pollutants inside the sack and saying "Bag it!" Place all the other items on the outside of the sack and discuss how they help lakes or ponds.

B. Pair students up to play the "Bag-It" game. Have students place game cards face down. Each student draws a card and places it in the appropriate spot. If it is a pollutant it goes in the sack and the student says, "Bag It!" If it is helpful to lakes and ponds it is placed outside of the sack. Students may count how many pollutants they bagged as opposed to those placed in the lake.

C. Have students make posters to go along with the saying, "Don't throw it. Bag it!" and display around the school

RESOURCES

Berenstain, Stan and Jan, The Berenstain Bears and The Coughing Catfish, Random House, Inc., New York, 1987.

Hoff, Mary and Rodgers, Mary M., Our Endangered Planet Rivers and Lakes, Lerner Publications Company, Minneapolis, 1991.

Saign, Geoffrey, Green Essentials: What You Need to Know about the Environment, Mercury House, San Francisco, 1994.

Stidworthy, John, Ponds and Streams, Troll Associates, New Jersey, 1990.

Name _____

Coughing Catfish Math

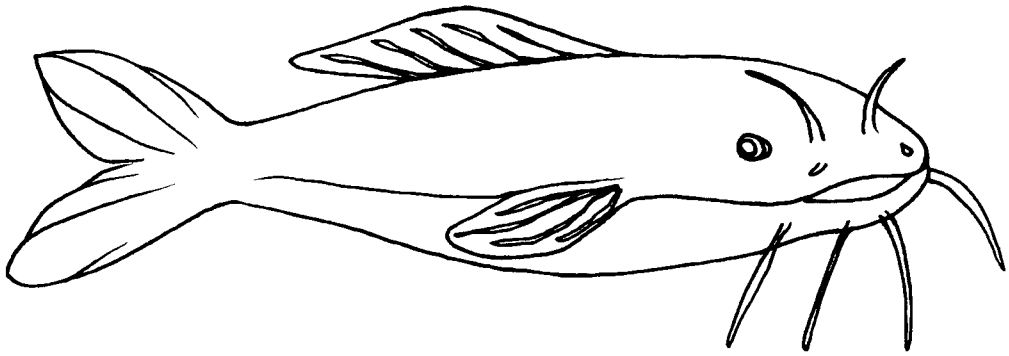
_____ + _____ = _____

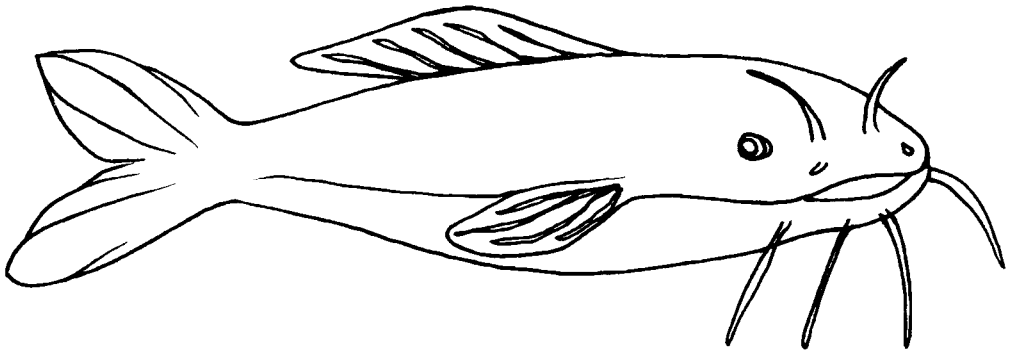
_____ + _____ = _____

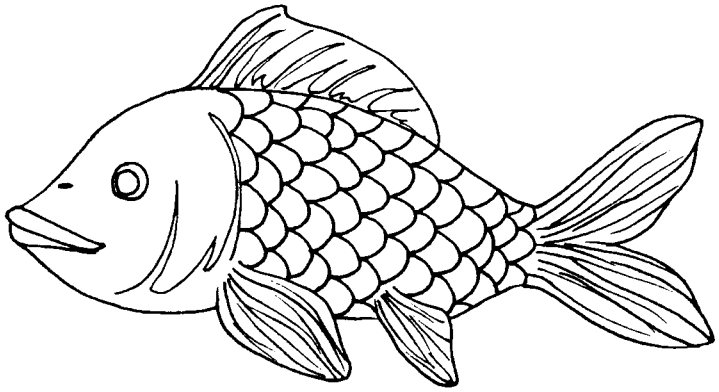
_____ + _____ = _____

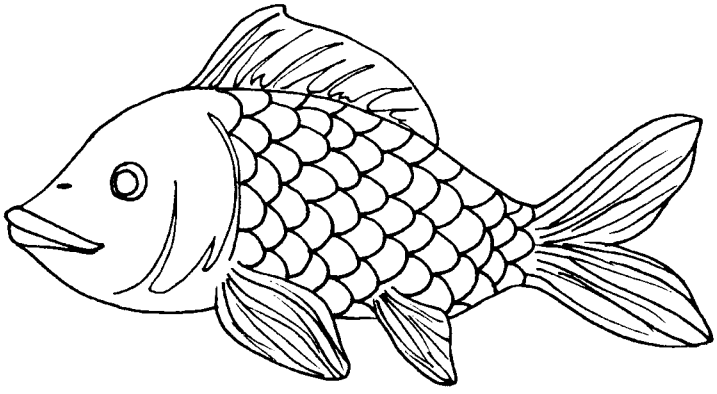
_____ + _____ = _____

FISH CARDS (COPY 5)



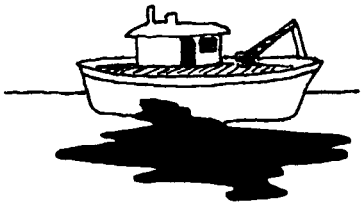
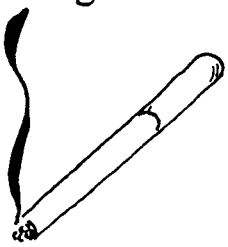
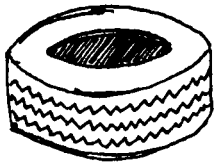
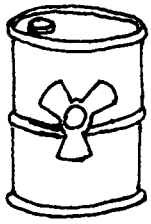
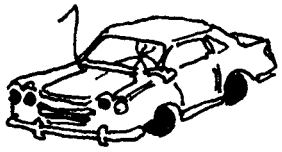
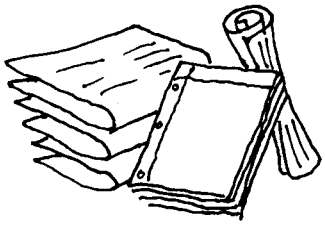
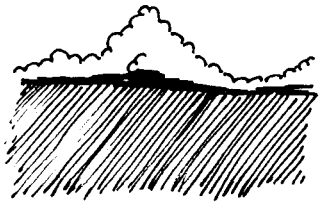






BOOT CARD (COPY ONE)

"Bag It" Cards

drink can 	oil from a boat 	old boot 
plastic bottle 	cigarette 	rubber tire 
chemicals 	old car 	paper 
fish food 	plants 	rain 

HAPPY THE FISH

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Illustrate or tell ways that the actions of people affect fish;
2. Simulate or talk about the addition of pollutants to water;
3. Order numerals 1-13; and
4. Give an oral or written definition of new terms: chemicals, cooling pond, and pollutant.

SUBJECTS:
Science, Whole Language, Math, Art

TIME:
Advance prep (day 1) 20-30 min
Activity (day 2) 30-40 min
Follow-up (day 3) 20-30 min
(This activity should be spread over 3 days to allow drying time.)

MATERIALS:
Happy the Fish (story)
sentence strips
pictures of Happy the Fish
15 sheets of white 12 x 18 construction paper
blue, brown, red and green tempera paint
wide, clear shipping tape (may use regular width transparent tape)
hole punch
2 or 3 large metal rings (may use yarn)

BACKGROUND INFORMATION

Water has the amazing ability to clean itself. If waste materials are put into a river, they often sink to the bottom or mix with so much water that they cause no real problems— unless we dump too much waste material or even small amounts of dangerous material. Then it is a problem for people and for the plants and animals that live in the water.

When factories pour hot water into rivers, it is not healthy for the plants and animals that live there. Some fish need cool water and cannot live in warm water.

Terms

chemicals: substances which are used in factories, farms, and homes for a variety of purposes such as cleaning, painting, killing pests, and maintaining vehicles.

cooling pond: a pond where hot water from factories and power plants is stored until it is the same temperature as nearby bodies of water.

pollutant: any substance suspended or dissolved in water that builds up in sufficient quantity to impair water quality.

ADVANCE PREPARATION

A. Prepare the pages of the big book.

1. Cut the sentence strips apart.

2. Glue the #1 sentence strip to the bottom of one of the pieces of large, white construction paper turned lengthwise.

3. Do the same for sentence strips #2 - #13 (one sentence strip per page).

4. Copy the fish picture page for each child.

B. Prepare the fish pictures.

1. Have students color and cut out the pictures of Happy the Fish.

2. Have students sort and stack the fish pictures according to facial expressions. (3 stacks)

PROCEDURE

I. Setting the stage

Share background information and definitions of terms.

II. Activities

A. Read the story of Happy the Fish, encouraging the students to make facial expressions to match how they think the fish feels throughout the story.

B. Make the pages for a class big book.

1. Distribute the prepared big book pages to the students. Since there are 13 pages, some of the students should work together.

2. Let the students illustrate the pages.

3. The students who illustrate pages which need a picture of a fish should go to the sorted pictures, select the appropriate fish, and glue it to the illustration according to the text. (For example: the student who has page 2 will glue a smiling fish to the bottom of the illustration because page 2 says, “Happy loved to swim...Happy swam low....”)

4. Let one or more students design the book cover on one of the large pieces of construction paper.

5. Let one or more students make the last page by writing: "This is the end of our little fish tale!"

6. Make a paint wash by diluting tempera paint with water. Let the students brush the paint wash over their pictures.

   pages 1-5 - blue paint wash
   pages 6-7 - brown paint wash
   pages 8-9 - red paint wash
   pages 10-11 - green paint wash
   pages 12-13 - blue paint wash
   book cover and last page - blue paint wash

III. Follow-Up

A. Assemble the book.

1. When the pages are dry, spread them in random order on the floor.

2. Lead the class in counting aloud 1-13.

3. Choose a student to write the numerals 1-13 on the chalkboard.

4. Let the other students put the pages in order and number them.

B. Bind the book.

1. Reinforce the left edge of each page with wide, clear shipping tape. Punch holes in each page along the left edge (either 2 or 3 holes).

2. Attach the pages by threading metal rings through the holes.

C. Read the class big book.

IV. Extension

Give each student small amounts of blue and brown playdough or clay. Say, "Let's pretend the blue is river water and the brown is a chemical. Mix the two together." Allow time for them to do this. Ask, "When people put chemicals in water, do you think it would be easy to get them back out?" "Can you get the brown playdough back out?" Discuss.

RESOURCE

"Water Pollution Fact Sheet", Water Sourcebook: Grades 3-5.

1

Once there was a little fish named Happy.
He was happy because he lived in a cool, clean river.

2

Happy loved to play and swim in the clean water.
Happy swam low - splishy, splashy.

3

Happy swam high - splishy, splashy.

4

Happy was comfortable in the cool water.
Happy relaxed low - flitty, floaty.

5

Happy relaxed high - flitty, floaty.

6

Then one day someone put chemicals in the river.
The chemicals made Happy sick.

7

Happy didn’t feel like splishing or splashing.

8

Then hot water is poured in the river from a factory.
The hot water made Happy uncomfortable.

9

Happy didn't feel like flitting or floating.

10

Then the people said, "We should be nice to the fish. We should keep the water clean."
They stopped putting chemicals in the water.
Happy felt a little better.

11

Then the factory workers said, "We should be nice to the fish. We should keep the water cool."
They built cooling ponds to cool the hot water.

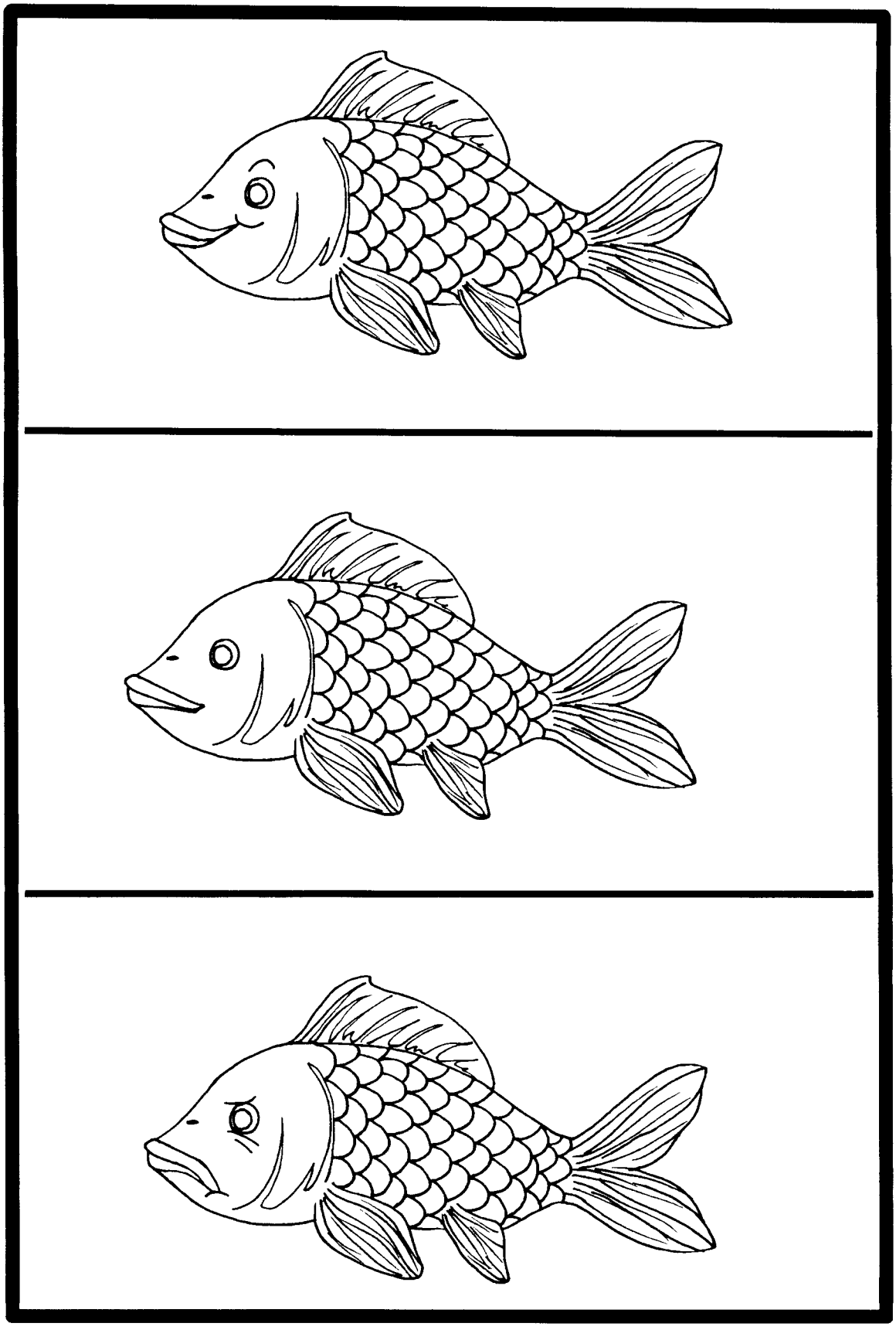
12

Happy felt much better.
Once again Happy swam low - Splishy splashy, Splishy splashly.

13

Once again Happy swam high -

Splishy splashy, SPLISHY SPLASHY!



HOW WATER FLOWS: SURFACE RUNOFF

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Observe and orally explain that water flows downhill;
2. Observe and orally explain surface water absorption and runoff; and
3. Give an oral or written definition of new terms: absorb, flow, and runoff.

SUBJECTS:
Science, Art, Math

TIME:
30 minutes

MATERIALS:
tin pan
sand
button
measuring cup
water
food coloring
droppers
water
various materials for absorption experiment
Rain Rain Rivers by Uri Shulevitz

BACKGROUND INFORMATION

When rain or snow does not evaporate, soak into the ground, or freeze into ice glaciers, it runs into streams, rivers, or the ocean. The rain water is known as surface runoff. The following factors affect the amount of surface runoff:

1) type of soil (Some soils absorb more water than others.)

2) conditions of the soil (Dry soil absorbs more than wet soil.)

3) the slope of the land

4) the number of plants in the soil (If there are more plants, then there are more roots absorbing water and less runoff.)

Terms

absorb: soak up.

flow: move smoothly.

runoff: water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a waterbody; may pick up and carry a variety of pollutants.

ADVANCE PREPARATION

Gather materials.

PROCEDURE

I. Setting the stage

Read Rain Rain Rivers by Uri Shulevitz.

II. Activities

A. Use wet sand to shape a small hill on a pan.

B. Place a button or other small object at the final destination of the water according to the class prediction.

C. Slowly pour one cup of water from a measuring cup on to the top of the hill.

D. Observe the water flow.

E. Record class observation.

III. Follow-Up

Science/Art - Use modeling clay to shape a hill. Let children add details such as models of trees, boats, people, etc. Display projects and title them. Have children pour water over the model and discuss runoff and its effects on the model.

IV. Extensions

A. Make rain at the easel!

B. Mix paint and water (half and half).

C. Have children dip a brush in the paint and observe the paint running down the paper making different designs. Repeat using various textures of paper or fabrics, discussing differences in paint absorption and design. Display children's art work.

Materials: paint, brushes, water, paper, easel

RESOURCES

Shulevitz, Uri, Rain, Rain Rivers.

Van Rose, Susan, Earth: Eyewitness Science, New York, New York: Dorling Kindersley, 1994.

SETTLING IN - SEDIMENTATION

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Mix sand with water and record or tell what they observed with sedimentation or settling;

2. Predict, record, or tell the effect of shaking on the particles; and

3. Give an oral or written definition of the new term: sediment.

SUBJECTS:
Science, Language

TIME:
1 hour

MATERIALS:
1 baby food jar for each child
sand
water
recording sheet
soil (optional)
tablespoons
stopwatch

BACKGROUND INFORMATION

Sediment is one of our most destructive water pollutants. America's water is polluted by more than one billion tons of sediment annually. Every year, Americans lose millions of dollars because of sediment pollution.

Sediment is caused by erosion, which is the gradual wearing down and carrying away of the earth's materials. Soil erosion occurs when soil is moved from one place to another by natural means. Wind blows soil, and moving water washes soil away. Normally, soil erosion occurs slowly over a very long time because trees and grasses hold the soil in place. Erosion can also occur naturally from forest and prairie fires, hurricanes, or tornadoes which strip the land of its protective vegetation cover. Nonpoint source erosion by people can also cause soil erosion to happen much more quickly than normal by allowing over grazing by farm animals, and by digging and building on steep slopes, cutting down trees, and plowing the land for crops. The rapid soil erosion that results from such activities can be very harmful to the environment.

Erosion by water often starts when rain strikes bare soil. Large amounts of rain washing down a sloping area pick up loose soil and carry it away. Harmful pollutants and nutrients can be washed away with the soil during the runoff event. Substandard agricultural and other land practices can cause fields and their topsoil to be washed away. Besides making the water less attractive to swim in and drink, the soil kills fish and other organisms living in the water.

Term

sediment: eroded soil material, often suspended in water, that consists mainly of particles derived from rocks, soil, and inorganic materials.

ADVANCE PREPARATION

Fill the baby food jars about 2/3 full of water, and place one on each student's desk.

PROCEDURE

I. Setting the stage

A. On the recording sheet, have students draw a picture of the water and sand as they think they will look when both are in the jar.

II. Activities

A. Have students add 1 tablespoon of sand to the water in their jars and then draw a picture of their observations.

B. Have students draw a picture of how they think the sand and water will look when they shake their jars.

C. Have students shake the jar and draw what they see. Immediately begin the stopwatch. Have students guess how long it will take for the sand to settle.

D. Have each student raise his/her hand when all of the sand has settled. Write the settling times on the board.

E. Have students record their hypotheses about what the water will look like when potting soil is first added, and then after it has been shaken.

F. Have students shake their jars and then record their observations.

G. Again, start the stopwatch and take students' predictions for potting soil settling. Students should watch their jars and raise their hands when it settles. Record these times on the board.

III. Follow-up

A. Working in pairs, have students write or discuss their ideas about why one kind of material settled more quickly than the other.

B. Point out that what occurred in the jar is similar to what happens in a natural body of water. The shaking is similar to the rivers or streams flowing and moving particles from place to place. The particles that settle out at the bottom are called sediment.

IV. Extension

A. Conduct a tour around the schoolyard looking for signs of erosion. In an urban setting, look for such things as cracked and pitted sidewalks, rounded pebbles used for decorative

stone and rivulets carved in dirt by water flowing along street gutters or down slopes on schoolyard.

1. Construct a chart with names of areas of erosion. Brainstorm possible solutions.

2. Write a letter to the principal explaining what you have been studying, along with the area noted on your tour and possible solutions. Ask permission to enlist help from parents and community to correct problem areas.

3. Set up a work session with students and parents to follow through with solutions designed by the class.

RESOURCE

Video: 3-2-1 Classroom Contact. Children's Television Workshop, "Erosion: Earth vs Change".

Name--------

SAND- after shaking

prediction

actual

Time needed for settling:----------

SOIL- after shaking

prediction

actual

Time needed for settling:----------

Which took longer to settle?----------

THE TRIP OF DRIP

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. List, orally or in writing, and illustrate materials that should not be found in water;

2. Sing a song about "Water is in Our Hands"; and

3. Give an oral or written definition of erosion, pollution, and sediment.

SUBJECTS:
Science, Music, Language Arts, Math

TIME:
30 minutes

MATERIALS:
puppet show "The Trip of Drip"
puppets
sponge
thread
clear container of water
dark syrup (small amount)
dirt or potting soil
green and red food coloring
pebbles
rectangular shaped sponge
piece of grass sod the size of a sponge
grass seeds
ruler
watering can with spray head
needle
thread

BACKGROUND INFORMATION

There are many sources that cause water pollution. Some of the sources are easy to spot or find. They are called point sources. Manufacturing plants and factories are examples of point sources. Other sources of pollution are not as easy to locate. They are called nonpoint sources. Some examples of nonpoint source pollution are sediment from land erosion, human and animal wastes, and chemicals that have been washed from fields or lawns. People are the underlying cause of pollution. People must keep pollutants out of the water. Water is the most important substance for life on earth. The earth gets no new supply of water. The water we have now is what the Earth has always had so we must work together to take care of water. The care of water is in our hands!

Terms

erosion: the wearing away of the Earth's surface by running water, wind, ice, or other geological agents; processes, (weathering, dissolution, abrasion, corrosion, and transporation) by which material is removed from the Earth's surface.

pollution: an unwanted change in air, water or soil (usually through the introduction of pollutants or contaminants) that can affect the health and survival of humans or other organisms.

sediment: eroded soil material (often suspended in water that consists mainly of particles from rocks, soil, and inorganic materials).

ADVANCE PREPARATION

A. Prepare all of the puppets to be used in the puppet show. Puppet patterns are included at the end of this activity.

B. Gather all materials.

C. Copy student's little book, "Rivers, Lakes, and Oceans Should Definitely Not Have _____." The book was developed by Pat Butler, Weeden School, Florence, Alabama.

PROCEDURE

I. Setting the stage

A. Share background information.

B. Show the children "Drip" the puppet. Tell them that Drip is going on a trip that is going to get pretty rough. The students will have an opportunity to help Drip.

II. Activities

A. Perform the puppet show, "The Trip of Drip".

The Trip of Drip

Original by Cindy Taylor

Drip Puppet #1	Boys and girls, I have been around and around for a long time. Once a dinosaur drank me. I have been raindrops. I have been snowflakes, I have helped make electricity for you. I have traveled across the world many many times. Sometimes I was on earth traveling in a stream, lake, river, or ocean. Sometimes I have a bird's-eye view of the world from a cloud being pushed along by the wind.
Snow Flake Puppet #2	Today I am a solid snowflake on top of a big mountain. I feel the warm sun changing me into a liquid water drop.
Drip Puppet #3	Now as a free flowing liquid I'm trickling down the mountain. Whoooo this is fun!
Small Stream Puppet #4	My water drop buddies and I are grouping together forming a small stream. I see several other streams joining our stream. Hello and welcome!

River Puppet
#5 Now we all are a river. What a journey we will take. Rivers run through small towns and big cities.

River with Fish
#6 Oh look at all the fish swimming in the river we've formed. They love this fresh clean water. They are having so much fun. And look at those people having a picnic beside our river.

Greasy Drip
#7 What's this slippery stuff getting around me? Oh I see, that man is dumping oil in our river. It's the old oil from his car!
It makes me want to boil
When I see someone not recycling oil
It makes the fish have no more fun
For what the people have done.
Please don't be so mean
Always keep the water clean!

Farmland
River Puppet
#8 Now we're running through rich farmland. Oh look at the cows grazing in the pasture. There's one cow getting a drink of water from our river.

Moo moo move over cow
Make sure you put your manure
in your own pasture.
Please don't be so mean
Always keep the water clean!
They know the solution
People must stop pollution.

Greasy Drip
#9 Boys and girls, please do all you can to protect water. Pass the word to others.

It ought to be in the Constitution,
Everyone should stop pollution.
We have to work together
That's the only solution!

We have to work together, together, together,
We have to work together to keep water clean.
The water is my water; the water is your water,
We have to work together to keep water clean!

III. Follow-Up

A. Give the children a copy of the little book "Rivers, Lakes, and Oceans Should

Definitely Not Have _____." Have the children fill in the blanks with their own ideas. Have students dictate when necessary.

B. Sing the song "Water Is In Our Hands"

Water Is In Our Hands
(Tune: He's Got the Whole World in His Hands)

1. We've got the lakes and the streams in our hands
   We've got the lakes and the streams in our hands
   We've got the lakes and the streams in our hands
   We've got the care of water in our hands.

2. We've got the rivers and the oceans in our hands
   We've got the rivers and the oceans in our hands
   We've got the rivers and the oceans in our hands
   We've got the care of water in our hands.

3. We've got all kinds of fish in our hands
   We've got all kinds of fish in our hands
   We've got all kinds of fish in our hands
   We've got the care of water in our hands.

4. We've got all the sea life in our hands
   We've got all the sea life in our hands
   We've got all the sea life in our hands
   We've got the care of water in our hands.

5. We've got all living things in our hands
   We've got all living things in our hands
   We've got all living things in our hands
   We've got the care of water in our hands.

6. We've got to stop the pollution and the waste
   We've got to stop the pollution and the waste
   We've got to stop the pollution and the waste
   We've got the care of water in our hands.

IV. Extensions

A. Cut a small raindrop shape out of a sponge. (The raindrop shape sponge is the puppet "Drip.") Sew a piece of thread to Drip to pull him out of the water.

B. In a clear container of water add Drip. Discuss how happy Drip is in the clean, clear, cool water. If you prefer, use a gallon size resealable plastic bag instead of the clear container. If you use the baggie, there is no need to sew thread on the sponge-shaped drop of water.

C. Add pollutants to the water one at a time. After each pollutant is added, let the children discuss Drip's condition and how he might feel, if he were real. Pollutant examples:

1. Dirt and pebbles for sediment
2. Red and green food coloring for chemicals
3. Dark syrup for oil
4. Small chunks of dirt for manure

Erosion Experiment:

A. Place potting soil or dirt on a rectangular-shaped sponge. (The sponge represents land.)

B. Hold the sponge over a container of water. The container of water represents a body of water such as a lake, river, stream, or ocean. Blow the sponge (representing the wind).

C. Using a watering can, pour "rain" on the sponge. Some of the dirt will go into the water. This demonstrates wind and water erosion. Define erosion - "the movement of soil from one place to another by water and wind." Shake the rest of the lose soil from the sponge.

D. Place a piece of grass sod on the sponge. The sod needs to be the size of the sponge. Sprinkle "rain" on the grass sod. The dirt on the sod will stay on the sponge. If sod is not available, skip this step of the activity and go to step E.

E. Add a small amount of soil or dirt to the sponge and cover entire sponge with grass seed.

F. Have the person designated as the "botanist" keep the sponge damp. Keep the sponge in the science center, preferably near sunlight.

G. Observe the sponge daily. Discuss what the grass seeds need to grow (sun, water, air).

H. As the grass begins to grow, have the children measure its height.

I. After the grass is thick, blow on the soil, then pour "rain" on the sponge, using the watering can. Note that the soil stays on the sponge.

Contrast erosion in the previous demonstrations with erosion in this demonstration. Explain the importance of crops and other plants in preventing wind and water erosion.

RESOURCES

Bains, Rae, Wonders of Rivers, Troll Associates, 1982.

Schmidlkofer, Regina, Educational Specialist, Tennessee Valley Authority, Muscle Shoals, Alabama, 205/386-3550.

Rivers, Lakes, and Oceans

by

Rivers, lakes, and oceans
should definitely not have

_____.

Rivers, lakes, and oceans should definitely not have

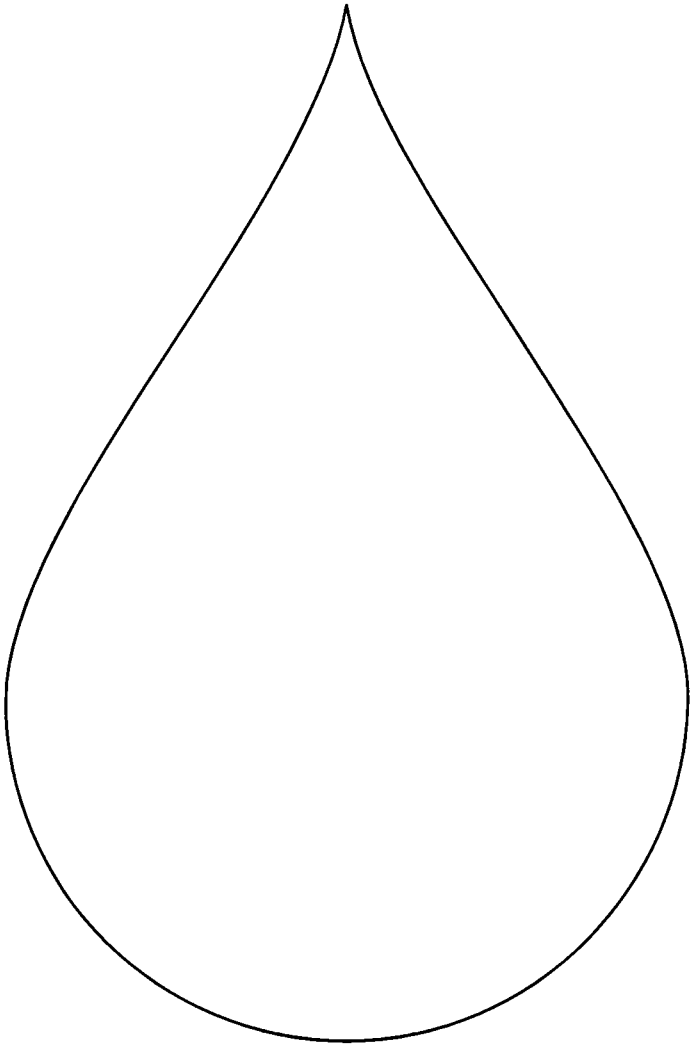
_____.

Rivers, lakes, and oceans should definitely not have

_____.

DRIP PUPPET PATTERN

Make 2



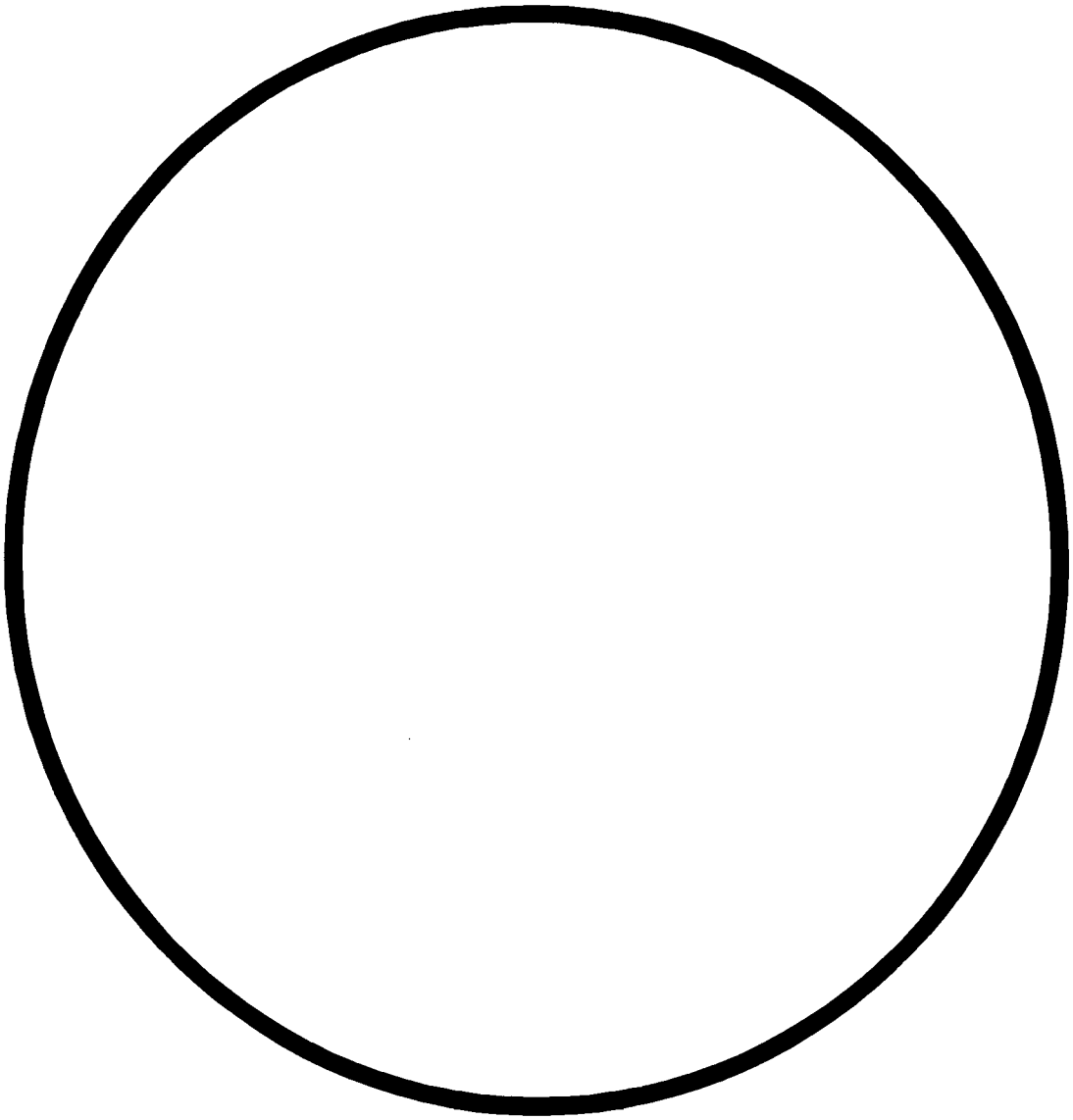
Drip Puppet #1 and #3
Make one puppet
for use as puppet #1 and #3

Glue blue plastic wrap
on white poster board pattern
Cut out, add wiggly eyes

Greasy Drip Puppet #7 and #9
Make one puppet for use as
puppet #7 and #9

Glue black plastic on
white poster board pattern
Cut out, add wiggly eyes

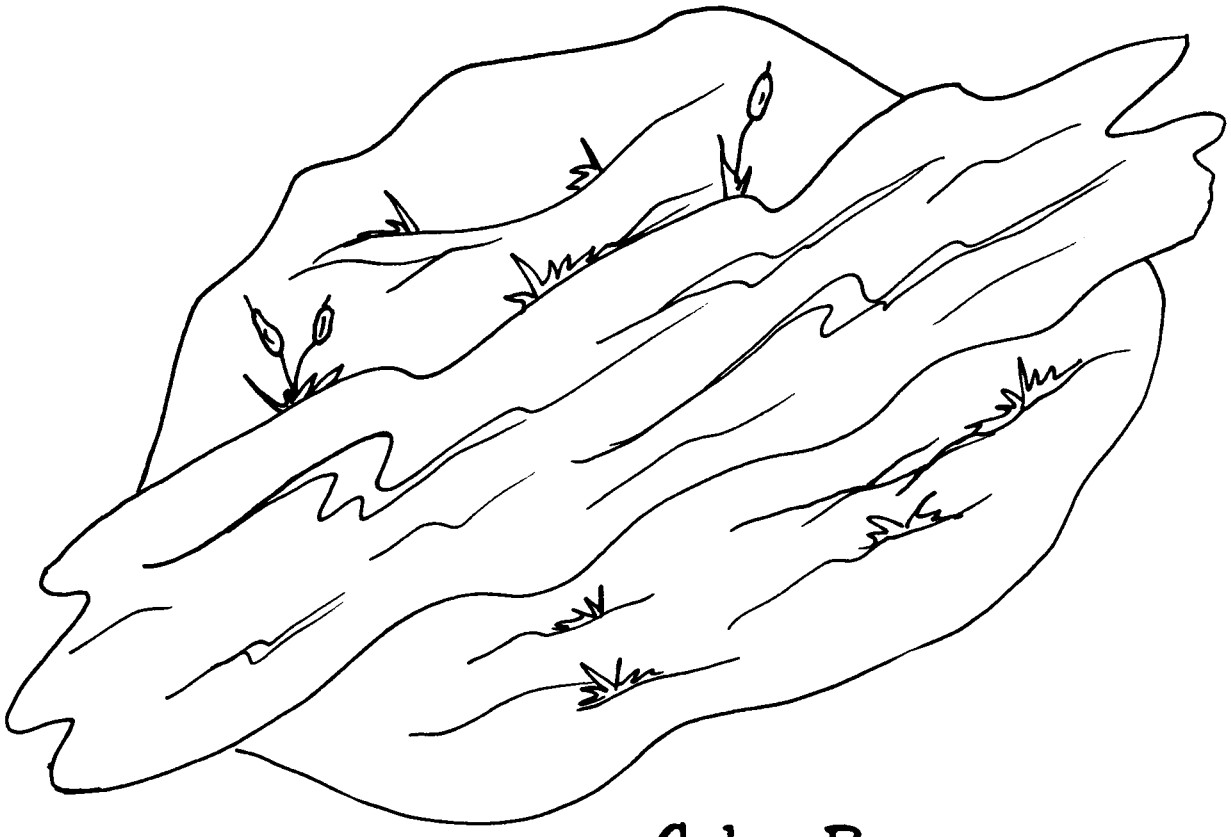
SNOWFLAKE PUPPET #2



Directions

1. Cut out circle pattern
2. Fold it in half
3. Next fold it in thirds
4. Cut circular end off so the side will be straight
5. Cut small triangles and other designs on all sides of the pie-shaped piece

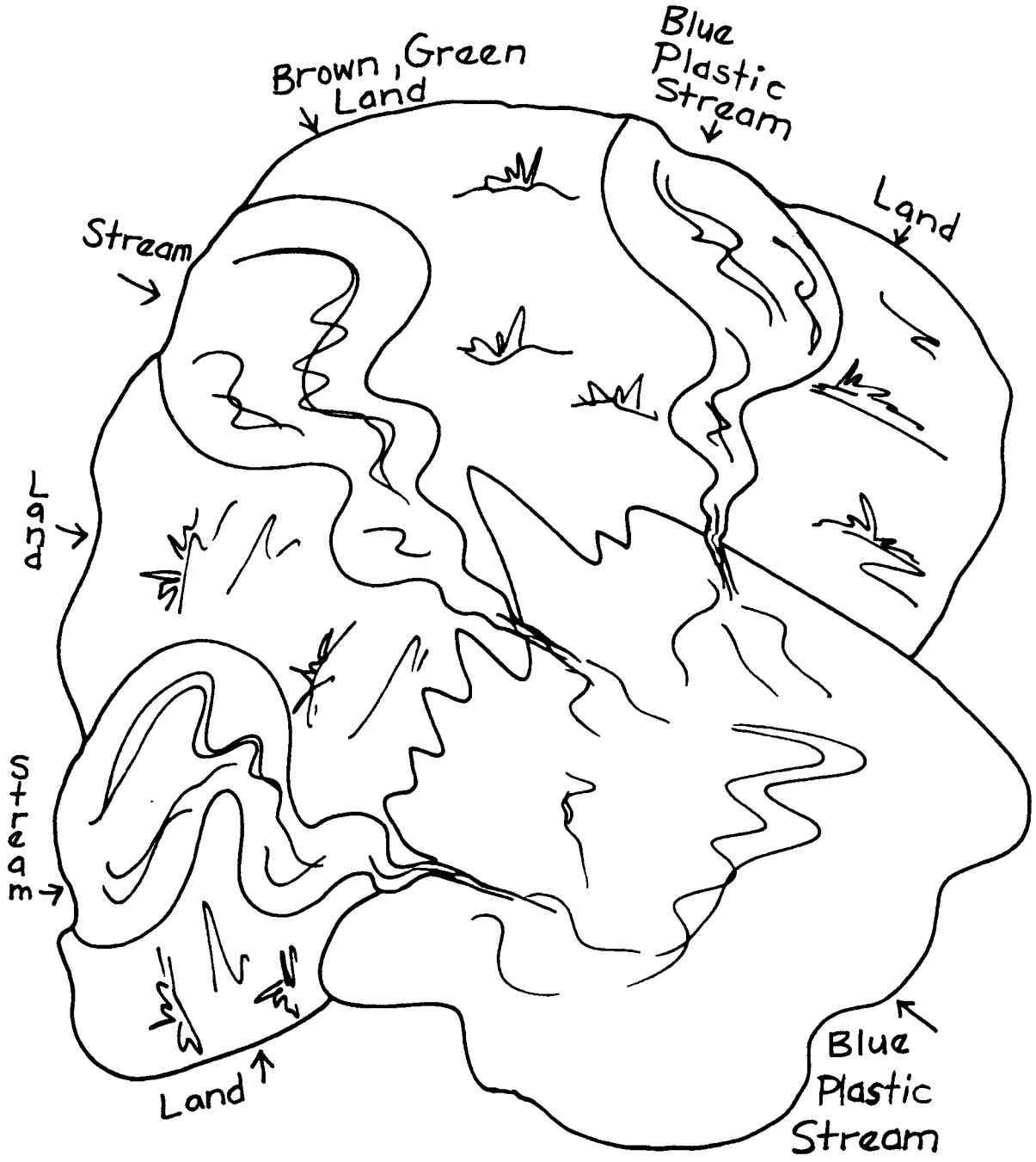
Small Stream Puppet #4



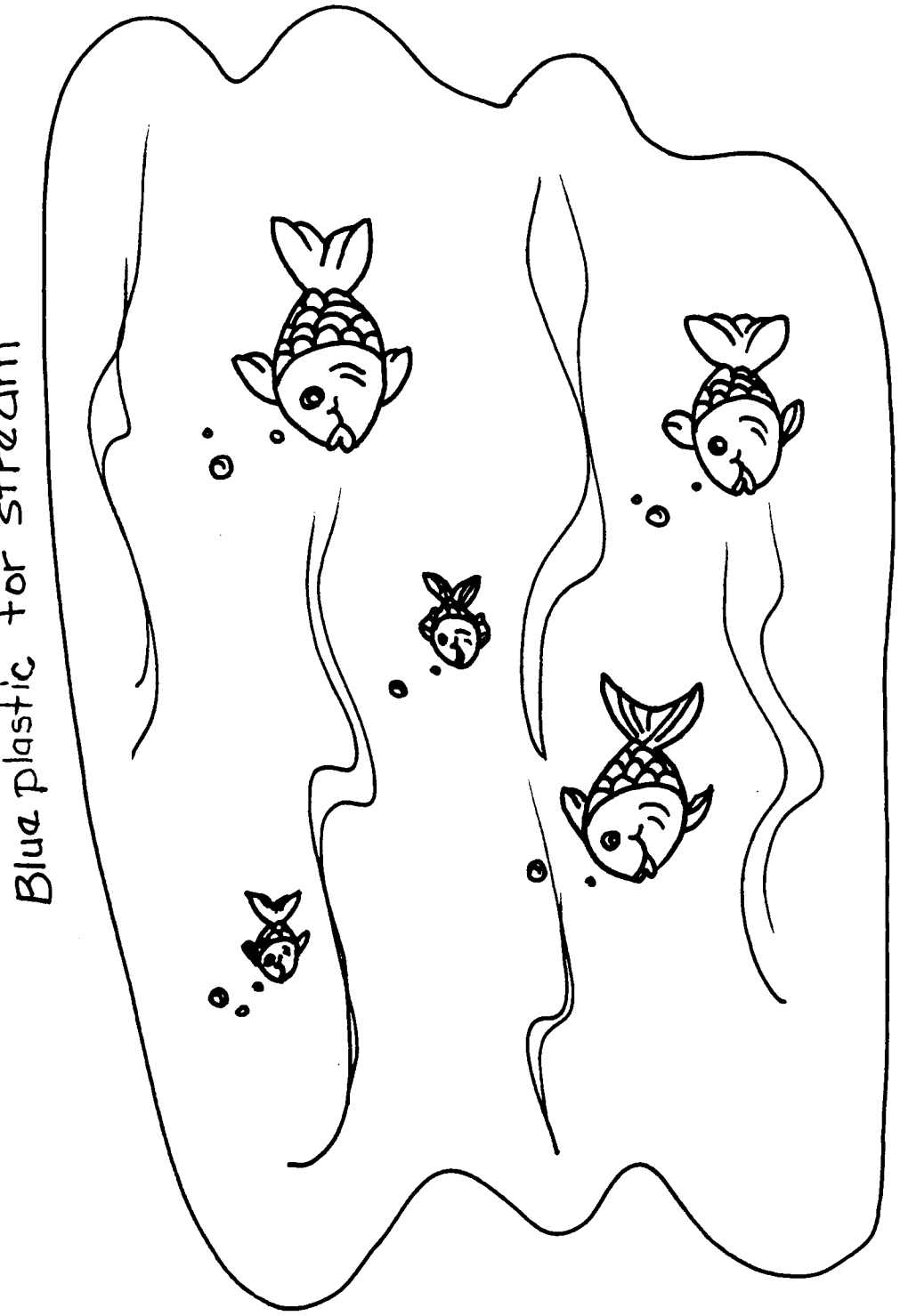
Color Brown
and green land

Blue plastic stream

River Puppet #5



River with Fish #6



Farmland River Puppet #8

THE LITTLE GOLD FISH

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Act out a play about water pollution;
2. Make props and costumes in small groups;
3. Create and act out their own version of a play incorporating their solution to the problem of pollution; and
4. Give an oral or written definition or water pollution.

SUBJECTS:
Art, Dramatic Play, Social Studies

TIME:
45 minutes for one day or divide over a two day period

MATERIALS:
paper and markers for props and costumes

BACKGROUND INFORMATION

Creative dramatics help young children use movement, mime, and dialogue to answer important questions or solve dramatic problems. Through reenactment of a story about water pollution, and through moving and make believe, children can begin to understand and remember the facts about pollutants in water and how to help solve the problems. In addition, because creative dramatics is a group effort, children learn to work together and to solve the problem collaboratively. By making up their own versions, they learn important problem solving and critical thinking skills.

Term

water pollution: water that has been made unclean for aquatic life and plants by dumping in foreign objects or liquids from human activities or natural processes.

ADVANCE PREPARATION

A. Prepare a space to perform the play.

B. Pre-select small groups to perform the play together.

C. Pre-read the play.

The Little Gold Fish

by Donna Morgan

Adapted from the classic children's story, "The Little Red Hen"

Once there were four friends - a beaver, a snake, a duck, and a little gold fish. The little gold fish had three baby fish. One day the little gold fish and her three baby fish were swimming in a shallow pond, and she found some aluminum cans, polystyrene foam cups, and plastic rings. She went to her three friends and asked, "Who will help me pick up the trash to make our pond beautiful?"

"Not I," groaned the beaver.

"Not I," hissed the snake.

"Not I," quacked the duck.

"Then my children and I will pick up the trash from the bottom of the pond," said the little gold fish. And they did.

Then the little gold fish asked her three friends, "Who will help me recycle all this trash to conserve our beautiful pond?"

"Not I," groaned the beaver.

"Not I," hissed the snake.

"Not I," quacked the duck.

"Then my children and I will recycle the trash," said the little gold fish. And they did.

By and by the little gold fish asked her three friends, "Who will help me write laws about littering in our pond and help to stop the pollution?"

"Not I," groaned the beaver.

"Not I," hissed the snake"

"Not I," quacked the duck.

"Then my children and I will write the laws about littering our pond," said the little gold fish. And they did.

Next the little gold fish asked her friends, "Who will help me make posters and bumper stickers to let the people know about pollution in our pond?"

"Not I," groaned the beaver.

"Not I," hissed the snake.

"Not I," quacked the duck.

"Then my children and I will make posters and bumper stickers to let the people know not to pollute our pond," said the little gold fish. And they did.

Then the little gold fish called to her friends, "Who will swim and play in the beautiful pond?"

"I will," groaned the beaver.

"I will," hissed the snake.

"I will," quacked the duck.

"Oh, no," said the little gold fish. "My children and I will swim in the pond by ourselves." And they did.

PROCEDURE

I. Setting the stage

A. Read the story, The Little Gold Fish, adapted from the classic children's story, "The Little Red Hen," and discuss the lesson to be learned by the animals and what lesson we can learn from the story. If your students are not familiar with the story, "The Little Red Hen," read it first. Then, discuss how the two stories are alike and different (drawing a Venn diagram on the board might be helpful). Guide the discussion to help the students understand the story and relate it to their own lives. Call attention to the events in the story, how lazy friends might act, how the little gold fish might feel doing all the tasks by herself with her children, and how the friends might feel when they are left out in the end. Pose questions of the different actions having children exaggerate body parts to show the action.

II. Activities

A. Narrate the story as a small group of children act it out using student-made props and costumes (guiding the activity as the children dictate the action).

B. Divide students into small groups for the different characters in the story. If there are extra children, have them make up characters or roles for them. The groups will make up their own version of the play along with their own costumes and props. And of course, what the children invent is always right. After the students have had sufficient time to invent their play, have them act it out for the other groups. Compare the different ways the groups did the play.

C. Students may want to polish their plays to perform later for parents or the school. This may be over a couple of days. Emphasize to the students how these plays deliver a message about water pollution.

III. Follow-Up

A. Have the students make up a different version of the play with all the characters helping the little gold fish to clean up the pond, recycle the trash, write the laws, and make the posters and bumper stickers. Ask the students to decide how the play might end if everyone cooperated.

B. Make bumper stickers with a recycle-type message.

IV. Extension

A. Have one group write a new version of the play, The Little Gold Fish, while another group makes the costumes and props, and another group becomes the characters. This could be a complete production with sound effects, a narrator, and a director.

RESOURCES

Barton, Byron, "The Little Red Hen," Harper Collins Publishers, New York, 1993.

Berenstain, Stan and Jan. The Berenstain Bears Don't Pollute Anymore, Random House, Inc., New York, 1991.

MUDPUPPY POND

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the amount and distribution of water on the Earth in fresh water and sea water;

2. Identify, orally or in writing, causes of water pollution;

3. Describe and evaluate, orally or in writing, the effects of different kinds of land use on wetland habitats; and

4. Give an oral or written definition of new terms: habitat, lake, pollution, pond, river, runoff, urban stormwater runoff, and watershed.

BACKGROUND INFORMATION

For years people believed that materials dumped int water supplies would decompose or be diluted to th point that they were virtually harmless. It has been show that unlimited and unmonitored dumping of wastes ca be very harmful to water supplies. The vast quantities c industrial, animal, and human wastes produced must firs be treated, either physically or chemically, before the are allowed to re-enter lakes, streams, rivers, and oceans Bodies of water cannot clean themselves as fast as peopl pollute them—so people must try to keep out pollutant of water.

Frogs are an indicator species because they are amon the first animals to be affected by habitat destructio and environmental pollution. The disappearance of frog from any habitat signals a coming ecological crisis. B recognizing the importance of saving frogs and acting t stop environmental contamination, we can save othe species including ourselves.

SUBJECTS:
Science, Language Arts, Art, Music

TIME:
1 hour preparation time
50 minutes

MATERIALS:
12-14" x 22" poster board
glue
plastic frog
1 gallon jar
tablespoon
cold tap water
36" x 24" cardboard box or refrigerator box
1 heavy duty 33 gallon trash bag
sand
aluminum foil
2-4 index cards
popsicle sticks
7 small paper cups or baby food jars
soil
small rocks or gravel
brown sugar ("fertilizer")
pancake syrup or molasses ("oil")
salt
punched paper dots ("litter")
detergent (no phosphate type)
warm tap water
red food coloring ("sewage")
green food coloring ("toxic waste")
yellow food coloring ("animal waste")
wood ashes from fireplace

Terms

habitat: the place or type of site where a plant or animal naturally or normally lives and grows.

lake: a standing body of water which undergoes thermal stratification and turnover by mixing.

pollution: an unwanted change in air, water, or soil (usually through the introduction of pollutants or contaminants) that can affect the health and survival of humans and other organisms.

pond: a still body of water smaller than a lake where mixing of nutrients and water occurs primarily through the action of wind (as opposed to turnover).

river: a large body of flowing water that receives water from other streams and/or rivers.

runoff: water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a waterbody; may pick up and carry a variety of pollutants.

urban stormwater runoff: road salt, soil, lawn and garden chemicals, and pet wastes travel via streets and storm drains to nearby rivers, lakes, and ponds.

watershed: land area from which water drains to a particular surface waterbody.

ADVANCE PREPARATION

A. To set up Verde Frog's habitat, cut sides of cardboard box leaving a depth of 8 inches. Slit the heavy duty garbage bag down one side and across the bottom. Line the cardboard box with the plastic bag. Place about 4-5 inches of sand in box forming a watershed area, river, creek, and pond. Line the waterways with aluminum foil to hold water in these areas.

B. Place a plastic frog in pond.

C. Number the baby food jars 1-9. Place soil in jar 1. Label it No. 1 - SOIL. Put 1/4 to 1/2 cup of water and 4-5 drops of yellow food coloring in jar 2. Label it No. 2 - ANIMAL WASTE. Put 1/4 cup brown sugar in jar 3. Label it No. 3 - FERTILIZER AND PESTICIDES. Put 1/4 cup molasses or syrup in jar 4. Label it No. 4 - OIL. Place paper punched dots in jar 5. Label it No. 5 - TRASH. Put 1/4 cup salt in jar 6. Label it No. 6 - SALT. Put 1/2 cup of warm water and a squirt of dishwashing detergent into jar 7. Label it No. 7 - FACTORY WASTE. Set out red and green food coloring. Label the red "sewage" and the green "toxic waste". Put 1/4 to 1/2 cup ashes in jar 8. Label it No. 8 - ASHES. Fill jar 9 with small rocks and cover with vinegar. Label it No. 9 - ROCKS.

D. Make big book from suggested pages in activity.

E. Make student copies of Verde (Spanish for green) Frog student activity page.

PROCEDURE

I. Setting the stage

A. If all of the Earth's water fit in a gallon jug, available fresh water would equal just over a tablespoon. About 97 percent of the planet's water is seawater; another two percent is locked in icecaps and glaciers. Vast reserves of fresh water underlie the Earth's surface, but much of it is too deep to tap economically. Help students understand the notion by modeling the gallon jug of water and a tablespoon of water.

B. Tell the students that water pollution has become one of the most serious environmental problems facing the United States as well as countries around the world. Industry, government, cities, and towns have spent billions of dollars on research and treatment plants to try to reduce water pollution. Three chief sources of water pollution are: industrial (factory) wastes, municipal (city), wastes (sewage), and agricultural (farm) chemicals and wastes. Oil spills are another source of pollution. This activity will help students realize how water is polluted and the effects of pollution on animals.

II. Activities

A. Ask students to identify pollution and ways in which water becomes polluted. Use a semantic map or word web to organize the students' ideas.

B. Make word labels - watershed, pond, creek, frog habitat - using index cards and popsicle sticks. Ponds and freshwater wetlands are known as standing water habitats. Many species of animals live in these areas of freshwater. Habitats are areas where animals find food, water, and shelter necessary for their daily living and reproduction. Ponds and wetlands are some of the best places for frogs and amphibians to live. Place labels at appropriate places in the box of sand.

C. Invite the students to see what happened to Verde Frog's habitat as pollution begins to invade Mudpuppy Pond. Pass out the activity jars, food coloring, and Verde Frog student activity page.

D. Read the big book story, <u>The Disappearance of Mudpuppy Pond</u> - a story about the destruction of Verde Frog's habitat at Mudpuppy Pond. Pause after each page for students to add "pollution" to the frog's habitat. Every student should write down a different describing word each time they are asked the question, "How does Verde Frog feel?"

E. After the "pollution" has been added to the habitat, discuss the appearance of the frog and his habitat. Record the describing words on a master list.

III. Follow-Up

A. Go back to the semantic map organizer and with a different color marker, identify more ways water can be polluted.

B. Follow-up this activity with "The Big Clean-Up."

IV. Extensions

A. Divide the class into up to 11 groups. Write a class comic strip about Verde Frog's predicament. Assign a different pollution activity to each group. As groups place their pages on the wall, have students sequence the stages of polluting Mudpuppy Pond.

B. After the discussion, have the students form a circle (symbolic of the water cycle), and sing the following song about Verde Frog.

SONG
Sing to the tune of "Froggie Went a-Courtin".

Froggie was a floatin' in Mudpuppy Pond, uh-huh, uh-huh.
Froggie was a floatin' in Mudpuppy Pond, uh-huh, uh-huh.
His long sticky tongue helped him catch his prey;
Slurping his worm and a croakin' all day, un-huh, uh-huh.

Pollution threatened to end his life, uh-huh, uh-huh.
Pollution threatened to end his life, uh-huh, uh-huh.
Contaminatin' all his food;
And destroyin' his home, oh how rude! Uh-huh, uh-huh.

Soon Froggie wasn't feeling very well, uh-huh, uh-huh.
Soon Froggie wasn't feeling very well, uh-huh, uh-huh.
Eroded soil filled his pond;
He lost his home since the water's gone, uh-huh, uh-huh.

Be careful not to pollute the water, uh-huh, uh-huh.
Be careful not to pollute the water, uh-huh, uh-huh
Help our world and dispose your waste;
Put it in its proper place, uh-huh, uh-huh.

RESOURCES

Lind, Karen K. Water, Stones, and Fossil Bones, Council for Elementary Science International and National Science Teachers Association, Washington, D.C., 1991.

Polluted, United States Environmental Protection Agency, Office of Water, Washington, D.C.

Ranger Rick's Nature Scope. Let's Hear It For Herps! National Wildlife Federation, Washington, D.C., pp. 19-35, 1987.

Water-The Power, Promise, and Turmoil of North American's Fresh Water. National Geographic Special Edition (1993), Vol. 184, No. 5.

Poster - Water-Precious Resource can be obtained from the National Geographic Society, 1745 Seventeenth Street, NW, Washington, DC, 20013-7138. Poster includes a map of the United States and surface water, groundwater, sources of water pollution, hazards of irrigation maps, and facts about water use.

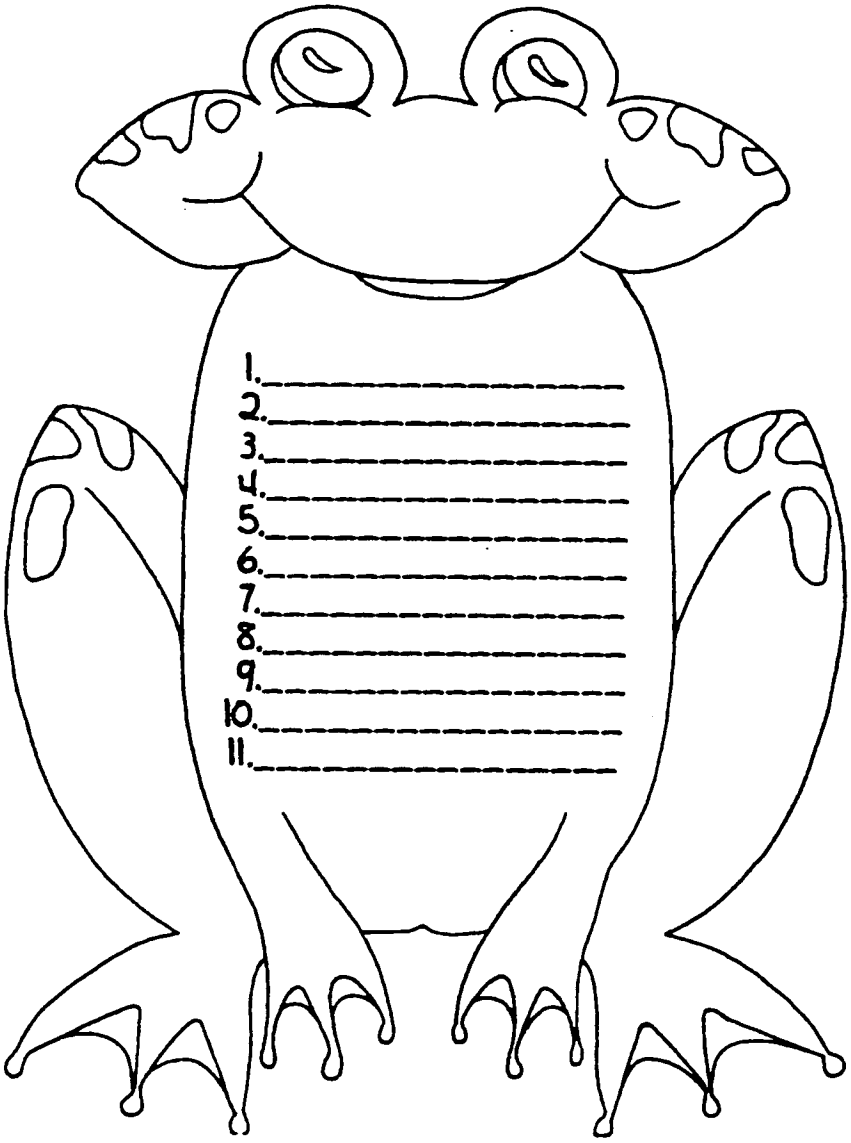
Poster - Water Quality and others can be obtained from the U.S. Geological Survey by writing to the following address:

U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO 80225. In your letter, please identify the poster title and grade level.

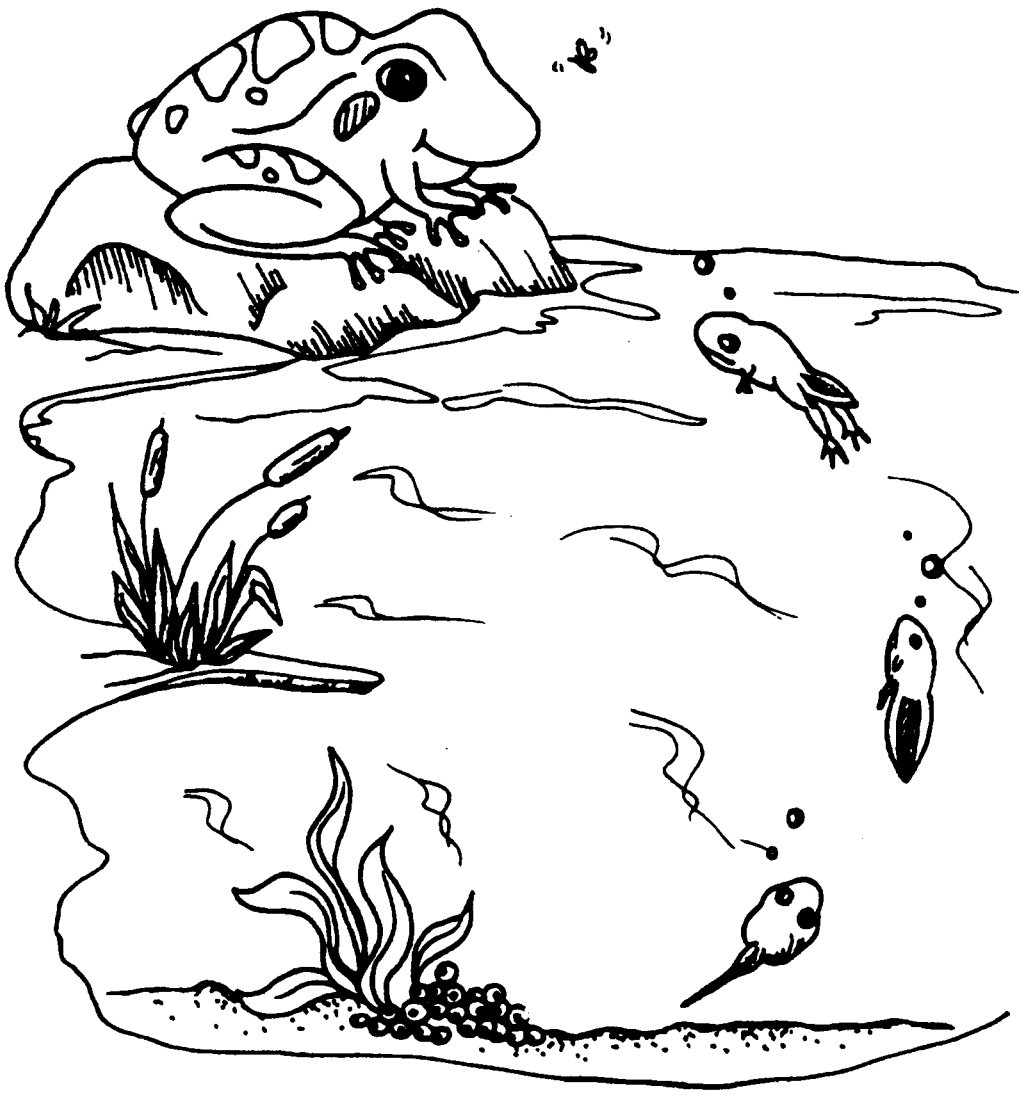
Videos - National Geographic Programs and Products
Great Lakes, Fragile Seas, general, 59 min., 1991.

Water: A Precious Resource, general, 23 min., 1980.

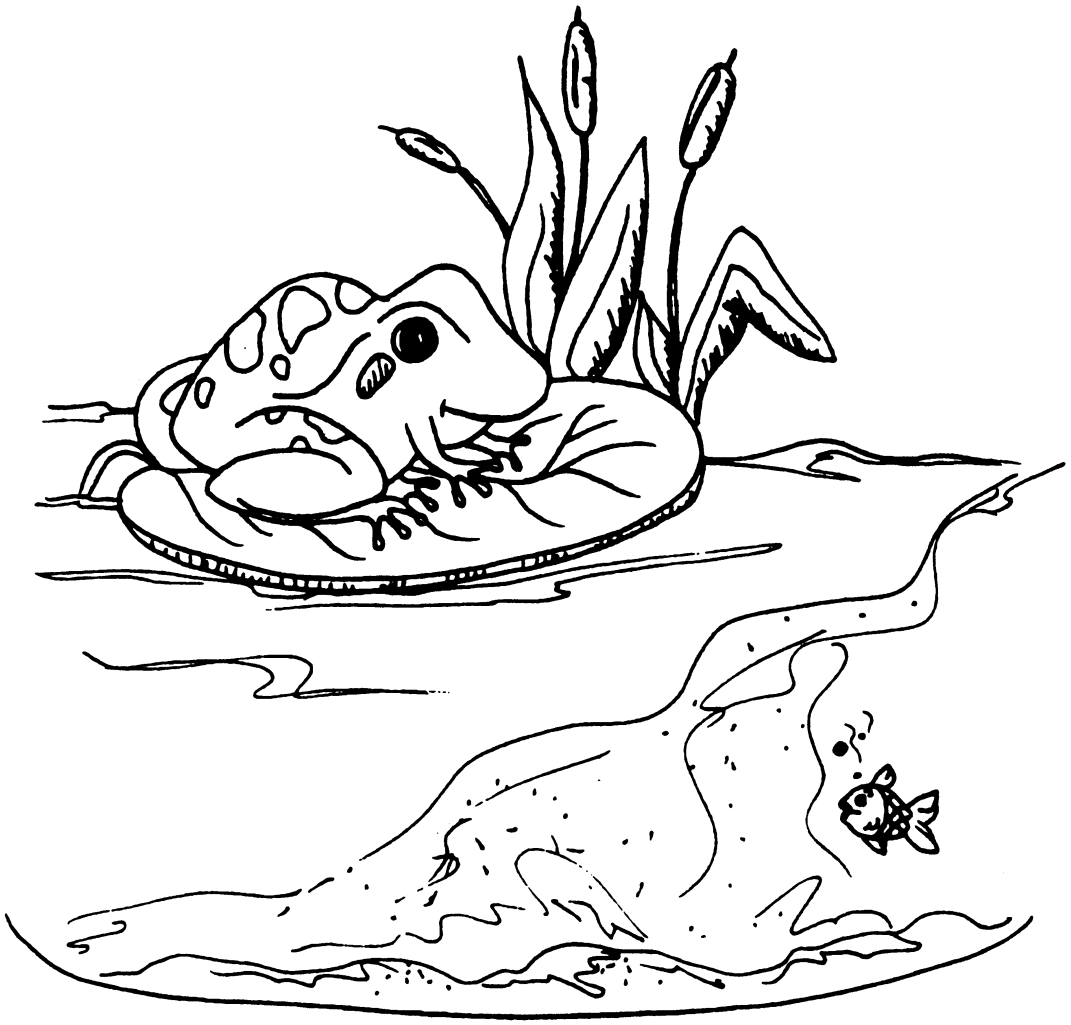
HOW IS VERDE FROG?



Directions: Write down a different describing word each time you are asked the question, " How does Verde Frog feel? "



In the spring, Verde Frog began his life at Mudpuppy Pond. Like all amphibians, he went through several changes or metamorphoses before he became a frog. The unpolluted waters of Mudpuppy Pond helped him grow from an egg, to a tadpole, and finally to an adult frog. Verde loved to hop and swim in Mudpuppy Pond. Slurping bugs and worms with his long sticky tongue was the best part of the day. Life was good. Until . . .



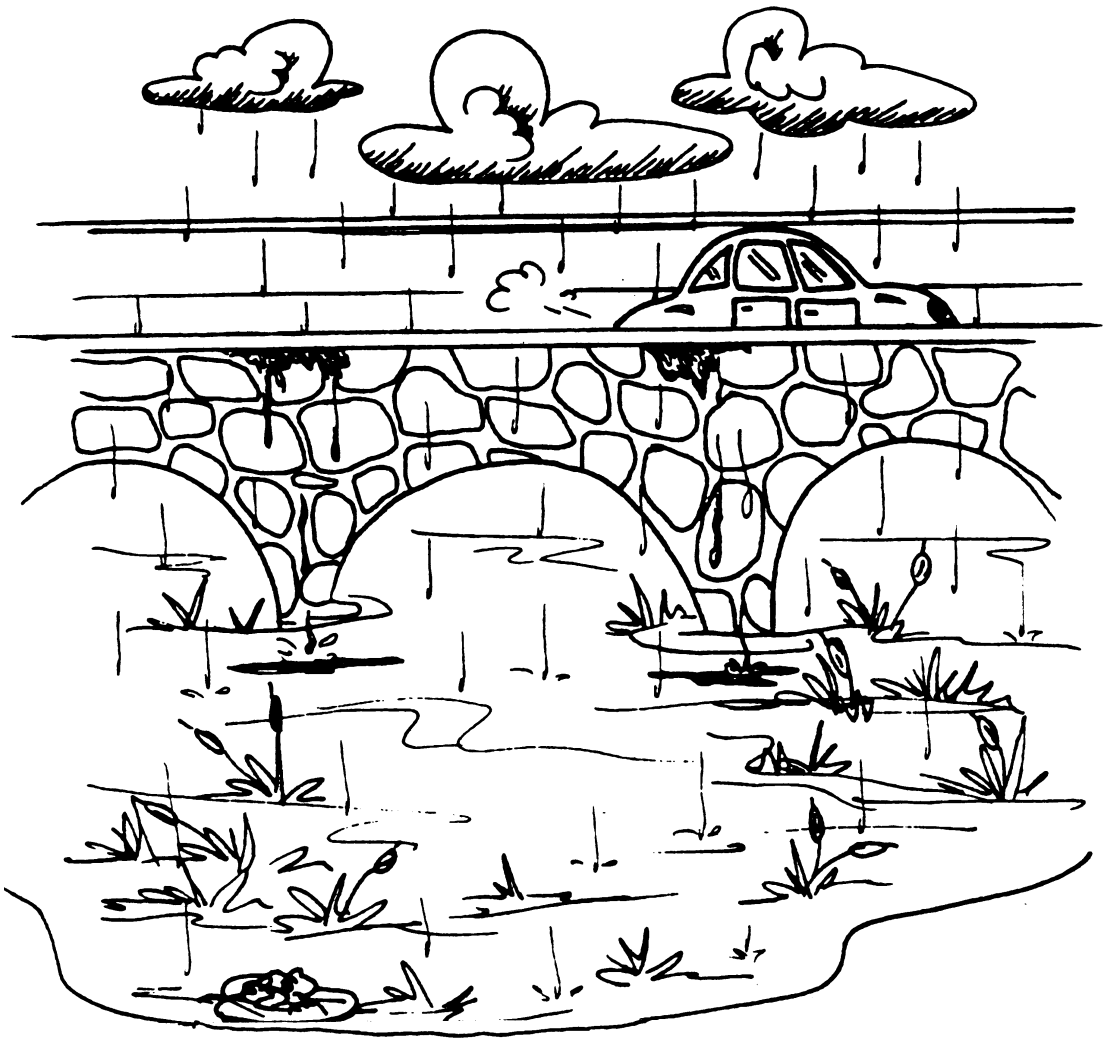
People became careless. They did not think about all the species of animals that lived in Mudpuppy Pond and the creek upstream from it. Water, the most abundant liquid on the earth, provides a variety of valuable habitats or homes for wildlife. Verde's habitat began to change.

Mr. Farmer freshly plowed his field near the creek. It begins to rain and some soil erodes into the creek near Mudpuppy Pond. Large amounts of sediment are beginning to fill in the creek and pond. (Pour contents of jar 1 into the creek near Mudpuppy Pond.) How does Verde frog feel?

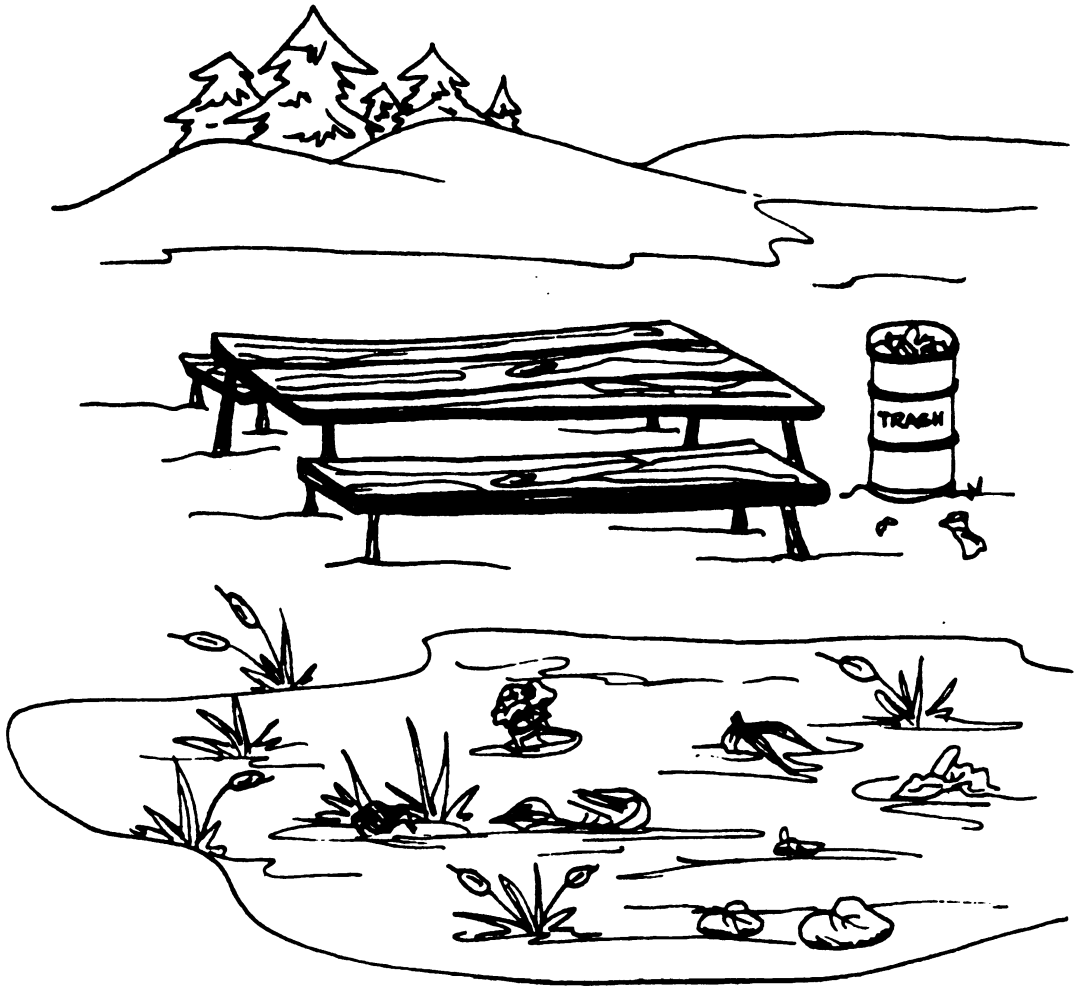
3

The cows are grazing on the green grass next to the creek. Sometimes they wade out into the creek to get a drink of water or to cool off on a hot summer day. The animal waste washes into the pond. (Pour the contents of jar 2 into Mudpuppy Pond.) How does Verde Frog feel?

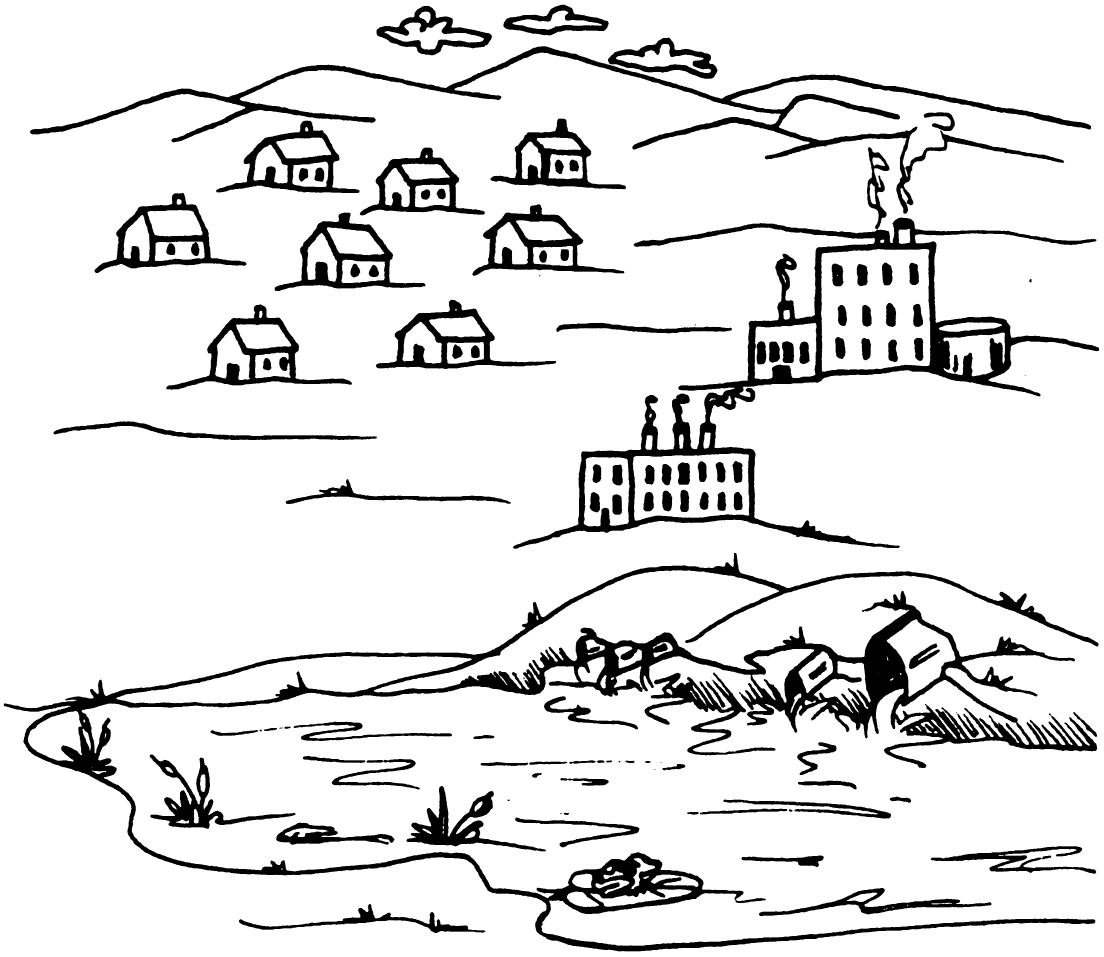
Many houses are built near the pond. Fertilizer and pesticides used on the lawns and gardens wash into the pond after a heavy thunderstorm. The fertilizer makes the plants in the pond grow very fast and thick. Mudpuppy Pond can't support all those plants. They begin to die and are starting to rot. Their decomposition (rotting) is using up some of the oxygen Verde's food sources need to live. (Pour contents of jar 3 into Mudpuppy Pond.) How does Verde Frog feel?



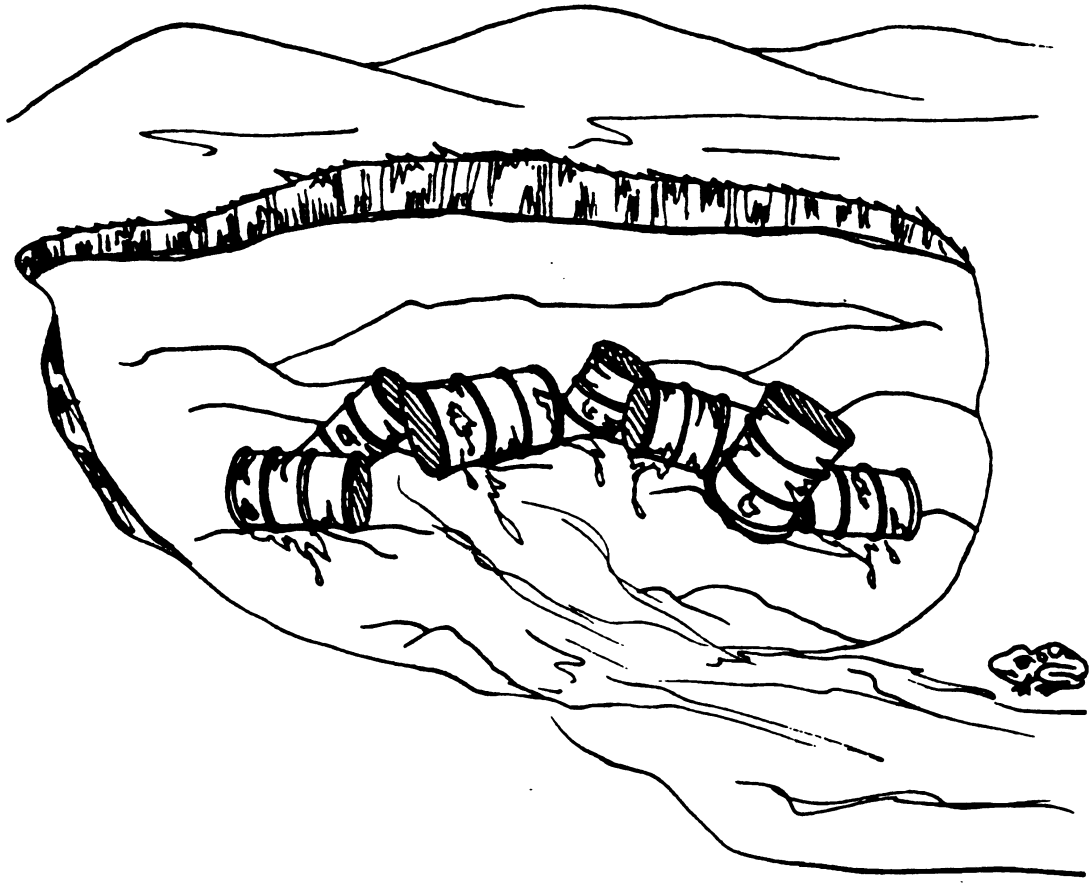
A beautiful park was built on the other side of the creek near Mudpuppy Pond. A bridge was built over the creek so people could travel back and forth. Some cars traveling across the bridge are leaking oil. The rain is washing the oil into the creek. (Pour contents of jar 4 into the creek.) How does Verde Frog feel?



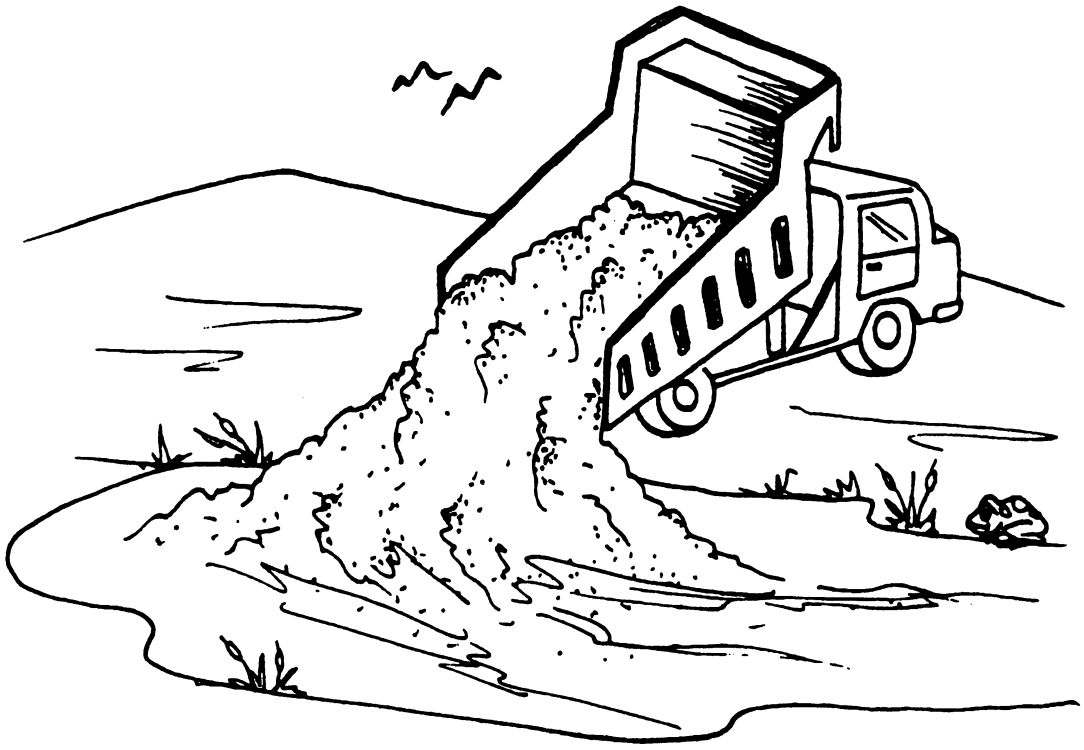
People visit the park often. They play games and picnic near the water. Some people don't throw their trash into the garbage cans provided by the Parks and Recreation Department. The wind is blowing paper into the creek and pond. (Pour the contents of jar 5 into the pond and creek.) How does Verde Frog feel?



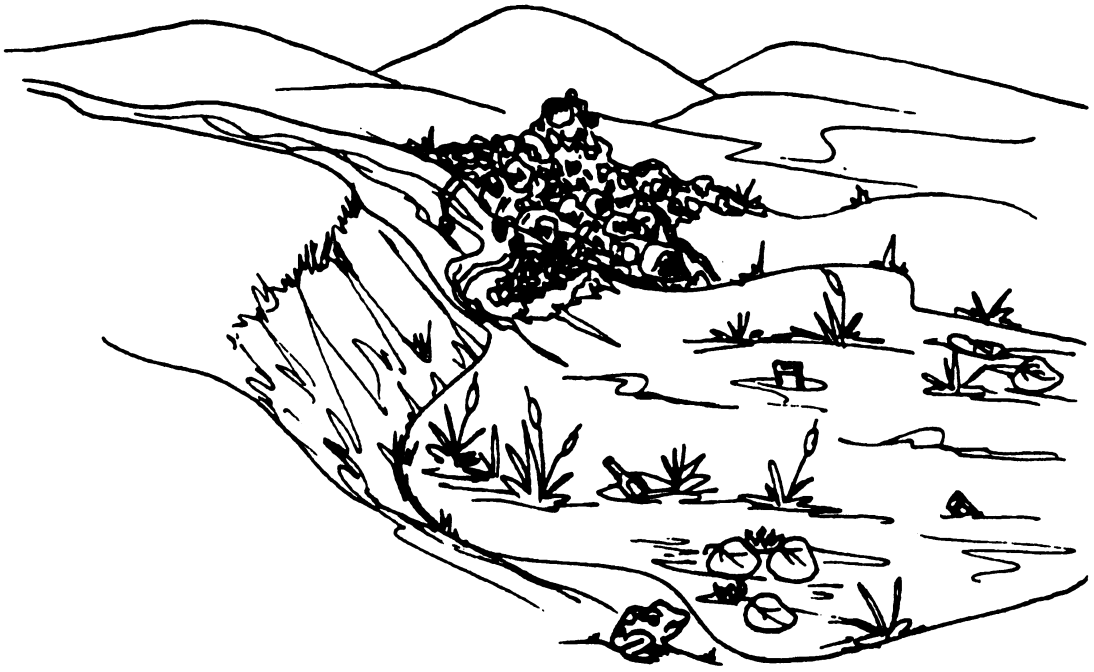
The town began to grow and several factories were built near the creek upstream from Mudpuppy Pond. Although laws limit the amount of pollution the factories are allowed to dump into the water, the factory owners don't always obey the laws. (Pour contents of jar 7 into Mudpuppy Pond.) How does Verde Frog feel?



A hazardous waste landfill was built to store dangerous materials. The town's people knew how important it was to prevent them from getting into surface water and groundwater. Over time, the barrels become rusty and toxic chemicals start leaking onto the ground. The rain washes these chemicals into Mudpuppy Pond. (Squirt one drop of green food coloring into Mudpuppy Pond for every barrel that is leaking.) How does Verde Frog feel?



The growing town needed more electricity than the neighboring town's power plant could supply. The town built a coal-burning power plant close to Mudpuppy Pond. The pollution laws and rules aren't as strict as they should be, so the plant dumps the ashes left from burning coal into the pond. The ashes have a lot of metals in them. Mercury is one of those metals that is harmful to the wildlife living at Mudpuppy Pond. (Pour contents of jar 8 into Mudpuppy Pond.) How does Verde Frog feel?



Local residents discovered a mineral on a hill near Mudpuppy Pond. Mining is started to remove the mineral. The owners dump the rocks removed from the hill near the pond. As the rock pile grows, some of them fall into the pond. The rocks are filling in the place where the creek runs into Mudpuppy Pond. Fresh water cannot flow in. Soon, the water becomes smelly. (Pour contents of jar 9 into the creek where it runs into the pond.) How does Verde Frog feel?

Mudpuppy Pond has changed. People forgot that every living thing has a purpose and exists so that other living things can continue to live. The pollution in the lake has upset the balance in Verde's environment. How can we help Mudpuppy Pond become healthy again?

CERTIFICATE

for
being a
FRIEND
of the
EARTH

Name _____ Date _____

CAN YOUR DAM HOLD WATER?

K-2

OBJECTIVES

At the end of this lesson, the students will be able to do the following:

1. Construct a dam in a milk carton using selected materials;

2. List, orally or in writing, facts about why dams are important; and

3. Give an oral or written definition of dam.

SUBJECTS:
Language Arts, Science, Social Studies

TIME:
20 minutes for a 2-day period

MATERIALS:
32 oz. juice box
pitcher for water
waterproof paint
caulking
utility knife
green sponge
materials for beaver dam
(see Advance Preparation)
materials for dam construction
(see Advance Preparation)
1-pint milk cartons for each student

BACKGROUND INFORMATION

A dam is a barrier across a water source to stop the flow of water. People use dams to store water for irrigation, town or city water supplies, to produce electricity for homes and industries, and for recreational purposes on the lakes and reservoirs created by dams. Dams also control flooding and can regulate the water flow for fish and wildlife in streams below the dams. Just as a beaver builds a dam for special purposes, such as shelter and protection against enemies, human-made dams are also built for special purposes. Unlike the beaver dam, which is made of sticks, stones, and mud, human-made dams are made of many different materials and vary in size according to the water source and need.

There are two main types of human-made dams: masonry dams and embankment dams. A masonry dam is built using concrete, stone, and other human-made materials. An embankment dam is constructed of compacted natural materials such as rocks, gravel, sand, silt, and clay. Some dams are built to support the entire weight of the force of the oncoming water and others are constructed in an arch curved outward toward the flow of the water to transfer the force of the flow to outside walls. To design a dam, builders must collect information about the location and the surrounding area. They must understand the purposes of the dam and reroute the water source while building the dam.

Term

dam: human-made or animal-made barrier across a steam or river that holds and regulates flow of water.

ADVANCE PREPARATION

A. To demonstrate how a dam blocks water and forms a pool or lake, construct a stream using a half gallon juice carton or waxed cardboard box. Cut top and bottom off, then cut the corner of two sides from end to end. Push the two sides down exposing the inside of the milk carton forming a "V" shape in the middle of the other two sides. The end of the milk carton will make an "M" shape. Tape the cut ends to a piece of cardboard 14" x 14". Paint the model with waterproof green paint with a small blue stream in the "V" of the box. Glue small pieces of sponge to represent trees. Raise one end slightly to create a downward motion of the stream.

B. Gather the materials for the beaver dam. Find small twigs, sticks, and rocks. If real mud is not available, use modeling clay moistened with a small amount of water.

C. Collect 1-pint milk cartons and cut the tops and one side off for each of the students for constructing a dam at the open end.

D. Provide a box of materials for building a dam. Put in such things as twigs, sticks, rocks, shells, clay, glue, pipe cleaners, tissue paper, plastic paper, wood pieces, crayons, pencils, buttons, small blocks, small plastic lids, pieces of cloth, tape, yarn, string, etc.

E. Have pictures available of different types of dams both human-made and beaver made. Have books about dams and beavers available for the students.

PROCEDURE

I. Setting the stage

A. Read the story, "A Beaver's Dam Home." While reading the story, use twigs, small sticks, rocks, and mud to build a dam in the "model stream" (see Advance Preparation) as the beaver does in the story. Pour water to form a small pool. Then, discuss with the students why beavers build a dam.

II. Activities

A. Discuss with the students why dams are important to people. List students' suggestions on the board or chart paper. Then discuss and list other reasons as discussed in the "Background Information." Discuss different kinds of dams made from human-made and natural materials. Ask the students to suggest other materials that the beavers could have used to build their dam.

B. Give each student a milk carton that has been prepared with the top and one side cut off. Instruct students to construct a barrier or dam that will hold water in the milk carton. Supply a few materials in a box and let them discover different things to use from around the room. Have them test their dams until the water will stay in the milk carton for at least five minutes. If their dam does not hold water, let them try again. Students may work on their dams for short periods of time over a couple of days.

III. Follow-Up

A. After the students have had a sufficient amount of time to build their dams, bring the students together to discuss their ideas about building a dam. Have them discuss the problems and successes encountered when building their dams. If time allows, have students modify their dams using the knowledge gained.

IV. Extensions

A. Beside a water table filled with sand (or using a sand box), set a bucket of water on a platform and put a flexible tube from the bucket to the water table. Use the tube as a siphon letting the water run slowly into the table to form a small stream. Have a small group of students construct a dam to make a small lake.

RESOURCES

Kala, Sybille and Klaus, The Beaver Family Book, Neugebauer Press, Austria, 1987.

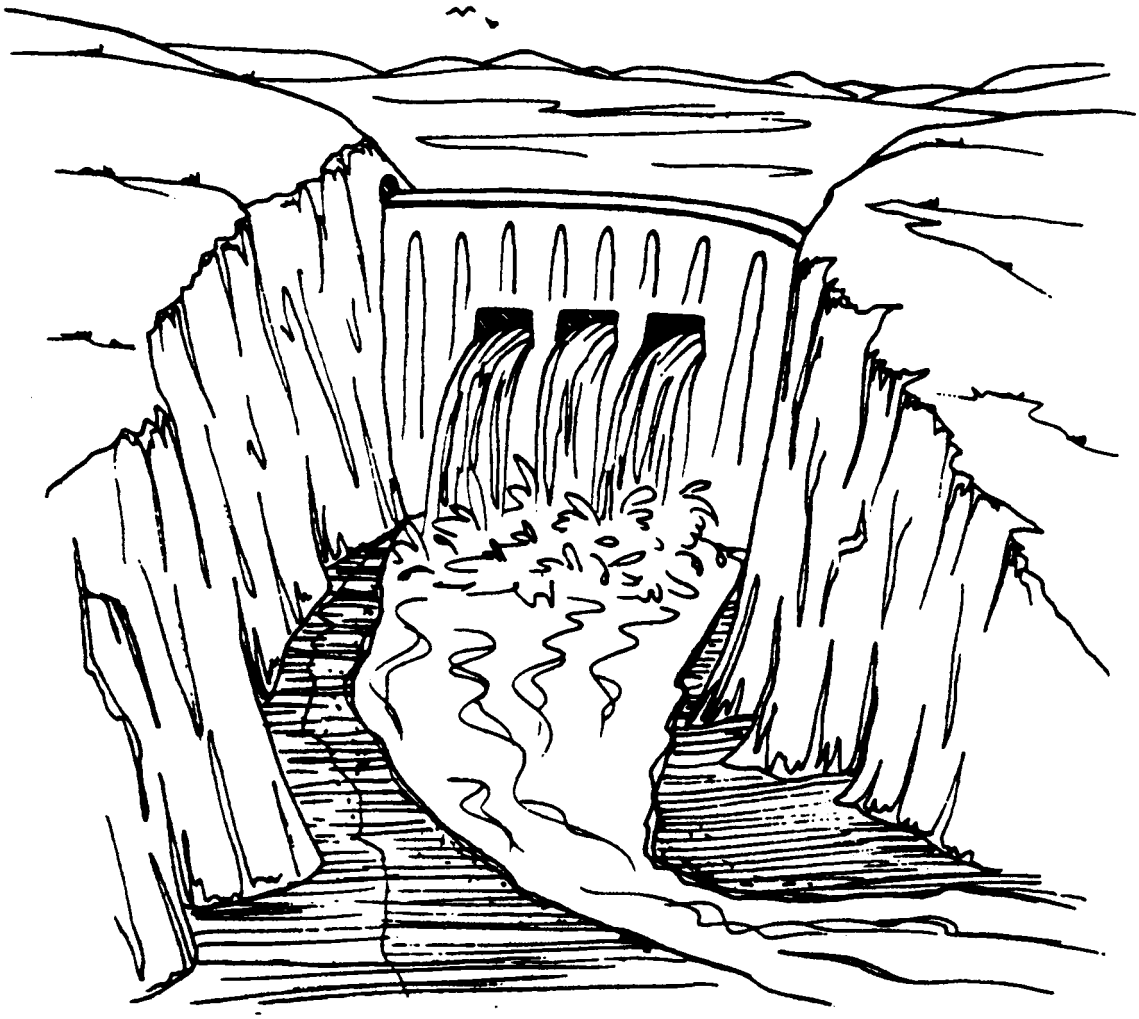
The World Book Encyclopedia, World Book, Inc., Volume D5, 1995.

Stidworthy, John, Ponds and Streams, Eagle Books, Limited, New Jersey, 1990.

A Beaver's Dam Home

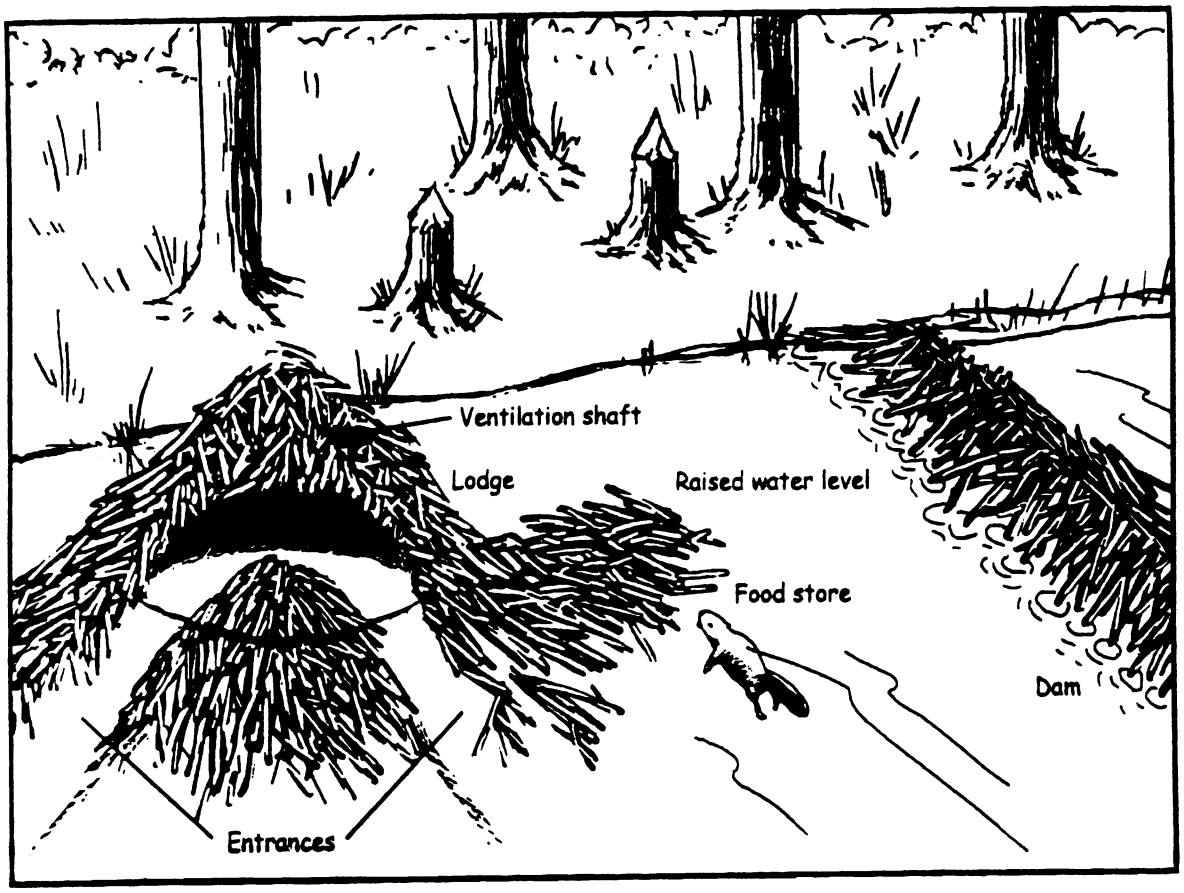
In a small stream where the water gently rippled over pebbles in a beautiful meadow hidden by a lush green forest, two beavers discovered the perfect place to build their new home. They would work very hard to make suitable lodging to raise a family of young beavers called kits or pups. No one had ever taught them how to build a house, but they went right to work gathering twigs and rocks, and cutting down small trees by gnawing with their four, strong, curved, front teeth. After the beavers had gathered all their materials, (begin to build the dam by molding all the materials in a haystack shaped mound to fit the width of the stream) they began to firmly wedge the trees, twigs and rocks plastering them together with mud from the bottom of the stream. They needed to build a strong house to keep out mean wolves, foxes, and bears. The beavers would dive to an underwater passage they had made that led to a comfortable, dry, softly-lined sleeping chamber for their baby kits. As the twigs began to pile up and their home grew bigger and stronger, a small pond began to appear. (Pour water down the stream to form a small pool of water.) The beavers had built a dam. As the dam grew, the pool became bigger and deeper and flooded the nearby meadow making a place where the beavers could swim, play, and exercise. Soon the kits will be squeaking and grunting as they hide in the sleeping chamber. Their home, which is not a dam, was built up gradually through many nights of hard work.

Human-made Dam
Masonry Dam

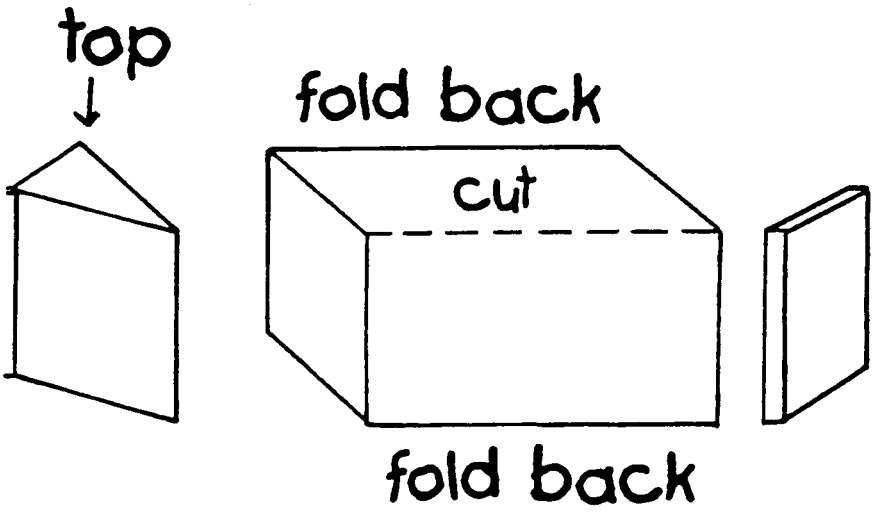


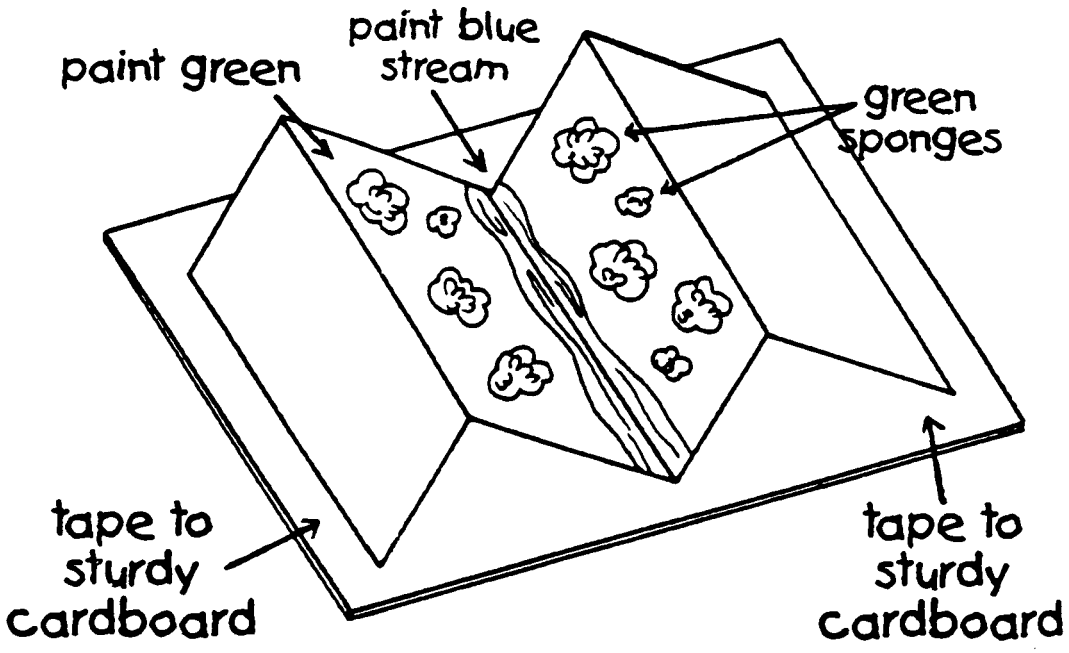
Beaver-Made Dam

Enbankment Dam



Dam


top
fold back
cut
fold back


paint green
paint blue stream
green sponges
tape to sturdy cardboard
tape to sturdy cardboard

WATER WORKS FOR US

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Name, orally or in writing, ways that moving water can do work;

2. Act out ways that water is used to perform work; and

3. Give an oral or written definition of kinetic energy.

SUBJECTS:
Science, Music, Creative Drama

TIME:
20 minutes

MATERIALS:
aluminum pie pan
scissors
pencil
ruler
knitting needle with a flat head
liquid dish detergent bottle
teapot
hot plate

BACKGROUND INFORMATION

Water moving from a higher level to a lower level has energy. The energy of moving water is called kinetic energy. The faster the water moves the more energy it has. Moving water turns water wheels that can run machines. One important use of water is for turning water wheels called turbines. Turbines generate electricity for homes and businesses.

Term

kinetic energy: the energy of a body resulting from it's motion.

ADVANCE PREPARATION

A. Gather materials.

B. Make water wheel - cut the round bottom out of an aluminum pie pan. Make a small hole in the center with a nail. From the center divide the circle into eight equal sections. Mark the sections with a pencil. With scissors cut the pencil lines to about 1/2 inch from the center hole. Bend each section at approximately right angles to the circle to form blades. In the center hole, insert a knitting needle that has a flat head on the end.

C. Make charade cards.

PROCEDURE

I. Setting the stage

A. Explain the background information to the students.

II. Activities

A. Working water

Using water from the faucet or from the liquid dishwashing detergent bottle squeezed with a lot of force, direct a stream of water onto the blades of the water wheel causing it to spin.

B. Working steam (water in the gas form)

Using a teapot with a spout, heat water on a hot plate until steam is coming out rapidly. Hold the aluminum water wheel so that the steam hits the blades causing them to turn.

III. Follow-Up

A. Sing the song, "I've Been Watching Water Work" to the tune, "I've Been Working On the Railroad."

I've Been Watching Water Work
(to the tune of "I've Been Working On the Railroad")

I've been watching water work
All the live long day.
It produces electricity
to make life easier each day.

Don't you like to watch the TV
and run your computer too?

Don't you like to cool your house
and heat it when it's cold?

Water works so much
Water works so much
Water works so much for us for us.

Water works so much
Water works so much
Water works so much for us.

IV. Extension

A. Play charades with ways we use water. Make charade cards with the names of ways to put water to work. Examples: cooking, washing clothes, drying clothes, dish washing, heating, cooling, and as a power source for electrical appliances. Let the children draw a card and act it out for the others to guess.

RESOURCES

Victor, Edward, Science for the Elementary School, Fourth Edition, MacMillan Publishing Company, Inc., New York, pp. 339, 376, 377, 1980.

Walpole, Brenda, 175 Science Experiments to Amuse and Amaze Your Friends, Random House, New York, p. 25.

WATER FUN FOR EVERYONE!

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Pantomime, by drawing or in writing, water recreational activities;

2. List, orally or in writing, five ways water is used for recreation; and

3. Discuss water safety.

SUBJECTS:
Science, Social Studies, Art, Health

TIME:
45 minutes

MATERIALS:
scissors
magazines
paste or glue stick
poster board

BACKGROUND INFORMATION

Water is an essential part of everyday living. Water may be used for fun and enjoyment. Some possible water activities are swimming, boating, jet skiing, water skiing, parasailing, diving, canoeing, sailing, snorkeling, surfing, fishing, and man-made water parks. Safety is essential in all of these activities.

ADVANCE PREPARATION

A. Gather materials.

PROCEDURE

I. Setting the stage

A. Sing "Row, Row, Row Your Boat," "Crawdad Hole," and other songs pertaining to water recreation.

B. Share water activity stories.

II. Activities

A. Game

1. To one of the students the teacher whispers a recreational water activity to act out while the class guesses.

2. When the class names the activity, the teacher writes it on the board.

B. Activity Collages

1. Give each small group of students a poster board and magazines. Instruct them to create a collage of water activities.

III. Follow-Up

A. Give each group the activity page called "Water Safety." Assign each group 3-4 activities. They should create a list of safety rules for their activities.

1. Each group will share his/her report as students choose several safety measures to record on the chart.

B. Ask a Red Cross safety instructor to come in and teach artificial respiration and/or teach water safety. (May consider doing as whole group for young students).

IV. Extensions

A. Arrange "A Day at the Beach" activity day. Play water games and volleyball, and have a picnic lunch.

B. Art Activity - use colored sand for sand painting.

RESOURCE

Official Water Watcher Resource Manual, Southwest Florida Water Management District, 2379 Broad St, Brooksville, Florida, 34609-6899. 352-796-7211.

Water Safety

activity	safety measure
swimming	
diving	
surfing	
snorkeling	
boating	
canoeing	
fishing	
water skiing	
sailing	
jet skiing	
water parks	
parasailing	

DON'T BOAT WITHOUT A FLOAT

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, safe boating practices;
2. Discuss the role of surface water in recreation;
3. Simulate the need for wearing a life jacket; and
4. Give an oral or written definition of "a personal flotation device" (PFD).

SUBJECT:
Science

TIME:
1 hour

MATERIALS:
3 different types of PFDs
1) life jacket
2) throwing device (buoyant cushion)
3) life vest
3 chairs
stopwatch (or watch/clock with a second hand)
The Wreck of the Zephyr by Chris Van Allsburg

BACKGROUND INFORMATION

Boating is a major recreational activity in the United States. Rivers, lakes, streams, and coastal areas are used for boating, jet skiing, canoeing, swimming, and many other water sports. It is important for children to know safety procedures when enjoying our nation's waterways.

Term

PFD: personal flotation device or life jacket.

ADVANCE PREPARATION

A. Collect materials.

PROCEDURE

I. Setting the stage

A. Read the book, Wreck of the Zephyr by Chris Van Allsburg (Houghton, 1983). Discuss/ brainstorm how the wreck occurred and what happened to the passenger(s). Ask: "Were

they wearing a “personal flotation device?” “How did you know?” “How could it have changed the outcome of the story?”

II. Activities

A. Introduce the lesson by stressing the importance of putting on a “personal flotation device” (PFD) BEFORE getting into a boat. The one minute it takes to put it on could save a life!!

B. Line the chairs one behind the other as in a boat. Put a PFD under each chair (that is where most PFDs are kept). Have a student sit in each seat. “Signal” for the boat to start to sink. Have each student spend one minute to find the PFD under the seat and put it on correctly. “Signal” at the end of one minute. See which student(s) were able to save themselves and which student(s) “drowned.” (It usually takes only one minute for a nonswimmer (struggling to stay afloat) to drown.)

III. Follow-Up

A. Brainstorm and list various types of boats.

B. Discuss rules of safe boating. List the rules on a piece of poster board (cut in the shape of a boat) as they are discussed. Review the rules. Role play selected rules.

C. Determine how these rules might be different for different boat types.

D. Provide various materials (polystyrene foam, aluminum foil, popsicle sticks, etc.). Have students construct boats of various types.

E. Conduct boat races. Test each for safety.

IV. Extensions

A. Discuss boat terms: port, starboard, bow, stern, fore, aft.

Practice: Make a large outline of a boat on the floor using yarn or paper. Have a student get into the pretend boat. Let the observing students take turns naming the boat terms. The student in the boat will move into the area of the boat that is named.

B. Provide nautical maps. Plan a short trip by boat and calculate the distance by water. Plan the same trip by land and calculate the distance. Are land miles and nautical miles the same? (Convert if possible.) Compare the two distances. Which is the greater distance?

C. Invite a Red Cross safety instructor to speak to the class.

D. Invite a Coast Guard representative to speak to the class.

RESOURCE

Tennessee Valley Authority, Cedar Creek Learning Center, Knoxville, Tennessee.

GRANDMA'S BOAT RIDE

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Sort items according to "garbage" or "recycle"; and

2. Identify, orally or in writing, at least two items which should not be placed in rivers, streams, lakes, or oceans.

SUBJECTS:
Language, Art, Music

TIME:
30-40 minutes

MATERIALS:
The "Grandma's Boat Ride" story booklet
2 garbage cans
2 cardboard boxes
a variety of garbage items (include some aluminum cans and paper, as well as other types of garbage)

BACKGROUND INFORMATION

Sometimes people throw garbage on the ground or in water. This garbage makes our land and water dirty and sometimes hurts animals and plants that live there. Instead, people should dispose of garbage properly and, whenever possible, recycle items such as glass, aluminum cans, paper, and plastic.

ADVANCE PREPARATION

A. Make copies of "Grandma's Boat Ride" for each student and teacher. Staple pages together so that each person has the complete story.

B. Gather at least as many items of garbage as you have students. (See materials list.)

C. Prepare four labels on sentence strips or construction paper:

garbage — mount each labeled piece of construction paper on the side of an empty garbage can

recycle can (aluminum cans)

recycle box (paper)

recycle box (plastic)

mount each labeled piece of construction paper on the side of an empty cardboard box

PROCEDURE

I. Setting the stage

A. Share the background information.

II. Activities

A. Read “Grandma’s Boat Ride” to the class.

B. Pass out the individual booklets.

C. Read the story again, allowing them to follow along.

D. Have students draw illustrations in their booklets.

III. Follow-Up

A. Place the container of garbage items (collected earlier), the garbage cans and the boxes in front of the class. Let a student select a piece of garbage. Have the class sing this song with the teacher:

(tune, “Mary Had A Little Lamb”)

Garbage should not go in water,
Go in water,
Go in water.
Garbage should not go in water,
It should go in here.

Have the student place the piece of garbage in the correct container (garbage can, recycle (aluminum cans) can, recycle (paper) box, or recycle (plastic) box). Let each student have a turn.

B. Discuss the impact of polluted water on recreational water activities.

IV. Extension

Write the word “Grandma” on the chalkboard. Have the students go through their booklets, page by page, circling the word, “Grandma”. Count how many times the word is in the booklet.

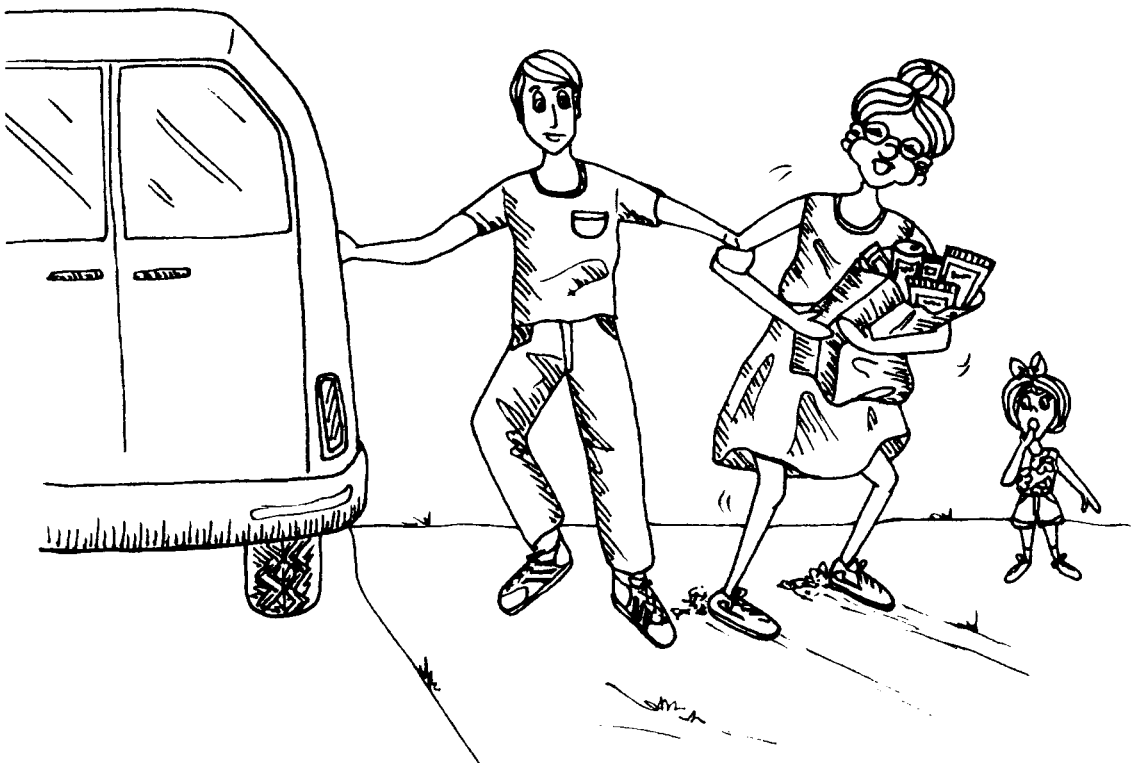
Optional: Repeat the activity with other words.

RESOURCE

Bittinger, Gayle, Learning and Caring About Our World, Warren Publishing House, Inc., Everett, Washington, page 73, 1990.

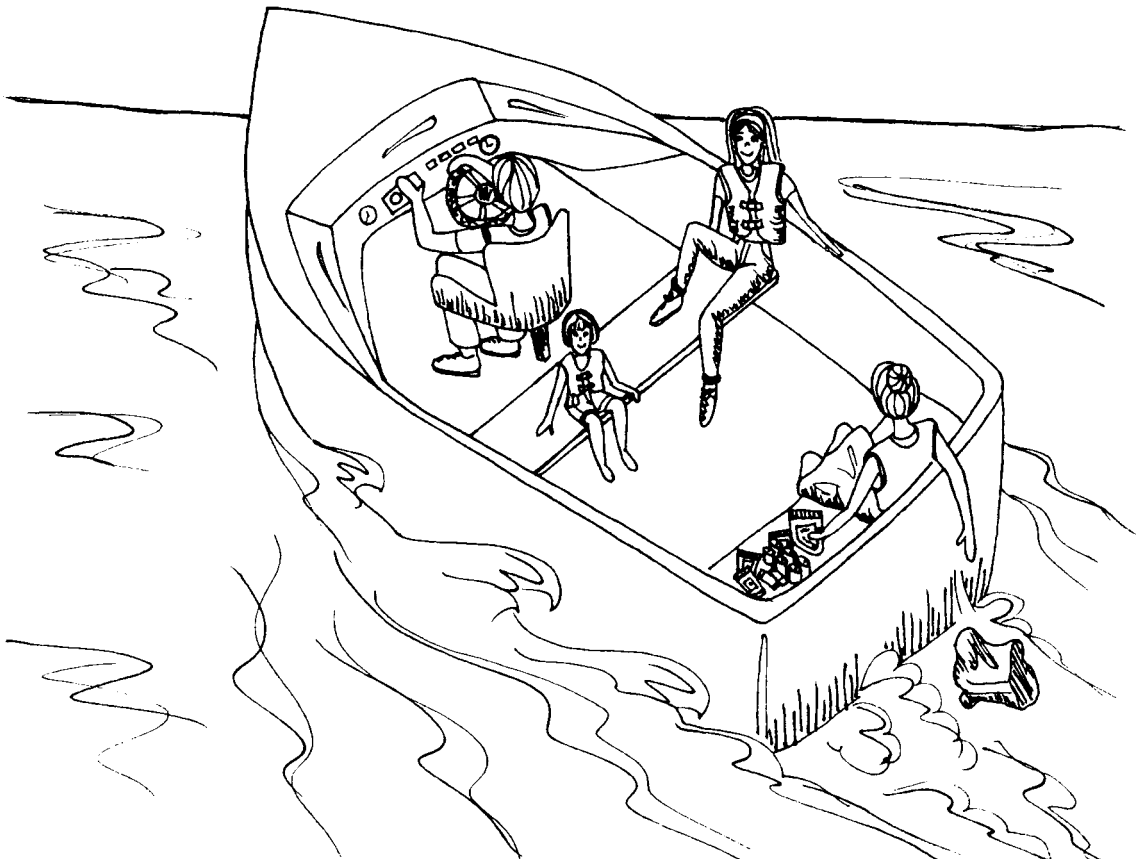
-|-

One day my family went for a boat ride. Grandma said she wouldn't go. But she did.



-2-

When we got into the boat,
Dad told us not to throw
garbage into the water.
Grandma said she wouldn't.
But she did.



-3-

Grandma threw candy wrappers in the water.

-4-

Grandma threw cans in the water.

-5-

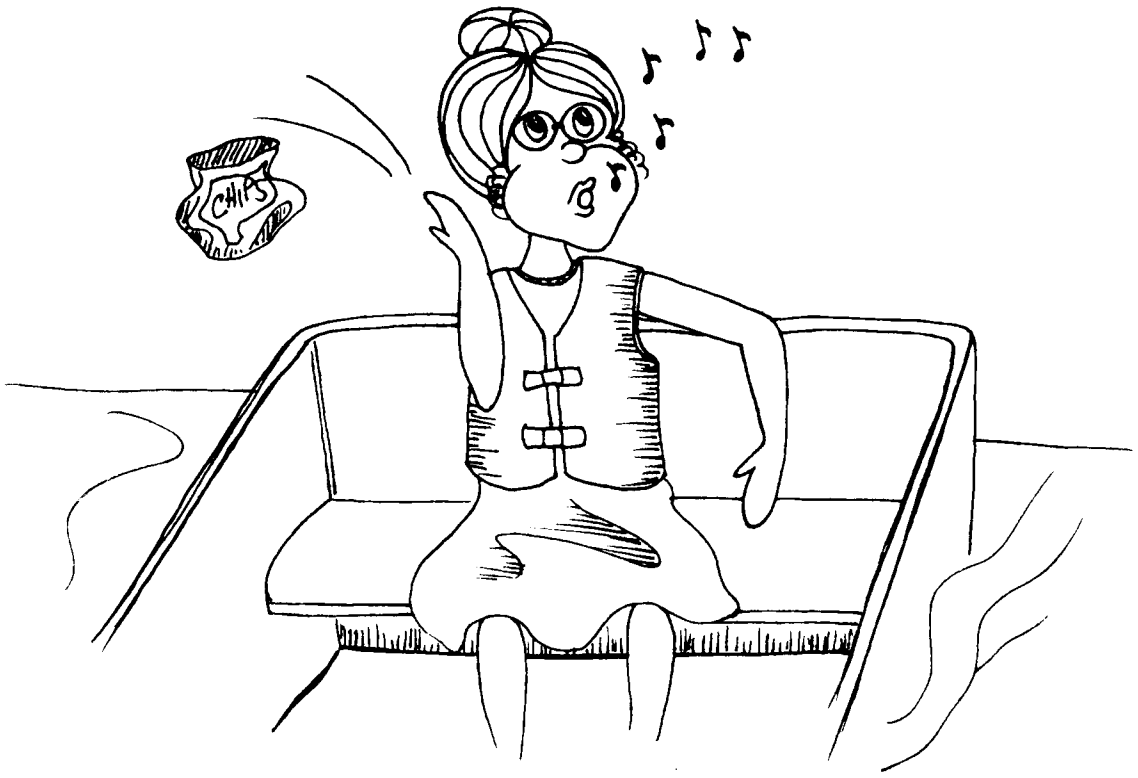
Grandma threw plastic bags in the water.

-6-

Dad told Grandma to stop polluting. He explained that we must take care of our water by helping keep it clean.

-7-

Grandma said she wouldn't throw garbage in the water again. But she did.



-8-

Dad stopped the boat. Grandma said she wouldn't get out. BUT SHE DID!

Original Story
by
Beth Corum

RAIN WATER RUNOFF

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the effects of rainwater runoff;

2. Conduct an experiment on soil erosion and give an oral or written description of the results;

3. Compare and discuss, orally or in writing, the effect of sloping and erosion on soil samples;

4. Give an oral or written definition of the new terms: erosion, nonpoint source pollution, point source pollution, runoff, and sediment.

SUBJECTS:
Science, Language Arts, Math

TIME:
1 hour

MATERIALS:
each group of 3 students will need:
3 1.89 liter (half-gallon) milk cartons
outdoor source of soil
2-liter bottle
metric ruler
plastic bucket (5 gallon ice cream bucket)
water supply
paper towels or cloth hand towel
newspaper
3 large baby food jars
masking tape
Rain, Rain Rivers by Uri Schulevitz

BACKGROUND INFORMATION

Sediment is one of our most destructive water pollutants. America's water is polluted by more than one billion tons of sediment annually. Every year, Americans lose millions of dollars because of sediment pollution.

Sediment is caused by erosion, which is the gradual wearing down and carrying away of the Earth's materials. Soil erosion occurs when soil is moved from one place to another by natural means. Wind blows soil, and moving water washes soil away. Normally, soil erosion occurs slowly over a long period of time because trees and grasses hold the soil in place. Erosion can also occur naturally from forest and prairie fires, hurricanes, or tornadoes which strip the land of its protective vegetation cover. Nonpoint source erosion by people also can cause soil erosion to advance much more quickly that normal by allowing over grazing by farm animals and by digging and building on steep slopes, cutting down trees, and plowing the land for crops. The rapid soil erosion that results from such activities can be very harmful to the environment.

Erosion by water often starts when rain strikes bare soil. Large amounts of rain washing down a sloping area pick up loose soil and carry it away. Harmful pollutants can be washed away with the soil during the runoff event. Substandard agricultural and other land practices often prepare fields and their topsoil to be washed away. Besides making the water less attractive to swim in and drink, the soil kills fish and other organisms living in the water.

Terms

erosion: the wearing away of the Earth's surface by running water, wind, ice, or other geological agents; processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is removed from the Earth's surface.

nonpoint source pollution (NPS): pollution that cannot be traced to a single point because it comes from many individual sources or a widespread area such as urban, rural and agricultural runoff.

point source pollution: pollution that can be traced to a single point source, such as a pipe or culvert (e.g., industrial, wastewater treatment plant, and certain storm water discharges).

runoff: water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a water body; may pick up and carry a variety of pollutants.

sediment: eroded soil material (often suspended in water that consists mainly of particles derived from rocks, soil, and inorganic materials).

ADVANCE PREPARATION

A. Collect a plastic gallon bag of soil for each group. Do not use potting soil.

B. Use scissors to cut out the side panel of a milk carton under the spout, leaving the spout intact.

C. Fill a 2-liter bottle with water. Divide the bottle into thirds by drawing a band around the bottle with a permanent marker and collect supplies on a cardboard tray (box from four 6 pack soft drinks works great) or tub.

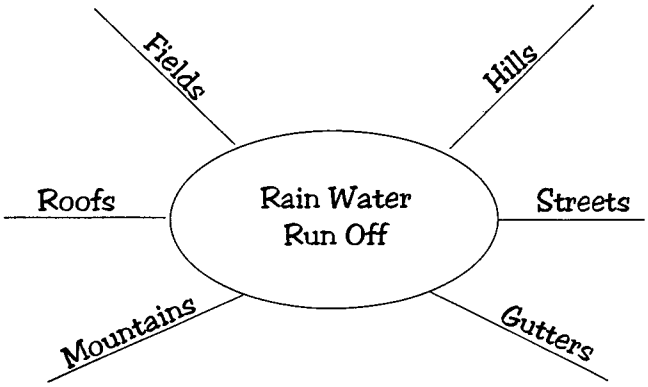
D. Reproduce one copy of student activity pages for each student.

PROCEDURE

I. Setting the stage

A. Read Rain, Rain Rivers by Uri Schulevitz to students.

B. Explain what erosion is and that rain is important to animal and plant life. Much of runoff is uncontaminated. Runoff waters are necessary to renew many wetlands and habitats. However, erosion due to running water can be harmful to our environment. Pollution such as garden insecticides, automobile emissions caked on parking lots, and lead from paints and exhaust, are washed by runoff into surface waters, streams, rivers, lakes, and oceans. Look back through the book for examples of erosion. Silently hold up pictures again and have students write on a group semantic map (a graphic organizer) different types of erosion in the book. Discuss the different types observed and what each type of erosion could be washing away.



II. Activity

A. Ask students to describe what happens when water moves over soil. Does the slope of the land affect the washing away of loose soil? (What does slope mean?)

B. Group students into pairs and have them cover the work area with newspaper.

C. Hand out the record sheet. Show students the tray of materials and describe the procedure.

D. Hand out the trays to each group of students. Also hand students three strips of masking tape to label numbers on baby food jars (1, 2, 3) and place them on the empty jars. Guide students through the experiment.

E. Lay the milk carton on its side, with the cut out panel facing up, then fill the carton half-full with the soil. (Use no more than 1/3 of soil in bag.) Pat the soil to smooth the surface. Place spout side of milk carton on the edge of a desk. Place jar #1 in the middle of the bucket. A student will hold the jar and bucket under spout during the experiment.

F. Ask students to observe the water in the 2-liter bottle and record their description on the record sheet. To simulate rainfall, have one student pour 1/3 of the water from the bottle over soil while another student is catching water from spout in baby food jar #1 in a plastic bucket. The goal is to provide a constant flow of water over a flat surface. When jar is full, remove jar and observe the color of water. Are there any soil particles in water? Set jar aside and record observations.

G. Now repeat steps E and F with another milk carton and a fresh soil sample, but raise the end of the carton to 3 cm. Have students problem solve what to use from the classroom to raise the slope. Place jar #2 in the bucket and hold under spout. Be sure to use the same amount of water as in the first trial. Observe the difference in the flow of the water. When the jar is full, remove it from the bucket and observe the color and amount of soil particles. Set jar aside and record observations.

H. Repeat procedure for a third time, raising the carton to a height of 5 cm. Place jar #3 in the bucket and hold under spout. When the jar is full, remove from bucket. Observe the color of the water and amount of soil particles. Set jar #3 aside and record observations.

I. Allow each jar at least ten minutes for soil particles to settle. Ask students to observe jars. (Remind students to not move the jars when measuring). Then measure and record the amount of soil particles in the bottoms of the jars. Tell students that when soil particles settle from water it is called sediment. Have students write a definition for erosion and sediment at the bottom of the record sheet. When the slope of the carton was increased, what happened to the amount of soil particles?

J. To clean up, collect cardboard trays and supplies. Have students take milk cartons outside and dump the soil in flower beds around school. Collect milk cartons in garbage bag. You may possibly be able to rinse, dry, and store for use again. Use the overflow water in the buckets to water plants around the school.

III. Follow-Up

A. Have the students demonstrate their knowledge of soil erosion by performing the following task.

1. Explain how water gets muddy. (The runoff of rain water over soil.)

2. Define sediment. (Tiny bits of rocks, soil, and other materials carried into water.)

3. Define erosion. (The removal or wearing away of soil or rock by water.)

4. How can erosion be both harmful and helpful? (Erosion can be harmful when it removes soil from the land or destroys property along a riverbank. It can also be harmful when the runoff picks up harmful pollutants and deposits them in our surface water. It can be helpful when the soil is dropped somewhere else, building up new land.)

5. Have students complete "What Causes Erosion?" activity page.

IV. Extensions

A. Conduct a tour around the schoolyard to look for signs of erosion. In an urban setting, look for such things as cracked and pitted sidewalks, rounded pebbles used for decorative stone, and rivulets carved in dirt by water flowing along street gutters or down slopes on the schoolyard.

1. Construct a chart with names of areas of erosion. Brainstorm possible solutions.

2. Write a letter to the principal explaining what you have been studying, along with the areas noted on your tour and possible solutions. Ask permission to enlist help from parents and the community to correct problem areas.

3. Set up a work session with students and parents to follow through with solutions designed by the class.

RESOURCES

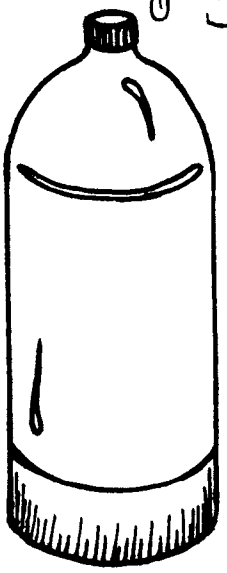
Butzow, Carol M. and Butzow, John, W., Science Through Children's Literature, p. 150-157, Teacher Ideas Press, Englewood, CO, 1989.

Lind, Karen K, Water, Stones, and Fossil Bones, p. 50-51, National Science Teachers Association, Washington, D.C., 1991.

Shulevitz, Uri, Rain, Rain Rivers, Farrar, Straus and Girous, New York, 1969.

Soils, Science and Technology for Children, p. 53-58, National Academy of Science, Washington, D.C., 1994.

RAIN WATER RUNOFF



scientist name

1. Describe water in bottle.

color	solid particles

2. Hypothesis:
After the rain shower I think the water will

Experiment

3. JAR 1 4. JAR 2 5. JAR 3



color

soil pieces

cm cm cm

6. erosion-

7. sediment-

What Causes Erosion

List the things in this picture that could cause erosion:

Name: _____ Date: _____