UNIT 1B. THE WATERSHED WEB OF THE WILD

TIME	LEVEL
60-90 minutes	All

BENCHMARKS	
Next Generation Science Standards	MS-LS2-3 MS-LS2.B MS-LS2.C MS-ESS3.C HS-LS2.C
Science & Engineering Practices	Developing and Using Models

MATERIALS:

- STUDENT HANDOUT 1B-1: The Sacred Circle
- STUDENT HANDOUT 1B-2: What is a Watershed?
- Two large balls of string
- Scissors
- **A large space to conduct the activity**

INTRODUCTION:

This activity brings students out of their seats and introduces them to a host of important concepts and ideas that are central to preparing them for their Salmon Watch field experience.

First, as students form a circle, they learn about the symbolic significance of the circle in Native American culture.

Second, students engage in actively creating a symbolic, pristine watershed and learn how it functions as an interconnected, multifaceted, dynamic and complex web.

Then, students witness and feel what happens to this watershed when parts of this dynamic system are impacted or damaged. Tension in the web is felt throughout and every part is affected.

So as not to leave students “bummed out” or without hope by this experience, students learn about real actions by students, community members, agencies, organizations and governments currently in motion in Oregon to restore the health and viability of watersheds.

OBJECTIVES:

Students will know and understand:

- the significance of the circle in many Native American cultures.
- the significant parts of a watershed ecosystem.
- the concepts of an indicator species and biodiversity.
- the roles that parts of the watershed have to the health of the watershed and ultimately to the salmon and the stream.
- the interconnectedness of all parts within a watershed.
- the various elements that can have an impact on a watershed.
- the elements of restoration in Oregon's watersheds.

PROCEDURE:

PART I. The background

1. Have students read the brief introduction, STUDENT HANDOUT B2: What is a watershed?

2. Cut out the WATERSHED PARTS and WATERSHED ROLES sections on the following pages and randomly hand to each student a section representing a piece of the watershed web.

3. Explain that they now represent that watershed part in this activity and that they must be able to articulate the role of their part of the watershed with regard to the health of the watershed, the salmon and the stream.

PART II. The watershed web of the wild

4. Have students, with information in hand, form a large circle. When in the large circle, read aloud with students STUDENT HANDOUT B1: The Sacred Circle to understand the importance of circle, cycles and hoops in Native American culture.

5. Have the student that received the Pacific Salmon part stand in the middle of the circle and hand him or her a ball of string. The Pacific salmon student must announce loudly, "I REPRESENT THE PACIFIC SALMON. PART OF MY ROLE IN THE WATERSHED IS……" They then must hold on to the string and gently toss the ball to any student in the circle.

6. The next student, let's say, represents the macroinvertebrates in the stream. The macroinvertebrates student announces loudly whom they represent and what their role in the watershed is. They next must hold on to the string and gently toss the ball to anyone they wish in the circle. Continue this process until all students have participated.

7. Once the web is complete, finish by sending the ball of string back to the Pacific salmon representative in the middle, thus symbolizing the interconnectedness of all parts of the watershed with the salmon as the indicator species at the center of the watershed ecosystem. As the facilitator, at this point be sure to stress the concepts of interconnectedness within ecosystems and watersheds, biodiversity and indicator species.

PART III. The tension and break of the web

8. Begin to examine some of the different destructive forces that can occur within this intact watershed if not properly managed. Use the WATERSHED IMPACTS chart as a guide for some potential problems. For example, announce that within this watershed there have been some poor logging practices (i.e. removing all trees to the edge of the stream thereby increasing soil erosion). The person that represents the live alder tree, then takes a step back, creating tension on the web for all to feel—especially the salmon.. You can also choose different parts of the watershed, like the small mammals. What would happen to the watershed, if there suddenly were no small mammals? Have the small mammals representative take a step back.

9. Continue announcing things that cause tension in the web of life in the watershed, and continue having individual students taking a step back until the string breaks or chaos ensues. Have everyone sit down, still in the circle. Announce that the salmon is near death (for effect, have the salmon representative writhe and cough if you wish).

PART IV. The restoration

10. Now that the web (the watershed) is in poor health, clear out the old string, and lead a discussion about possible methods to restore the impacted watershed.

11. Use the document called Restoration Efforts, which describes examples of actions within Oregon to restore watersheds. This would also be a great time to get the class brainstorming about possible community service learning projects in their watershed that help enhance or restore the watershed.

WATERSHED PART	WATERSHED ROLE
I represent cold, clean free-flowing water in the stream.	Part of my role in the watershed is to provide habitat for fish, aquatic insects, beavers, and a host of other wildlife.
I represent root wads in the stream.	Part of my role in the watershed is to provide shade and cover, as well as resting and rearing areas for salmon.
I represent wood in the stream.	Part of my role in the watershed is to provide shade, cover and trap gravels, as well as resting and rearing areas for salmon.
I represent clean, porous gravel in the stream.	Part of my role in the watershed is to provide the essential material for female salmon to dig nests called redds to lay their eggs.
I represent the stream side or riparian grasses and shrubs.	Part of my role in the watershed is to provide cover, in addition to shade, for temperature regulation. In autumn my leaves drop into the stream and eventually provide food for aquatic insects that are then eaten by salmon.

WATERSHED PART	WATERSHED ROLE
I represent deciduous trees like maples, madrones, oaks and ashes.	Part of my role in the watershed is to provide food and habitat for numerous wildlife species, and shade to cool streams for salmon. I also produce oxygen, stabilize the soil from erosion, and replenish soil nutrients.
I represent coniferous trees like firs, hemlocks, pines, spruces and cedars.	Part of my role in the watershed is to provide food and habitat for numerous wildlife species, and shade to cool streams for salmon. I also produce oxygen, stabilize the soil from erosion, and replenish soil nutrients.
I represent shrubs like salal, Indian plum, vine maple, and red huckleberry.	Part of my role in the watershed is to provide food and habitat for numerous wildlife species, and shade to cool streams for salmon. I also produce oxygen, stabilize the soil from erosion, and replenish soil nutrients.
I represent herbaceous plants like stream violets, Douglas' asters, large-leaved lupine and common red paintbrush.	Part of my role in the watershed is to provide food for wildlife and insects, stabilize the soil from erosion, and replenish soil with nutrients.

WATERSHED PART	WATERSHED ROLE
I represent wetland plants like cattails, wapato, yellow pond lilies and water plantain.	Part of my role in the watershed is to provide habitat for an incredible number of wildlife, fish and insects. I also filter sediment and pollution for streams and provide a buffer against flooding.
I represent macroinvertebrates or aquatic insects like stonelfy, caddisfly, and mayfly nymphs.	Part of my role in the watershed is to be the major food source for fish in streams and other aquatic and terrestrial life (birds). I am also a key indicator in determining pollution levels in streams.
I represent Pacific wild salmon.	Part of my role in the watershed after spawning and death is to provide nutrients for millions of tiny aquatic animals required to sustain hundreds of thousands of hatching salmon. I am a critical part of the food chain, eaten by such animals as bears, bad eagles, gulls and harbor seals. I am also a key indicator species in determining the heath of Pacific NW watershed.
I represent water microbes like algae, detritus, diatoms and copepods.	Part of my role in the watershed is to be food for salmon fry and macroinvertebrates like mayflies, which are consumed by young salmon.

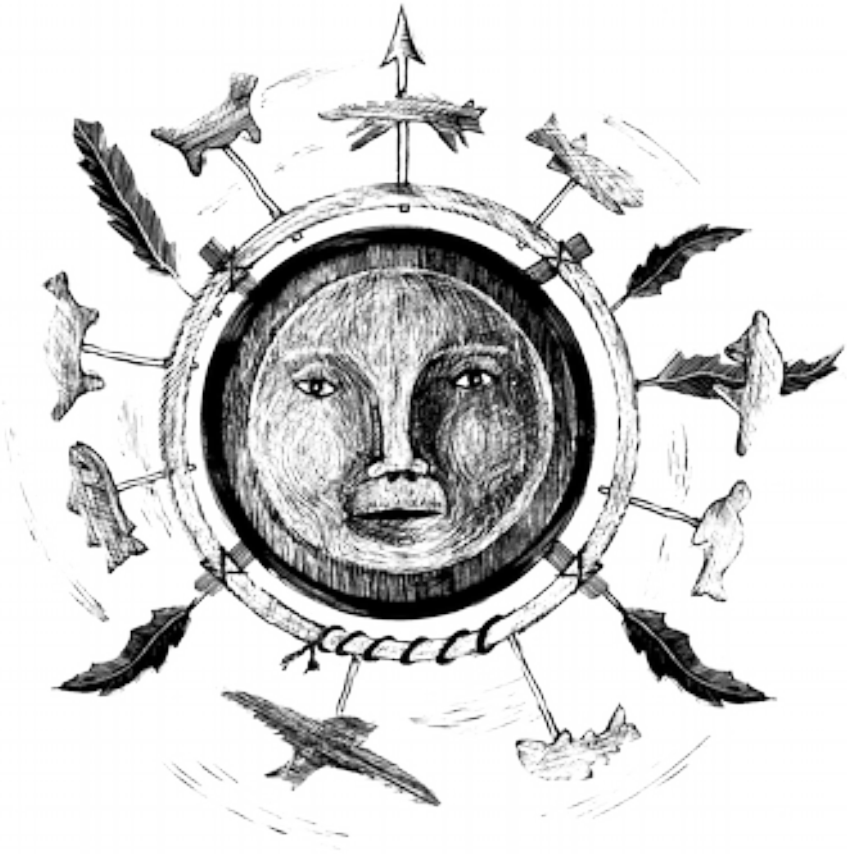
WATERSHED PART	WATERSHED ROLE
I represent waterfowl birds like grebes, herons, swans and ducks.	Part of my role in the watershed is to be critical indicators of the biodiversity and health of the watershed ecosystems.
I represent perching or songbirds like kingfishers, sparrows, robins and warblers.	Part of my role in the watershed is to eat fruits and berries from tress and plants and deposit seeds throughout the watershed.
I represent birds of prey or raptors like eagles, hawks, falcons, owls and ospreys.	Part of my role in the watershed is to help maintain the natural balance of the ecosystem by eating a variety of small animals and fish.
I represent small mammals like shrews, bats, rabbits, chipmunks, bobcats, skunk and porcupine.	Part of my role in the watershed is to invigorate the soil for plants and to be a food source for larger animals like mountain lions and birds of prey.
I represent large mammals like bear, deer, elk, mountain lion and humans.	I occupy the highest level on the food chain. I help maintain the natural balance of the ecosystem by eating a variety of small animals, fish and plants.

WATERSHED PART	WATERSHED ROLE
I represent reptiles like turtles, lizards and snakes.	Part of my role in the watershed is to be a food source for such wildlife as hawks, and help maintain the balance of the ecosystem by consuming insects and adding nutrients to the soil.
I represent amphibians like salamanders, newts, toads and frogs.	Part of my role in the watershed is maintaining the balance of the ecosystem by consuming insects and adding nutrients to the soil.
I represent beetles, worms, centipedes and millipedes.	Part of my role in the watershed is to create high soil nutrient quality through constant consumption of woody and plant materials on the forest floor.

HOW CAN THE FOLLOWING IMPACT SALMON & WATERSHED HEALTH
Over fishing
Logging practices
Agricultural pesticides
Dams
In-stream gravel mining
Agricultural irrigation
Road building and runoff
Housing and commercial development
Global warming
Acid rain
Road culverts
Livestock grazing
Household toxic wastes
Floods
Indsutrial pollution
Exotic plants and animals intrusion
El nino/El Nina
Volcanic eruption
Erosion
Overpopulation
Wetland fill

STUDENT HANDOUT 1B-1

The Sacred Circle



…Everything the Indian does is in a circle, and that is because the power of the world always works in circles, and everything tries to be round. In the old days all our power came to us from the sacred hoop of the nation and so long as the hoop was unbroken
the people flourished.

The flowering tree was the living center of the hoop, and the circle of the four quarters nourished it.

The east gave peace and light, the south gave warmth, the west gave rain and the north with its cold and mighty wind gave strength and endurance. This knowledge came to us from the outer world with our religion.

Everything the power of the world does is done in a circle.

The sky is round and I have heard that the earth is round like a ball and so are all the stars.

The wind, in its greatest power, whirls.

Birds make their nest in circles, for theirs is the same religion as ours.

The sun comes forth and goes down again in a circle. The moon does the same and both are round.

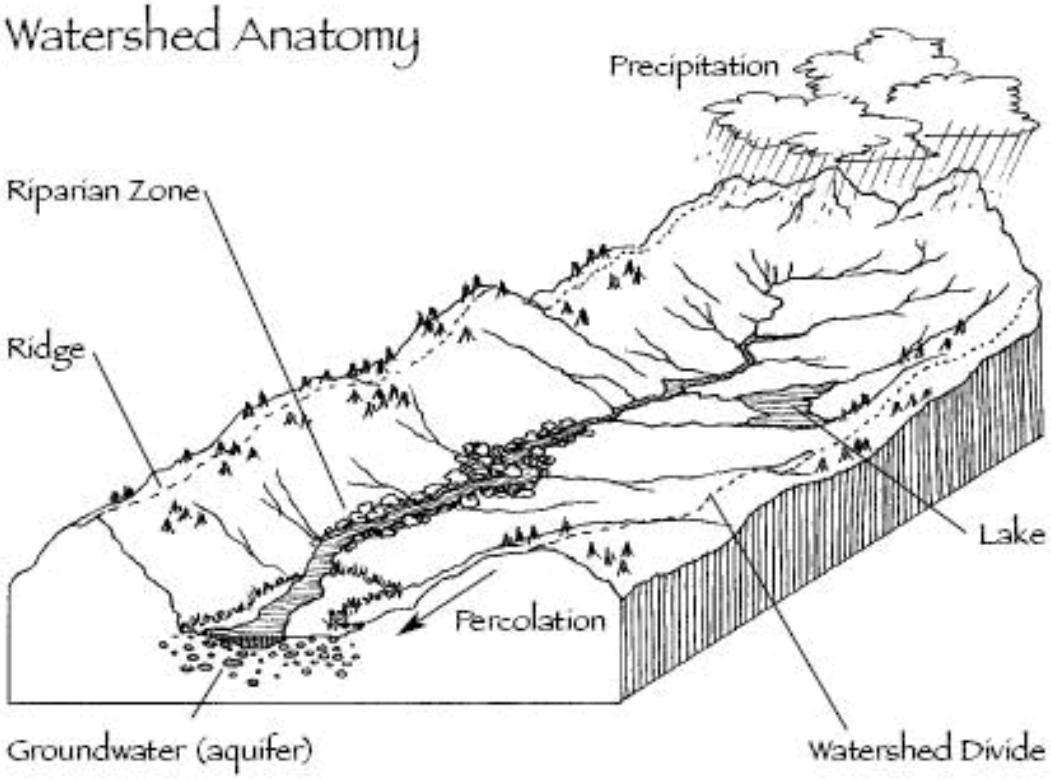
Even the seasons form a great circle in their changing and always come back again to where they were.

- Black Elk
Oglala Sioux Tribe
1863-1950

STUDENT HANDOUT B2

What is a Watershed?

All land on earth is in a watershed. Not everyone lives by a stream, but we all live in a watershed-the ultimate source of every stream. A watershed is an area of land that collects (captures) rainfall and snow melt which later flows into a stream. Many small watersheds make up the larger watershed or major rivers. Watersheds act as reservoirs storing rainwater in soil, leaves, grasses, trees and other vegetation, slowly releasing it into a river or stream throughout the year.



A watershed includes the entire area-visible and invisible-drained by a particular creek or river. The visible area is the landscape on which rain and snow fall; surface water runs off hillsides into streams and rivers or collects in lakes or in shallow depressions-marshes, swamps, bogs, sloughs, and so forth-collectively called wetlands.

The larger, invisible portion of the watershed lies beneath the surface, within the soils and rock that act like a giant sponge. There, rainwater that has infiltrated the duff or topsoil collects as groundwater above deep impermeable layers of rock or clay.

Watersheds range in size from the smallest coastal stream to huge river systems such as the Columbia, Frazer, or even the enormous Mississippi system, which drains the entire central portion of the United States.

Rivers, hillsides, mountaintops, and flood formed bottomlands are all part of one system. All are integrated with each other. Hillside shape controls the energy expenditure rate of water flow. All life in the watershed interact with and modify the energy flow through the system. So it follows that the shape of the watershed is a function of what lives there. The combination of climatic conditions, soil types, topography, vegetative cover, and drainage system define the particular character of each watershed.

Rivers do not stop at state lines. The effects of natural and human processes in a watershed are focused at its outlet, wherever it may be, even if it crosses another state or country's borders. Each watershed is a part of a larger watershed whose downstream portion may suffer from upstream influences.

Everyone who lives or works in the same watershed is interconnected, in an intimate and tangible way, with every instream animal and every other person or animal that depends on the watershed's streams and groundwater for drinking or waste removal, or for industrial processes, hydroelectric power, or irrigation. We are intimately connected, in fact, with every animal, plant, and grain of mineral in our entire watershed.

(text adapted from Adopt-a-Stream Handbook & Stream Scene)
(image courtesy of National Environmental Education Foundation)