



## WATERSHED LANDSCAPE

### Summary

Students create a human landscape and interact with a watershed model and to make connections between topography, natural watershed features, water quality, and human activity.

### Objectives

Students will:

- understand the concept of a watershed and know how rainwater flows over our area
- understand the concept of non-point source pollution and how human activity contributes to it
- know why it is important to protect water resources

### California Content Standards Addressed

Grade Six - *Science content 2.a*: "Students know water running downhill is the dominant process in shaping the landscape, including California's landscape."

Grade Six - *Science content 6.b*: "Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable."

Grade Seven - *Science investigation and experimentation 7.c*: "Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence."

### The Basics:

#### Grade Level:

6 - 8

#### Subject areas:

physical science

#### Duration

65 minutes

#### Materials:

*for the human watershed*

#### for the teacher:

1. large plastic tarp
2. adhesive labels and marker
3. large Watsonville Slough System map
4. spray bottle of water

*for the Enviroscape activity*

1. Enviroscape model, prepared and set up on a table
2. coffee grounds, shaker of chocolate sprinkles, sand, fish foot, vanilla extract, confetti, spray bottle of water

*for the journal prompt:*

#### teacher prep:

1. clipboard, pencil or colored pencils, and Journal Prompt 12 (Appendix B)

## Outline

*There are five pieces to this lesson:*

- 1) Human watershed (25 minutes)
- 2) Enviroscope (25 minutes)
- 3) Journal prompt (10 minutes)
- 4) Closing circle (5 minutes)

## Vocabulary

topography, rainfall, runoff, elevation, percolation, nonpoint source pollution, precipitation, watershed, condensation, evaporation, water cycle, groundwater, transpiration

## Background Material

*Excerpted from "Hands On Save Our Streams" by Karen Firehock.*

A watershed is an area of land that drains into an individual stream or river system. The area of land that drains into a stream is determined by the topography or "lay" of the land. Watersheds cross city, county, state, and national boundaries. They are found in all different shapes and sizes. Ridgelines or areas of higher elevation separate watersheds from each other, and watersheds are named for the major rivers and streams into which they drain.

Surface water flows over land to small creeks to rivers to bays to oceans. Water also reaches streams through groundwater flow and rainfall. Think of streams and rivers and branches of a tree and the trunk as the bay or ocean into which all the water eventually drains. Fish and other stream life travel along these branches. Unfortunately, pollutants also travel along water branches, which means a pollution problem from your backyard can impact many miles of waterway. Sometimes harmful pollutants such as toxics, which many take a long time to break down, flow in streams for many miles, harming aquatic life along the way.

## Water Pollution

Pollution is defined in several ways. Webster's Dictionary defines the verb pollute as "to make impure, soil, or defile." Other definitions describe pollution as something that when introduced into the environment degrades or impairs the usefulness of the resource. This is an important distinction because the usefulness of the resource is a subjective determination. For our purposes, a pollutant is defined as any substance or mixture of substances from unnatural sources or natural substances introduced into the environment in quantities or concentration

that harm the resource. For example, soil normally flows in rivers and streams. However, soil is a pollutant when it is deposited in streams at excessive levels caused by people's land-disturbing activities.

As water moves through the hydrologic cycle, there are many ways it can pick up pollutants. In the atmosphere, water vapor may form around particulate matter from factory smokestacks, car exhaust, smoke, and other sources. The water then may fall to Earth through precipitation and cause pollution of surface waters. As water runs over land, it picks up pollutants from farms, streets, lawns, and other sources. As water moves through the ground it may come in contact with pollutants that have leaked from landfills, illegal dumps or chemical spills. Spills of oil and chemicals into surface waters and legal and illegal discharges of wastewater are another way water becomes polluted.

### **Watershed Pollution Sources**

There are two types of water pollution sources: point source pollution and nonpoint source pollution. Point source pollution comes from a pipe, such as factory discharge pipe, and is easy to recognize along streams. Before passage of clean water laws such as the landmark 1972 Clean Water Act, much of our nation's most severe pollution problems came from industries and sewage treatment plants that did not properly treat and clean wastewater before discharging it into streams. However, after tougher clean water laws were passed, point source pollution no longer accounted for the majority of pollution problems. Nonpoint source pollution - runoff pollution caused when rainwater carries pollutants into nearby surface and ground waters - became the major pollution source harming America's surface waters. It is estimated that nonpoint source pollution accounts for at least 70% of America's surface water pollution.

Sources of nonpoint source pollution include farms, cattle feed lots, lawns, paved urban areas, construction sites, timber harvesting sites, landfills, and home septic systems. These sources contribute pesticides, fertilizers, metals, manure, road salt, and other pollutants. Nonpoint source pollution could be called "people pollution" because the way we use the land directly affects the amount of nonpoint source pollution in our surface waters. For example, land left as forest contributes very little pollution to surface waters, while land paved over for parking lots and highways contributes a great deal of nonpoint source pollution such

as oil, grease, dirt,, and trash. The types of land uses in our watershed determine the pollution problems affecting our sloughs.

### **Water as a Resource**

Earth is called the water planet. Seen from space, Earth appears as a large blue sphere with continents floating in a magnificent sea. but this picture is elusive. Most of Earth's water is in forms that cannot be seen or accessed easily by people. In fact, many areas of the planet suffer from water shortages. Here in the United States, California, Florida, and Nevada routinely suffer from water shortages. This may sound surprising since California and Florida are next to the ocean! Although more than 2/3 of Earth's surface is covered by water, more than 99% of that water is unavailable or unsuitable for human use because of its salinity (salt content), its form (gaseous), or its location (frozen polar ice caps and glaciers). Only about 1% of all the Earth's water is available for human use. In addition, some of that water has been polluted by extremely toxic materials, such as mercury, which means people can no longer use it.

As the world's population increases, the supply and availability of clean water has become a serious political issue. For example, in California, water is pumped from the more humid northern area to the drier south for agricultural irrigation. This causes conflict between the two parts of the state.

### **Procedure**

#### **1) Human landscape (25 minutes)**

*This activity is adapted from the Return of the Native's A Human Watershed*

- Ask students what they know about watersheds. What is in a watershed? What is the name of our watershed?
- Ask students to brainstorm the names of surrounding mountains, lakes, sloughs, schools, etc and write the name of each on an adhesive label. Use the watershed map to help students identify missing landmarks and also to help students visualize each of their location. (some labels should include: Pinto Lake, Corralitos Creek, Mt. Madonna, Pajaro River, Pajaro High School/WERC, the students' school, West Struve Slough, Monterey Bay)
- Tell students they are going to build a watershed model to learn how water flows and how the health of the watershed affects the health of the wetlands.

- Instruct students to go outside. Choose 2 - 4 students who will form the model of a watershed.
- Ask the students to sit down side-by-side on the ground, leaning back on their elbows and forearms so that the upper half of their body is at a slope and their knees are slightly bended.
- Lay the plastic tarp over the bottom half of their bodies.
- Explain to students that this tarp will represent their local watershed, the one on the map, and they will be labeling the major landmarks that form the local watershed.
- Ask students to decide where north, south, east and west are, and then have the students representing the watershed model aligned their legs facing southwest. Assign each student an adhesive label with the name of one of the landmarks. (If necessary, you can assign more than one landmark per student.)
- Ask students to start labeling their watershed. If students are not sure where to place their labels, instruct them to use the watershed map as a reference. If necessary, students can ask the students representing the watershed model to adjust their legs or feet to help them represent any of the landmarks.
- Tell students the watershed model will experience a rainstorm. Ask them to predict where will the water flow and collect in the model.
- Ask a student to spray water over the model for several minutes for a continual flow. Have students identify the branching pattern as water from smaller streams merge into larger streams, and to note where water has collected. What direction does the water flow? Is that predictable?
- Ask students: How do think the land is shaped by this flow of water?
- Ask students - what is pollution? How you think the things we do on land affect the health of the watershed.

## **2) Enviroscope activity (25 minutes)**

- Gather students around the Enviroscope model.
- Ask students to help identify these different areas on the Enviroscope model: where we live (residential), where we grow food (agriculture), how we get around (transportation), what happens when our community grows (construction).

- Tell students there are 2 types of pollution: point-source pollution (can be traced to a specific source), and non-point source pollution (cannot be traced to a specific source).
- Demonstrate point-source pollution on the Enviroscape model. Tell students that you have to know the exact cause of this type of pollution.
- Tell students that when they hear about water pollution, it is usually non-point source pollution they are talking about. Ask students to name some things that cause this kind of pollution. Possible pollutants are oil (represented by vanilla extract), sand (dirt), fish food (fertilizer), confetti (litter), and animal droppings (chocolate sprinkles).
- For each pollutant, ask a student volunteer to sprinkle some (represented by the items listed above) in the appropriate places in the watershed model. Ask students where that pollutant comes from.
- Ask a student to use the spray bottle to make it rain over the watershed. What happens to the runoff? Is it clean water or polluted water? Why?
- Ask students if they think water is a renewable or a non-renewable resource? Why?
- Ask students if we have more control over source point or non-source point pollution?
- Brainstorm some different things we can do every day to help reduce non-point source pollution

### 3) Journal Prompt (5 minutes)

- Give each student his or her science notebook, clipboard, and pencil or colored pencils along with Journal Prompt 12 (Appendix A).
- Ask students to take 5 minutes to write some notes about watersheds, non-point source pollution, and why we need to protect our water resources in their science notebooks.
- Tell students: Then, think about all the different ways you use your watershed and write them down.
- When students are finished, ask if anyone wants to share some of the ways in which they use their watershed.

### 4) Closing circle (5 minutes)

- Pass a stone around the circle and ask each student to name one thing they will do to help reduce non-point source pollution.

## Extensions

1. "Wetland in a Pan" activity, in *WOW! The Wonders of Wetlands*
2. Hands-on WERC restoration work

## Resources and Bibliography

Firehock, Karen. *Hands on Save Our Streams*. Gaithersburg, MD: The Izaak Walton League of America, Inc., 1995.

Watershed Institute, California State University Monterey Bay. "A Human Watershed."

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[http://watershed.csumb.edu/ron/teacherResources/resources\\_pdf/human\\_watershed.pdf](http://watershed.csumb.edu/ron/teacherResources/resources_pdf/human_watershed.pdf).

## Appendices

*Appendix A: Journal Prompt 12 - Watershed Landscape*

*page 8*

WETLAND NOTEBOOK  
WATERSHED LANDSCAPE

JOURNAL ENTRY 12

NAME \_\_\_\_\_ DATE \_\_\_\_\_

*Make a diagram about watersheds, non-point source pollution, and protecting water resources:*

*How do you depend on your watershed?*