A-HIKING WE WILL GO: Identifying Point and Nonpoint Sources

OBJECTIVES

The students will do the following:

1. Identify examples of point source pollution
2. Describe examples of nonpoint source pollution
3. Classify water pollution as either point source pollution or nonpoint source pollution

SUBJECTS: Science, Language Arts, Social Studies, Art

TIME: 1-2 class periods

MATERIALS:
water-based markers
spray bottle of water
picture cards (included)
word cards (included)
card stock
glue stick
masking tape
access to copier that enlarges (optional)
nonpoint source pollution picture for each student (optional
crayons or felt markers (optional)
access to lamination equipment (optional)

BACKGROUND INFORMATION

Water can become polluted in many ways. Water pollution results when people add things to water that makes the water unsuitable for use by humans and other organisms in nature. There are two main ways water can become polluted. The first way is when pollutants are put directly into water and you can go to one place and see it happening. This is called "point source." Point sources are fairly easy to find and control. For example, factories and wastewater treatment plants have pipes that pour wastewater directly into rivers, streams and lakes. Today, laws exist to make sure the wastewater is cleaned or "treated" before it enters a river, stream, or lake. Point sources can be easily inspected.

The second way water can become polluted is by nonpoint source pollutants. Nonpoint pollutants get washed off of land (runoff) or out of the air when it rains or snows. It is very difficult to determine exactly where these pollutants come from because you cannot go to one single spot and see it happening. That is why it is called "non" or "no" point pollution. In most cases, nonpoint source pollution results from the improper use of land. Any time we drop something on the ground or pour something into a storm drain, it can end up in our water. (NOTE: When runoff ends up at a wastewater treatment plant, it becomes a point source even though it originated as a nonpoint source.) These pollutants can change water and make it unfit for us to use. Preventing nonpoint source pollution is difficult because it is hard to determine where the pollutants are coming from.

Part of the difficulty in addressing nonpoint source pollution is the "everydayness" of the issue. We are so used to seeing the many land use activities that cause nonpoint source pollution, we never stop to consider them as causes of environmental pollution. For example, the runoff following a storm from a large urban area may contribute more pollutants to nearby waterways in a 24-hour period than any factory. Suburban shopping malls are convenient, but acres of

pavement provide no place for rain to slowly filter through the soil. Cattle wading in a creek at first glance look like part of any rural scene, but a closer look may reveal trampled streambanks and muddy water. The list could go on and on. These land use activities contribute sediment, excess nutrients, bacteria, and toxic chemicals to water bodies and reduce water quality. Unlike point source water pollution, pollutants from these activities come from a widespread area and cannot be traced to a single point or source such as a discharge pipe. Nonpoint source pollution can sometimes be traced to a single farm, mining operation, or town. However, it is generally difficult to control these pollutants at a single point. This is what makes water pollutants nonpoint.

It is often the cumulative effects of many land use activities in an area that seriously degrade water quality. A variety of land uses are necessary to survive as a society. However, pollution can be minimized by changing the way these land uses are carried out. For example, soil erosion can be minimized by using mulch and other groundcovers to protect disturbed soil. In some cases though, a land use change may be necessary to prevent pollution. For example, it is better to plant row crops following natural land contours.

ADVANCED PREPARATION

A. Enlarge pictures and mount on card stock with glue stick. (NOTE: You may want to make one set for each student. Or you may want to make one set, have several students color the pictures, and then laminate the set for future use.)

B. Make two copies of the "Word Cards" sheet (included). Mount on card stock and cut out.

C. Make one copy of the "Nonpoint Source Pollution" student sheet per student (optional).

PROCEDURE

I. Setting the Stage

A. Review with the students that water pollution is anything that is added to water by humans or human activities that makes the water unsuitable for a particular use. For example, when a lot of litter, mud and other debris washes off land into a favorite swimming hole, the water is no longer suitable to swim in, so it is polluted

B. There are two main types of water pollution—point source pollution and nonpoint source pollution.

1. With point source pollution, the direct source and types of the pollutants are known, and entry of the pollutants into the water can be observed. Ask students where they think wastes go when they take a bath or flush a toilet. Explain that it goes down the drain into pipes underground where it is taken to a wastewater treatment plant (or septic system). (NOTE: Septic systems are

considered nonpoint sources when they fail because it is difficult to trace the problem back to the sources.) Explain that at a wastewater treatment plant, the wastewater is treated and released through a pipe. An increase in pollutants in the river can be traced back to this pipe or "point."

2. In nonpoint source pollution, the source and types of pollutants are not from a specific point, but come from a broad area. Their entry into the water cannot be easily observed and it is difficult to tell what type of pollution it is without some tests. Nonpoint source pollution can sometimes be traced to a single farm, mining operation, or town. However, it is generally difficult to control these pollutants at a single point. These types of water pollutants are called nonpoint.

3. The release of pollutants from point source pollution can be seen when pollutants are released from a pipe into the water.

4. Nonpoint source pollution comes from a widespread area such as a surface mine, farm field, or parking lot. For example, in residential areas rainwater washes off houses, trees, grass, and streets, then runs down the curb carrying debris with it as it runs into the streams and rivers.

II. Activity

A. Read the following story. (NOTE: For younger students, you may want to shorten the story. To shorten the story, read only the portions marked by "*".)

*Jamie's family went camping at Big Pine State Park. Jamie told the family of a class assignment to look for signs of water pollution. Jamie's family agreed to help look.

*Saturday morning, Jamie went fishing. At the boat ramp, a man was spilling some gas on the ground as he filled the tank on his boat. (Hold up or point to Picture card 1.)

*Out on the lake, several aluminum cans, styrofoam cups, and plastic containers were floating on the water. (Picture card 2.)

*Later that day, Jamie's family went to the beach.

Jamie saw some people spray insect repellent on their bodies. Later Jamie saw these people swimming. (Picture card 3.)

Jamie's little brother saw some people who did not clean up after their dogs. (Picture card 4.)

Back at camp, Jamie's mother noticed old hamburgers, broken potato chips, apple cores, and litter on the ground in the camp next to theirs. (Picture card 5).

The next morning, they packed up to leave. As they left the parking lot, they saw oily spots on the pavement where the cars had leaked oil. (Picture card 6.)

*As they drove away, they noticed a pipe pouring dirty water into the river. Jamie was sad that the family had found so many examples of water pollution. (Picture card 7.)

B. Discuss the story.

1. Review the definitions of point source and nonpoint source pollution.

2. Discuss each example of water pollution that Jamie's family observed.

3. OPTIONAL: Have the students draw pictures of what was going on in the story or have them color the picture cards included. Use these for the activity instead of the black and white versions included.

4. Help the students decide which type of water pollution occurred in each situation by taping the picture cards of the story (included) onto the blackboard. One by one, have the students identify each picture either as point source or nonpoint source pollution, and then tape the appropriate word card (point source or nonpoint source) under each picture.

5. Review the answers. Point to the areas of the pictures where the pollution is occurring. (See "Jamie's Hike" student handout.)

   Gasoline being accidentally spilled on the ground as man walks to his boat – nonpoint

   Cans, cups, and plastic containers in lake – nonpoint

   Insect repellent being sprayed on and later washed off in the lake – nonpoint

   Dog doing his/her business on beach – nonpoint

   Discarded food and litter on ground – nonpoint

   Oil on parking lot (not near a city sewer) – nonpoint

   Dirty water pouring out of pipe into river – point

III. Follow-Up

A. If the students drew or colored their own set of pictures, have them combine them into a story book and draw a cover for the book. You may want to have older students write statements below each picture indicating what was polluting the water and how it can be prevented.

B. If the students have not colored the pictures, have them use water-based markers to outline them. When finished, take turns spraying water on the paper over a sink or dishpan. The water that drips off is like the pollutants that wash away in nonpoint source pollution. When the colors mix together, it is difficult to distinguish where they began, just as with nonpoint source pollutants found in water bodies.

C. Pass out "Jamie's Hike" student sheet and have the students draw lines from the words to the pictures. (NOTE: For younger students, you may want to have them cut the pictures out and categorize them.)

IV. Extension

A. Conduct a walk around the school grounds. Later have the students draw pictures of pollution they saw on their walk and write a brief story. Have them draw pictures or write solutions to the pollution problems they saw on the hike in their story.

B. Give each student a copy of the coloring picture "Nonpoint Source Pollution." (NOTE: Point out that in every case pollution is possible but does not always happen. Misuse is the problem. Most pollution can be prevented or controlled if land use activities are conducted using environmentally safe practices.) Discuss the various places in the picture where nonpoint source pollution could happen. Examples include a farmer using excessive weed and bug killers (pesticides); excessive soil loss from farming; cows standing in stream; logging an area, exposing soil, and not replanting vegetation; oil dripping from a car; used motor oil poured onto the driveway or ground; excessive pesticides and weed killers put on home lawns; and runoff from construction sites which contains soil and chemicals.

C. Have the students simulate nonpoint source pollution using a model. Make the model on a piece of scrap wood or an old bulletin board. Paint a stream down the middle and glue dirt to the other exposed surfaces. You might use straw to represent corn plants and glue the straw in rows. Then give the students miniature toy farm animals, tractors, cars, barns, etc., and have them arrange a scene. Then place the appropriate "pollutants" near each one. For example, vegetable oil by the tractor, household plant fertilizer on the field, and so on. Fill up a watering can and show the students the clean water, then water the model,

and you will have an instant simulation of nonpoint source pollution. Ask the students to describe the water before and after and explain how it got polluted.

D. Ask the students if they think people realize they could prevent nonpoint source pollution. Work with them to make a list of ways they could prevent nonpoint source pollution. Have them share this list with their parents.

RESOURCES

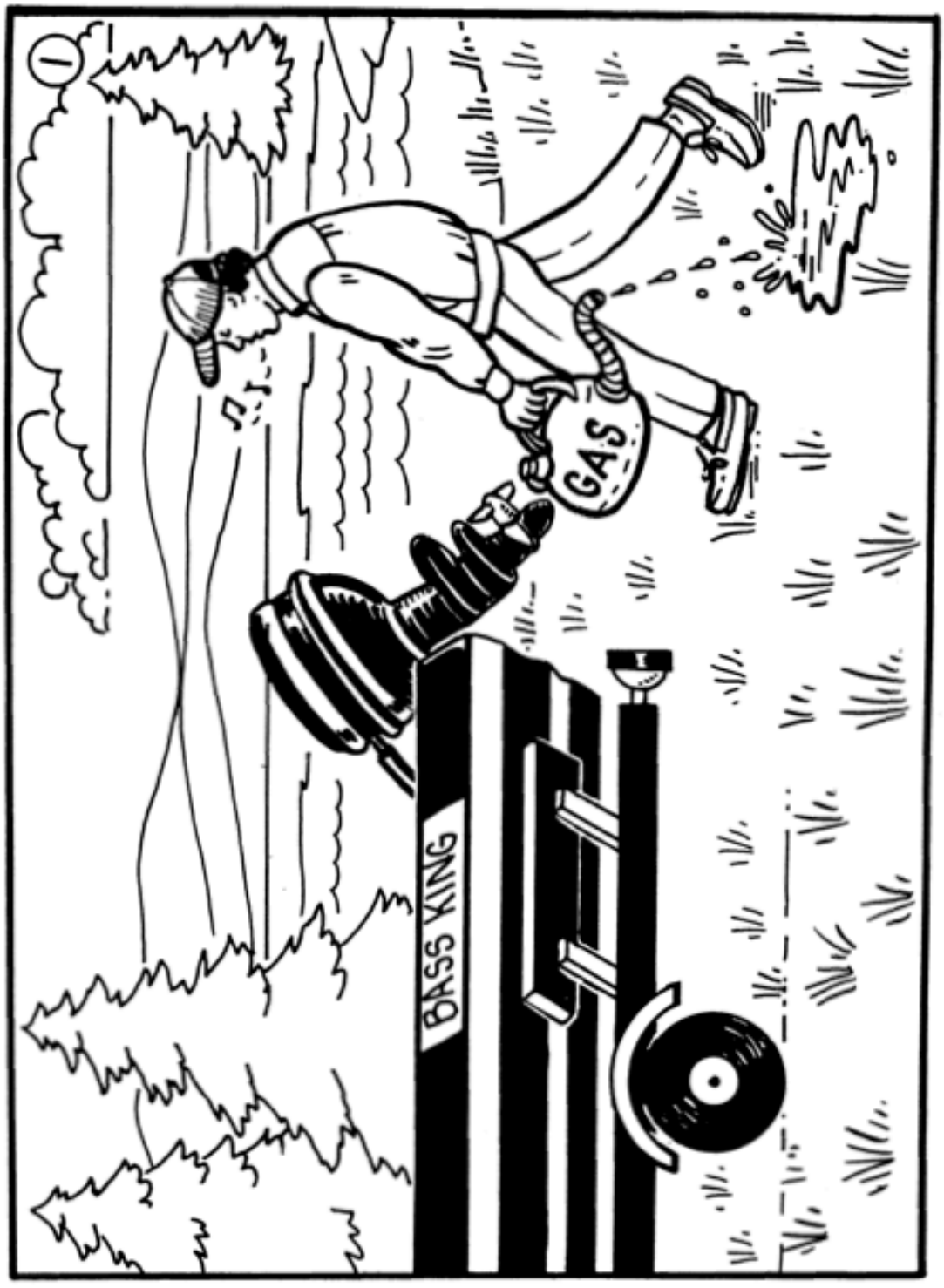
NOAA (National Oceanic and Atmospheric Administration). Nonpoint Source Pollution Tutorial http://oceanservice.noaa.gov/education/tutorial_pollution/welcome.html

USEPA (United States Environmental Protection Agency). Stop Pointless Personal Pollution! http://water.epa.gov/polwaste/nps/kids/middleschool/upload/stoppointless_article.pdf

USGS (United States Geological Survey). The USGS Water Science School. http://water.usgs.gov/edu/

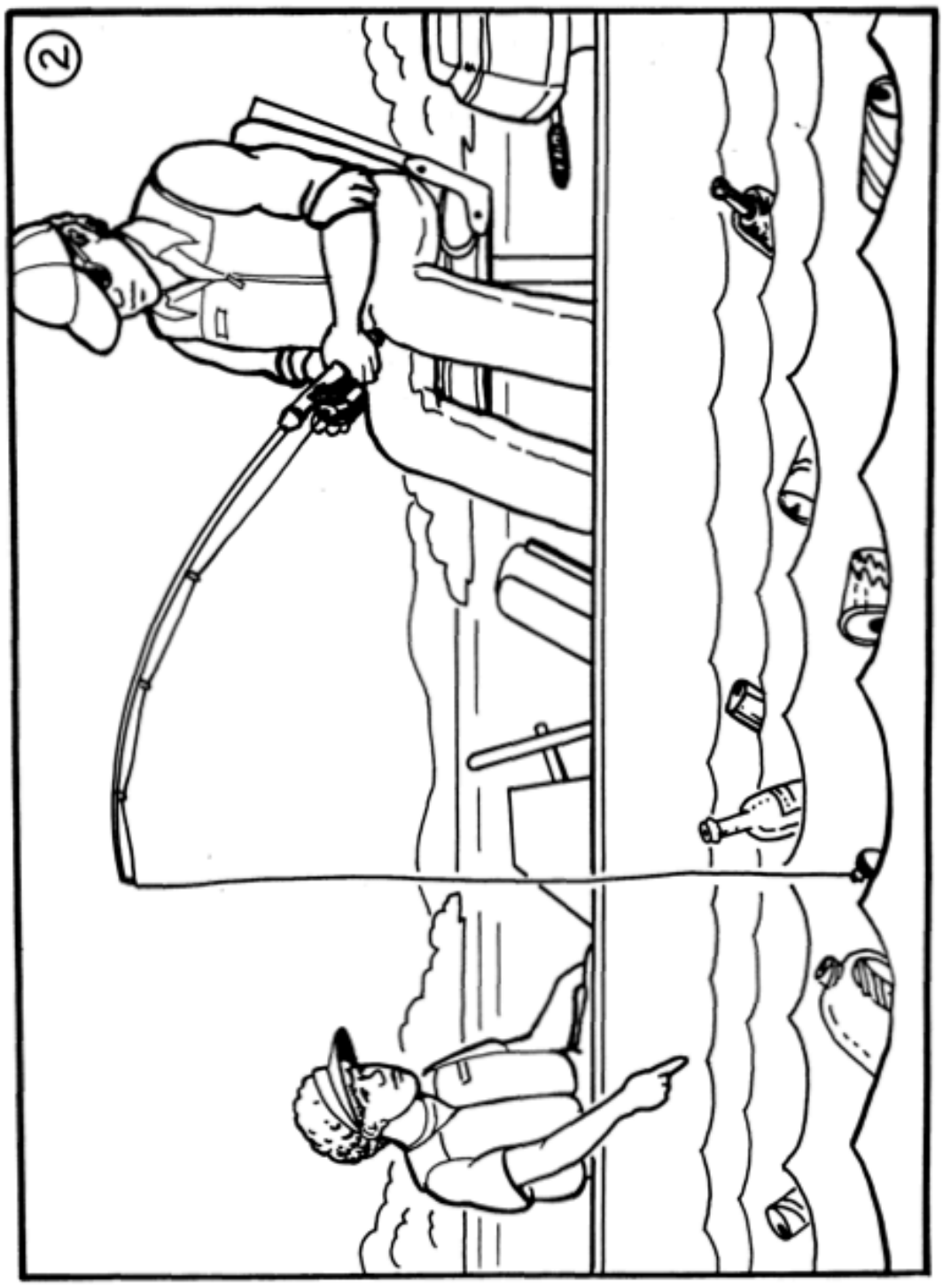
Teacher Sheet

PICTURE CARDS



Teacher Sheet

PICTURE CARDS
(CONTINUED)



Teacher Sheet

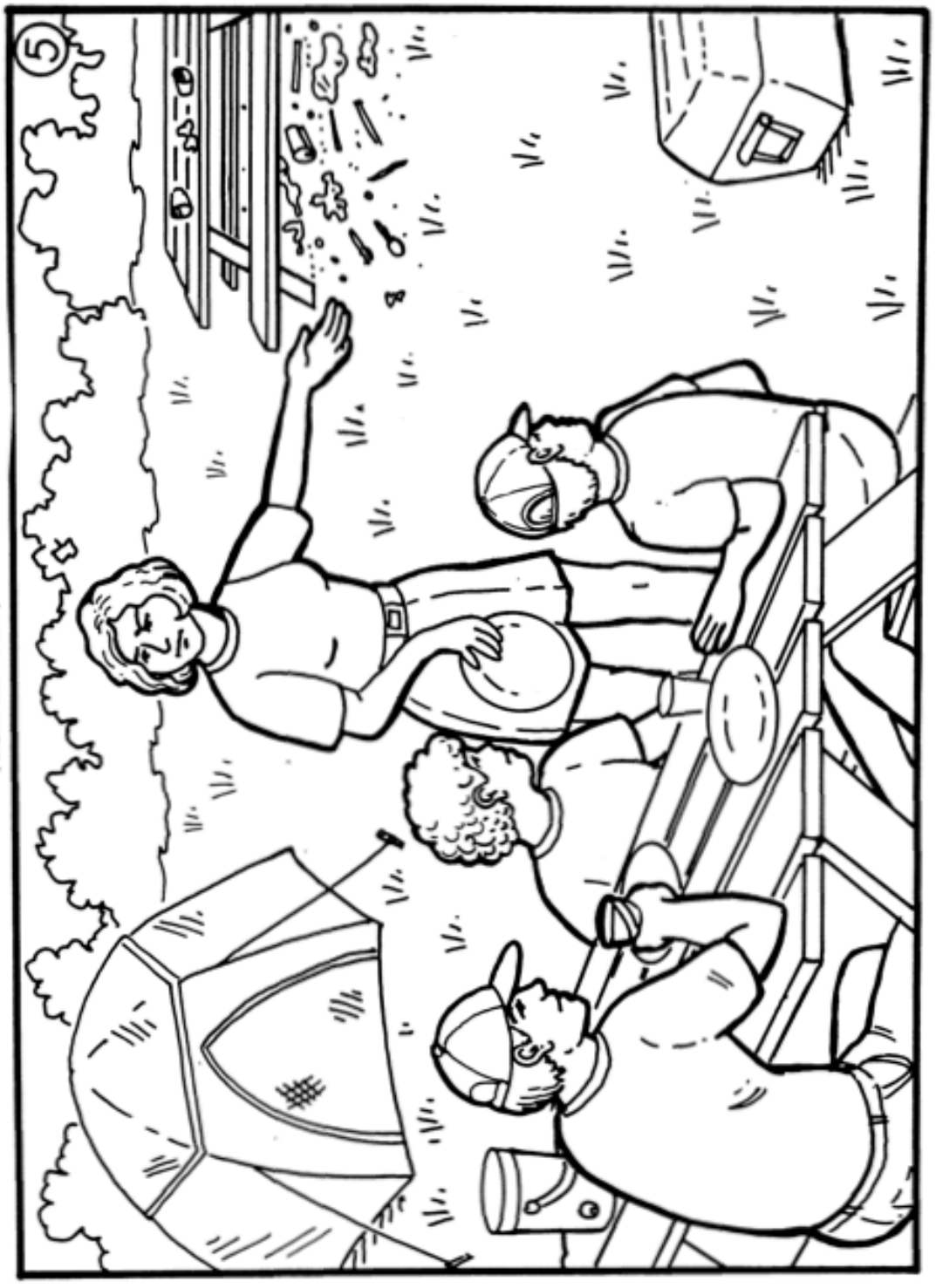
PICTURE CARDS
(CONTINUED)

Teacher Sheet

PICTURE CARDS
(CONTINUED)

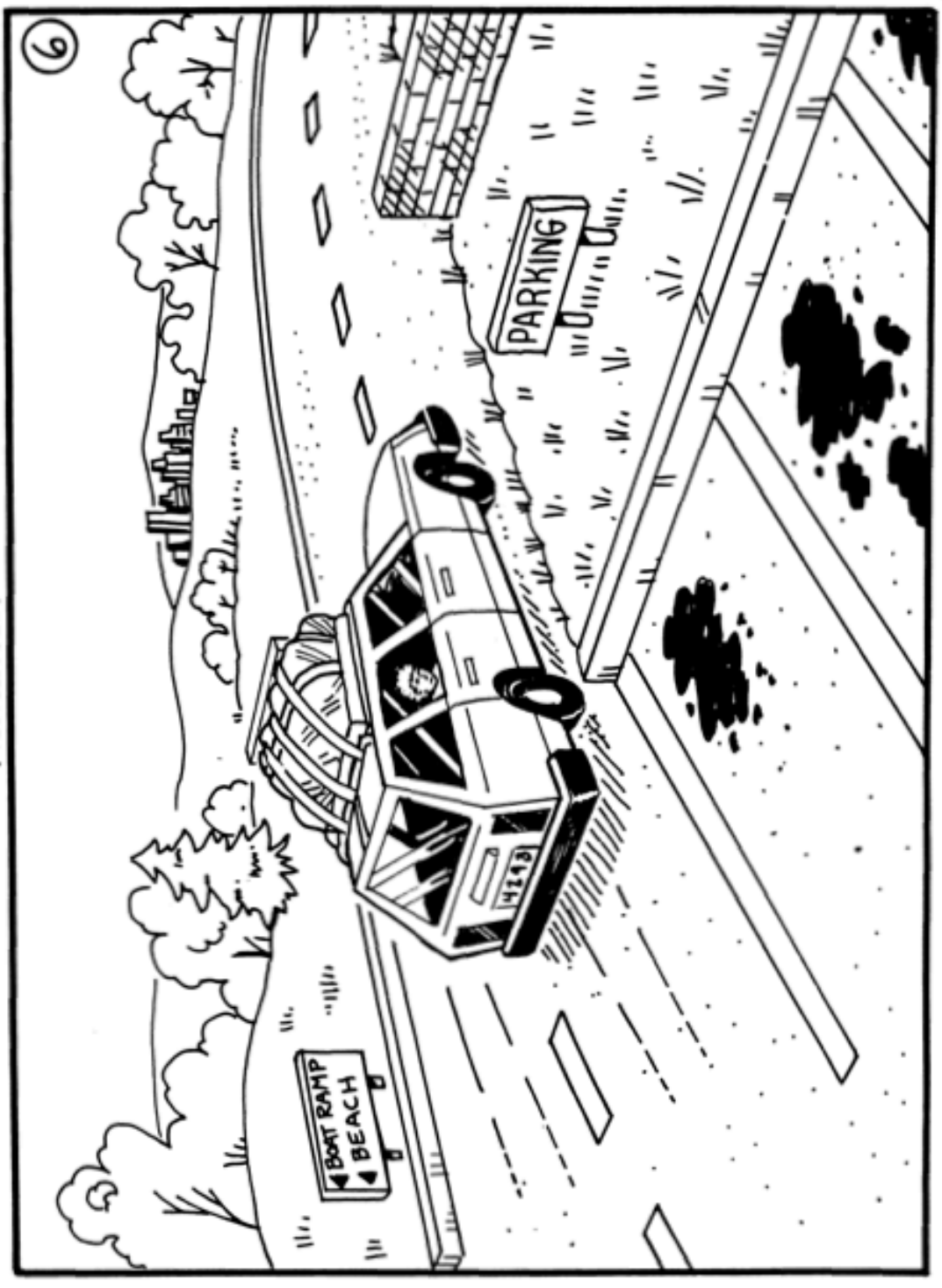
Teacher Sheet

PICTURE CARDS
(CONTINUED)



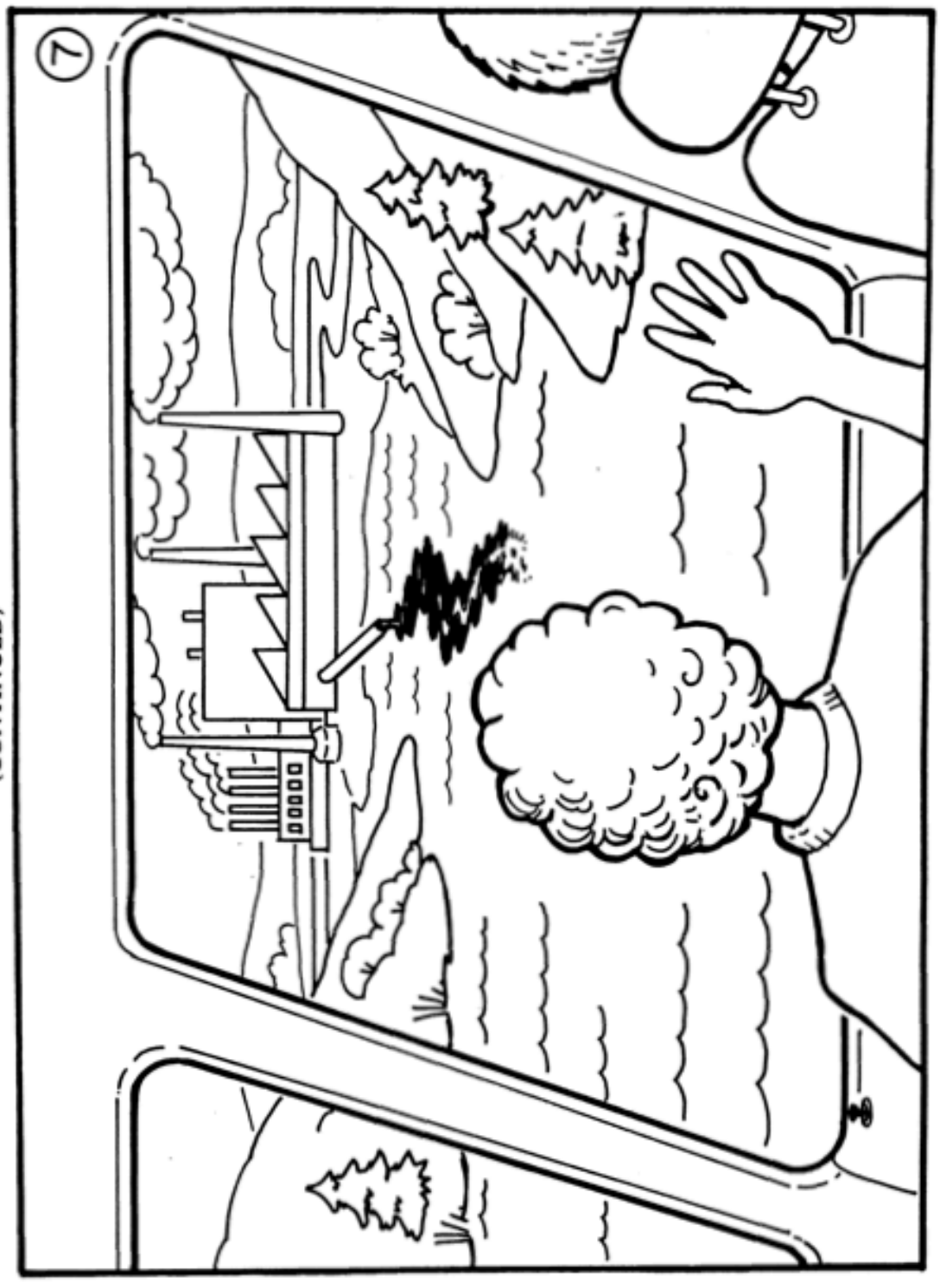
Teacher Sheet

PICTURE CARDS
(CONTINUED)



Teacher Sheet

PICTURE CARDS
(CONTINUED)



Student Sheet

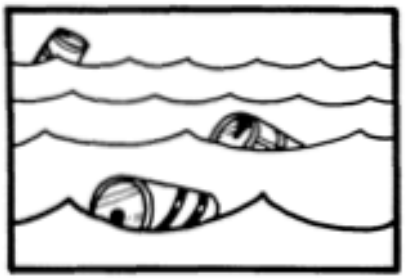
WORD CARDS

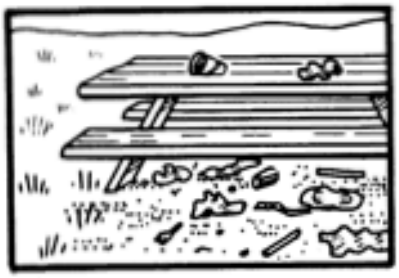
POINT	NONPOINT
POINT	NONPOINT
POINT	NONPOINT
POINT	NONPOINT

Student Sheet

JAMIE'S HIKE

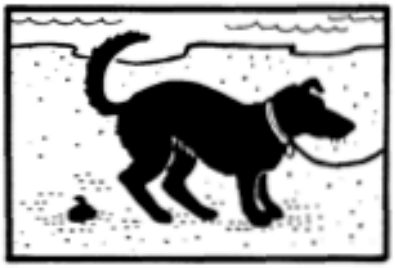
Color the pictures of things Jamie's family saw on their hike. Draw a line to connect each picture with either the word POINT or the word NONPOINT.





NONPOINT

POINT



Student Sheet

NONPOINT SOURCE POLLUTION