TEACHING WATER CONSERVATION ON THE PALOUSE

A K-12 Curriculum Series Developed by the

Palouse-Clearwater Environmental Institute

Spring 1995

About the Palouse-Clearwater Environmental Institute

The Palouse-Clearwater Environmental Institute (PCEI) is a non-profit, tax-exempt grassroots organization dedicated to increasing citizen involvement in the decisions that affect our region's environment. Through community organizing and education we strive to enable members of our community to find effective and sustainable solutions to local and regional environmental problems. We are celebrating ten years of connecting people, place and community.

For more information contact: Palouse-Clearwater Environmental Institute
112 West Fourth, Suite I *(On Friendship Square)*
P.O. Box 8596 Moscow, Idaho 83843
Phone (208) 882-1444
Fax (208) 882-8029
email: pcei@moscow.com
url: http://www.moscow.com/Resources/PCEI

TABLE OF CONTENTS

Forward

This curriculum series was developed by the Palouse-Clearwater Environmental Institute in the Spring of 1995. The purpose of this series is to help teachers on the Palouse incorporate water conservation education into their classrooms. The series consists of three lessons: "Where does our water come from and where does it go?", "The story of our water", and "Water and the World". Following the curriculum series, we include a copy of the handout briefly explaining the series to teachers. Finally, there is a list of youth education resources available to teachers on the subject of water conservation.

TEACHING WATER CONSERVATION ON THE PALOUSE

A PCEI CURRICULUM SERIES

Unit Introduction:

Water is an essential resource that continually cycles from the earth to the atmosphere. As we interrupt the water and pump water for our daily needs, we tend to take the availability of clean, fresh water for granted. The activities in this three lesson unit are designed to help students realize where their water comes from, the many ways they rely on it, and where it goes when if goes down the drain.

The unit begins with students investigating the nature of watersheds focusing on the processes of the water cycle and the ways that people interrupt the cycle as well as the ways that people affect the quality of water in a watershed. In the lesson, "**Where Does Our Water Come From and Where Does It Go?**" students investigate the source of their water as they create **mini-rivers** and investigate **water cycles** and the way water is treated once it goes down the drain. Students will discuss information about their water supply and create a mural to share what they have learned with others in the school.

In the second lesson "**The Story of Our Water,**" the students will write their own **story** following a class reading of a local native American Indian tale. For younger classes, the students will write a story in tandem to emphasize the importance of water for land, animals and humans and to exercise the imaginative and fun side of water. This lesson will be accompanied by a slide show of the Palouse water system explaining in brief where their water comes from and where it goes.

In the final lesson, "**Water and the World,**" students learn about the **global water supply** and the idea of **finite water** and exchange ideas on **water conservation.** Following a class discussion and an activity illustrating our world water supply, the students will make a **toilet dam** or a **water conservation poster** to display in their schools or homes.

As a supplemental activity for older students, **water figures** challenges students to predict and then monitor the water they use in on day. As a result, students discover the importance of responsible water use and opportunities to conserve water in their daily lives.

This unit is designed to teach students where their water comes from before it reaches their homes and schools, where it goes after they have used it, how humans affect water quality and the water cycle and why it is important to conserve water in their own homes.

LESSON I: WHERE DOES WATER COME FROM AND WHERE DOES IT GO?

A PCEI Curriculum

Overview: Students observe a mini-water cycle in the classroom and then develop diagrams that depict what might happen to the water that falls around their school. They then observe a mini-river systems on their school grounds and examine drainage patterns of local watersheds. To conclude this lesson students will learn about the source and treatment of their local water supply and create a mural to connect the components of their water cycle and to share their knowledge with others in the school.

Key Concepts: The land area that supplies water to a river or other large body of water is called a **watershed**. Human activities with in the watershed affect the quality of water. There is fixed amount of water that cycles between the atmosphere and the Earth's surface. The human made environment intercepts **precipitation** and affects the water cycle. **Ground water** is the original source of water we use for our daily needs. **Waste water** is water that is used in homes and business and is treated before it is returned to local surface waters, i.e.. Palouse river, Paradise creek and its **tributaries**.

Objectives: Students will be able to

1. Describe a watershed and the formation of a river.
2. Locate major waterways on a map to determine where runoff from their city drains ends up.
3. Identify ways that people can affect water quality and save water.
4. Identify ways that human activities affect the water cycle.
5. Recognize the source and treatment of the school's water supply.
6. Create a mural diagramming their watershed, the source of their water, and the treatment of water before it is returned to local surface waters.

Materials:

map showing streams and rivers in your city
a small garden trowel
pint of milk
water
water cycle diagram (provided)
overhead projector
colored paper, colored markers and paints
large sheet of butcher paper
magazines
scissors and glue

Teacher Background: A **watershed** is a land area in which water drains to a particular body of water. Rainwater that falls on the watershed drains into rills or narrow channels that feed into streams. The Paradise Creek watershed supplies Moscow, Idaho and Pullman, Washington with most of their surface water, although water used for homes, businesses, and irrigation is pumped from ground water. The four main users

of ground water are the cities of Moscow and Pullman and the two Universities. Small streams or **tributaries** flow into each other to form rivers. At the river's end it may divide into many channels as it flows across a delta, formed by the buildup of river-borne **sediments**. Eventually the river drains into a lake or ocean.

The Paradise Creek watershed has two main tributaries, Paradise Creek and the Palouse River. Paradise Creek flows from its headwaters in the Palouse Mountain Range south to Moscow, where it turns west and joins the South Fork of the Palouse River in Pullman, Washington. Paradise Creek is characterized as a youthful stream. The largest source of flow to Paradise Creek is the effluent from the Moscow waste water treatment plant located just outside of Moscow on the Pullman Highway.

Conditions within a watershed affect the quality of the streams and rivers flowing through it. Unfortunately human activities have caused the quality of water in many watersheds to deteriorate over the last 200 years. Clearing land for agriculture, mining, roads, parking lots and other human uses have caused increased soil **erosion** and the accumulation of pollutants in the nation's waterways.

Most of the land area of the Paradise Creek watershed is blanketed with the Palouse Loess, a light soil, very rich in nutrients that is essential for regional farmers. The Palouse is a land area sculpted into dunes by wind and water action. Running water, such as Paradise Creek and its tributaries, carved a network of valleys, stripping away loess and leaving hills.

Lawn fertilizers and pesticides, automotive oil, paints, solvents and detergents that wash from people's yards into local waterways also contribute to pollution. The focus of this activity is to introduce students to the concept of watershed and help them to see how human actions can affect the quality of **surface waters** in their community.

Precipitation that falls on the Earth's surface forms from **condensation** when water vapor in the air cools and condenses into drops of liquid water or ice crystals. Some of this precipitation infiltrates the ground and becomes part of the **ground water;** some is intercepted by plants or by human structures; and the remainder runs off the land as surface water. Water returns to the atmosphere through the combined processes of **evaporation** and **transpiration** through plants.

Most cities get their water by drilling wells into **ground water** supplies. Larger cities obtain their water from **surface waters-** rivers and lakes. Cities that rely on rivers as a source of water usually dam the river and store the water in a reservoir. Moscow and Pullman pump water from a deep aquifer where water has been stored for millions of years in the Columbia basalts, which is volcanic rock that underlies much of the Palouse's rich loess soils.

An important characteristic of the Paradise Creek watershed is its storm sewer drainage system. Moscow's city drainage system empties directly into Paradise Creek. Rainwater and street runoff pours into Paradise Creek at various different sites.

Teaching Outline:

1. Show class slide show of their watershed and the water cycle in their area.
2. Display overheads of the water cycle.
3. Take the class outside after a heavy rain to observe the pattern of water draining in an area around the school or have students simulate a watershed by pouring water from a hose (or pitchers of water) over sloped area. Have the students watch water run over a sidewalk or street.

- ❒ **How many small streams or tributaries are there?**
- ❒ **Do the tributaries feed a larger river?**
- ❒ **Are there slow and fast moving streams? What accounts for the differences in the rate of flow?**
- ❒ **Are there miniature waterfalls, dams or deltas?**

4. Demonstrate ways that students could affect this mini-watershed.

- ❒ **What happens to the main river if land in the watershed is cleared? (Remove some ground cover with a small garden trowel and observe the results. Compare this to what happens when land is cleared for construction and farming.)**
- ❒ **What happens to litter and pollutants that are added to the streams? (Add some small pieces of litter and pour some milk into a tributary to simulate pollutants.)**
- ❒ **How might these pollutants affect plants and animals in the river?**
- ❒ **What happens if dams are built? (Build a dam with rocks and observe what happens to the flow of water.)**
- ❒ **In regards to the Paradise Creek Watershed and our storm sewer drainage system, ask students what might happen if they dumped oil, pesticides, paint thinner etc. in their gutters, driveways, or lawns.**
- ❒ **What might happen to the water that falls on the pavement?**
- ❒ **How does pavement affect the amount of water that seeps down to the ground water?**
- ❒ **Where does the runoff finally end up?**
- ❒ **Since we will never have more water on Earth than we have now, should we be more concerned about water quality?**

5. Write the following statement on the board: "The water we use today is the same water that the dinosaurs drank thousands of years ago." Ask students if they believe the statement is true or false and discuss their ideas.

It is important to point out that the water we use is pumped from below ground and could very easily have been stored there since the time of dinosaurs. We don't know for certain that they drank this water.

6. Project the water cycle diagram and ask students to describe the processes that cycle water between the atmosphere and the Earth's surface. Help them to see that this is a closed cycle and that we will never have more water on Earth than we have now.

7. Ask students to divide into groups and then assign them a piece of the water cycle and watershed to draw. Be sure to include the creek, waste water treatment plants, homes, the headwaters, rain, evaporation (clouds) and various other water uses. Ask students to share their drawings and discuss their ideas while pasting them to

the bulletin board creating a mural as part of Paradise creek and the role it plays in the water cycle.

8. Ask each student to summarize ways that human activities affect the water cycle in the city and to illustrate them on the mural.

Extended Activities:

Have students construct a paper mache model of a local watershed. They could identify various land uses within the watershed including wildlife habitat and industrial and residential areas.

LESSON II: THE STORY OF OUR WATER

A PCEI Curriculum

Overview: Students listen to a native American myth about the cycling of water and watch slide show describing the water cycle in their area. Then they create their own story of the water they see around their home, the water they play in, the water they use in their homes, where it comes from and where it goes, and how they affect the water cycle and the animals the live in the streams around their homes. "The Story of Water" is designed for students to think of creative solutions to some problems they might encounter in their water cycles and to identify how and why they should conserve the water that they use.

Objectives: Students will be able to
1. Identify ways that people can affect water quality and save water.
2. Identify ways that human activities affect the water cycle.
3. Develop creative solutions concerning water quality and water conservation by writing a story or part of story describing their water cycle.

Materials: magazines
scissors and glue
markers
slide projector
slide show and script (courtesy of PCEI)
colored paper
butcher paper
native American storyteller script or tape

Preparations: Review "**Where Does Our Water Come From and Where Does It Go?**" teacher background section.

Teaching suggestions and discussion questions: Project the water cycle diagram and ask students to describe the processes that cycle water between the atmosphere and the Earth's surface. Help them to see that this is a closed cycle and that we will never have more water on Earth than we have now.

Read the class a native American myth concerning water.

Begin a discussion by writing local Indian words on the board.

Koos-ki-a water clear
Koos water
ki-a clear

The area including and surrounding Paradise Creek is known as the Palouse. Named after the Palouse Indians who inhabited part of what is now Whitman and Latah counties. These people called themselves Na-ha-um meaning "people of the river."

Ask each student to summarize ways that human activities affect the water cycle in the city and to illustrate them in their stories.

Ask each student to draw a picture or cut a picture out of a magazine which illustrates the water cycle, or a part of their water cycle such as how water relates to plants and animals and how humans interact with the water cycle.

LESSON III: WATER AND THE WORLD

A PCEI Curriculum

Key Concepts: There is a fixed amount of water on the earth and only a portion of that water is accessible for use. Students must take responsibility for their water usage to insure a ample water supply for the future.

Objectives: The objective of this lesson is to illustrate to students the amount of available water on earth, illustrate the increasing population and the idea of a finite resource. The students will design a t-shirt or poster conservation logo to be displayed around their schools and homes. An alternative activity would be for students to make a toilet dam out of a plastic milk jug in order to conserve water in their home. They will label the jug with a message concerning conservation ideas.

Materials: five gallon bucket
ice cubes
cup of water
paper
paint and markers
scissors and glue

For T-shirts:
an old t-shirt
cloth markers
clothing paint
sponges, Styrofoam lunch trays for making shirt stamps
knife
paint brushes

Teacher Background: We know pretty much exactly how much water we've got here on planet earth: 1.2 billion cubic kilometers, a million million million tons. If you our entire water supply into a 5 gallon bucket, more than 4.8 gallons of it would be salty ocean. A little over 2 and one half cups of fresh water would be frozen into about five regular sized ice cubes, floating on top (representing the glaciers and polar ice sheets). The remaining cup or so would be represent all the fresh water freely circulating in the form of lakes, streams, rivers, aquifers, and water vapor. And of that, a little over half a pint--less than one-third of one percent of the total -- would be technologically and economically accessible for human use.

Approximately 97 percent of the earth's total supply of water is found in the oceans. The remaining 3 percent is fresh water, which is mostly unavailable for use by plants, humans and other animals. Most of this water is either frozen in glaciers of polar ice caps or located deep beneath the earth's surface where it is not economically feasible to extract it.

Teacher Background: Water conservation is easiest implemented in the home as this is where most social habits form. Water usage in the home can be broken down into a few general areas. Inside the house, water is used largely for toilets, showers, sinks and

washing dishes and clothes. Flushing and showers are two areas where water use can easily be reduced.

Percentages for In House water use

Flushing	28%
Washing clothes	21%
Showers and baths	31%
Faucets	12%
Leaks	5%
Washing dishes	3%

Outside the house, water is used for landscaping and washing cars, sidewalks, and driveways. Forty percent of a households water goes to landscaping during the summer months.

Indoor Water Conservation Hints

- ❒ Cut down number of toilet flushes.
- ❒ Lower flush or decrease basin size with dam or bottle of water.
- ❒ Don't use toilet as a waste basket.
- ❒ Shorten showers or don't turn shower on at full pressure.
- ❒ Install low flow shower heads.
- ❒ Wash dishes by hand or turn dishwasher to energy saver wash and use only for full loads.
- ❒ Limit the use of the food disposal or start a compost system for outdoor plants.
- ❒ Using a small tub or a partially filled sink for washing fruits and vegetables is a great water saver.
- ❒ Turn water off when brushing teeth, shaving, and washing face and hands.
- ❒ Only wash full loads of clothes.
- ❒ Reduce pressure in household water systems. Install flow restrictors.

Outdoor Water Conservation Hints

- ❒ Water lawn during the cool morning or evening hours so the water doesn't evaporate off the grass before it can soak in.
- ❒ Water on calm days, when there is no wind so that the sprinkler doesn't get misdirected by the wind.
- ❒ Water for longer periods less frequently. Let water sink deep into the grass. This encourages root system to extend and helps grass to be more drought resistant.
- ❒ Remove thatch and weeds to allow water to reach the roots of the grass. Poking holes in the soil (aeration) also allows the roots to get more water.
- ❒ Water shrubs and plants separately from lawns.
- ❒ Apply water only as fast as the soil can absorb it. Don't over water.
- ❒ Do not turn on the spigot all the way open. This reduces the rate of flow through the hose which saves water and is kinder to delicate plants.
- ❒ Use mulches to cover the ground around plants. This helps reduce loss of moisture from the soil and reduces weeds.
- ❒ Repair leaky, misaligned or broken sprinkler heads.
- ❒ Clean gutters and down spouts manually instead of hosing them down.

- ❒ Redirect gutters and down spouts into large containers that can be covered so that waterborne insects will not breed. Don't use roof collected rainwater if chemicals have been used recently on the roof.
- ❒ Keep child's play in sprinklers to a minimum, during actual lawn watering or invest in a plastic swimming pool.
- ❒ Wash cars with a bucket and then rinse. You could even wash your car on the lawn.
- ❒ Dry clean or sweep the sidewalk, don't rinse.

WATER CONSERVATION HANDOUT TO TEACHERS

Water Conservation Curriculum

Palouse-Clearwater Environmental Institute
P.O. Box 8596 Moscow, ID 83843 (208)882-1444

Where Does Our Water Come From and Where Does It Go? (90 minutes)

Presentation (30 minutes) Students will investigate the nature of water sheds focusing on the processes of the water cycle and the ways that people interrupt the cycle. Students investigate the source of their water as they create mini-rivers and investigate water cycles and the way water is treated once it goes down the drain. Students will discuss information about their water supply and create a mural to share what they have learned with others in the school.

Activity (60 minutes) Students will create mini-rivers and discover how water flows on the Palouse, how human-made structures affect the flow, and how water can become polluted. Then they will map a section of their local watershed, incorporating human and natural influences and how they work together to form their local water system.

The Story of Our Water (60 minutes)

Presentation (30 minutes) Students will hear a class reading of a local native American Indian tale and discuss different Indian names for water and bodies of water.

Activity (30 minutes) Students will write a modern day fable emphasizing the importance of water for land, animals, and humans in an exercise expressing the fun and imaginative side of water. For younger classes, students can write their fables in tandem, first finding a magazine picture or drawing their own and then describing their picture as it fits into the class's water fable. The fable will be display on a bulletin board of wall at the end of the class period. (I am hoping to bring a video camera in this class and have the students act out their fable. The video would be used as a teaching tool for future classes and students can check out the video to take home for their parents to view.)

Water and the World (or A Message in A Bottle) (60 minutes)

Presentation (30 minutes) Students will learn about the world's water, their local water supply, and the idea of finite water. Following an activity illustrating our world water supply and how it relates to our local water supply, they will exchange ideas on how to conserve water in their schools and homes.

Activity (30 minutes) Students will make a water saving device out of an old milk carton for their toilets. They will illustrate the bottle with a message concerning water conservation. Students may also design a water conservation poster with their own motto and logo that they can display around the school or their homes. It is possible that one class will be picked at random to publish their posters in the Moscow Daily News and all posters will be considered for a t-shirt design.

YOUTH EDUCATION MATERIALS

Available at or through the PCEI office

EPA Youth Publications: Science Demonstrations Projects in Drinking Water, Grades (k-12) EPA 570-9-90-007, April 1990, YT-0490017

Water: The Source of Life, America's Clean Water Foundation YT-0092030

Don't Splash Your Trash (Coloring Sheet), WA Department of Ecology Y-0000039

Don't Teach Your Trash to Swim! (Coloring Book) Y-0000038

How Rivers are Formed, Water Lesson Plans, YT-0000018

Santa Barbara County Water Education Resource Guide, Grades K-12 Classroom Units: The Guzzler Gang and Activity Booklet, Grades K-3

Water Fun, Grades 1-3

Water is Your Best Friend, Grades K-3

Flannel Board Stories: Water is Peter's Best Friend, Grades K-2 and Peter's Magical Water Journey, Grades 2-4

The Story of Drinking Water, Grades 1-3, 4-6, 7-9

Water Fun for You Coloring Book, Grades K-3

The Official Captain Hydro Conservation Workbook, Grades 5-6

The Further Adventures of Captain Hydro, Grades 7-8

Think Earth, Grades K-6

Santa Barbara County Water Education Resource Guide, Grades K-12, Hands-On Activities Guide: WAter Activities Manual for Santa Barbara County, Grades 6-8

Water Science, Grades 3-6

Project Water Works-Project Science Software, Grades 6-12.

Computer Software: *Hydroexplorer,* Grades 4-6.

Project Water Science, Grades 7-12.

Santa Barbara County Water Education Resource Guide, Grades K-12, Films and Videos: "H2O-2010" Video, Grades 7-12.

To Quench A Thirst Video, Grades 7-12.

Think Earth, Grades K-3.

Water Activities Manual, Grades 6-8, Santa Barbara County Water Purveyors

Parents and their Children in Environmental Education by Karen J. Peterson, RRT 487, May 10, 1994

Project Wet. 1192. Idaho Water Resources Research Institute. University of Idaho; Morrill Hall Room 106; Moscow, Idaho 838343. (208)885-6429

Project Wild/Project Wild-Aquatic. Western Regional Environmental Council. P.O. Box 180060; Boulder, CO 80308-8060. (303)444-2390

Teenage Mutant Ninja Turtles, Storm Drain Savers Coloring Booklets

Living Lightly in the City: an environmental education guidebook for grades 4-6, volume II. Second edition. Written by Maura O'Connor and Kathy McGlauflin. Illustrated by Nancy Chenery. 1982. Available through Schlitz Audubon Center, Robert Nichols, Director, 1111 East Brown Deer Road, Milwaukee, WI 53217