



Navigating the Chehalis River Surge Plain

.....
Teacher's Guide to the
Chehalis River Surge Plain
Natural Area Preserve
.....

4th to 8th Grade



WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

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Prepared by the
Natural Areas Program
Asset Management and
Protection Division

Acknowledgements

Cover Photos

(Counterclockwise)

Basketmakers like this **Lower Chehalis woman** turned the dried leaves of the cattail into artful tools and trade items. Photo courtesy of Special Collections Division, University of Washington Libraries. Negative No. 4003

Marsh wren lives among cattails and wetland grasses. Its song is a chattering, bubbling trill. Photo by A. Morris/Vireo.

Trillium ovatum

DNR Photo Files

Students at Natural Area Interpretive Site

Janet Pearce / DNR

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Audubon Society

The Audubon Society's mission is to seek a sustainable balance between human activity and the needs of the environment and to promote enjoyment of birds and the natural world.

The Chehalis Basin Education Consortium

The Consortium's mission is to foster and support better stewardship of the Chehalis River Basin through environmental education that will lead to sustainable watershed health, functions and economic uses.

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Introduction

GINA BLUM



The Washington State Department of Natural Resources (DNR) manages about 3 million acres of state-owned trust lands. These forests, agricultural lands and commercial properties earn income to build schools, universities and other state institutions, and help fund local services in many counties. In addition to earning income, trust lands provide habitat for native plant and animal species. They also protect clean water and offer public recreation and education opportunities statewide.

DNR is steward of more than 2.4 million acres of aquatic lands, primarily submerged lands such as tidelands and bedlands under Puget Sound and the coast, and navigable lakes and rivers. These aquatic lands are home to fish and wildlife, provide commerce and navigation, and offer access to all the people of the state.

DNR also protects nearly 119,000 acres of the state's finest natural ecosystems as Natural Resources Conservation Areas and Natural Area Preserves.

NATURAL AREAS PROGRAM

Among the mosaic of diverse lands managed by DNR are natural areas—protected islands of Washington's unique or rare native plant and animal communities. In the past 100 years, the state's landscape has changed with the proliferation of homes, farms and industries. Natural areas are lands that have been selected and acquired to protect remaining high quality, mostly-undisturbed native ecosystems or scenic gems that offer opportunities for education and scientific research.

DNR is manager and steward of more than 31,000 acres in 51 preserves scattered throughout the state. These Natural Area Preserves (NAPs) provide the highest protection for fragile ecosystems and outstanding features, including native forests and grasslands, bogs and sagebrush communities. They are habitats for Washington's rare plant and animal species and are open for research and education. DNR also manages nearly 88,000 acres in 30 Natural Resources Conservation Areas (NRCAs) statewide that protect ecosystems, scenic vistas and landmarks, and provide access for education and hiking.

CHEHALIS RIVER SURGE PLAIN NATURAL AREA PRESERVE

The Chehalis River Surge Plain Natural Area Preserve, managed by DNR, is one of the largest, highest quality wetland ecosystems of its type in Washington. It is located where the daily tidal waters of the Pacific Ocean surge through Grays Harbor and meet the fresh waters of the Chehalis River. Spruce and many other trees and bushes that thrive in moist conditions and moderate climates are draped with mosses and lichen. The surge plain is home to diverse plants and animals year round, and supports migratory birds from early spring through late fall. Some are protected species such as the bald eagle and the Olympic mudminnow. Other species are declining, such as the band-tailed pigeons, while others are plentiful and typical of northwest wetlands, such as skunk cabbage, Sitka spruce and lady fern.

The entire surge plain is composed of about 2,640 acres of meandering sloughs and islands in the river. And much like other wetlands, it acts as an enormous "sponge" that helps minimize flooding downstream.

Introduction (Continued)

NAVIGATING THE CHEHALIS RIVER SURGE PLAIN TEACHER'S GUIDE

This interdisciplinary educational guide is designed to help teachers and their students explore one of our state's outstanding natural areas, the Chehalis River's unique tidal surge plain wetland. Activities provided in this guide help students explore the estuary environment where fresh and salt water systems come together, and understand the importance of wetland functions.

INTERPRETIVE TRAIL

There are more than a dozen interpretive signs along the rustic trail, which starts from the Preacher's Slough Road trailhead. The trail is not a loop, and is 1/2 mile each way. Amenities at the trailhead include a small parking lot that accommodates a few cars and a school bus; an ADA parking spot; barrier-free compact gravel trail; and a vault toilet. Visitors need to bring their own drinking water.

The interpretive signs relate stories that can be used to facilitate discussions about historical and environmental influences on the surge plain, including:

- ▶ The formation of the surge plain
- ▶ The plants, fish and animals that depend on the various wet areas of the winding slough
- ▶ The people who have lived, fished, gathered and built here
- ▶ How the elusive band-tailed pigeon relies on the surge plain

At the end of the interpretive trail is a large observation deck overlooking a channel of the slough and a recently restored surge plain wetland. At this spot, teachers can easily discuss with their students this unique wetland habitat.

For a longer walk, a rough-surfaced interpretive trail continues for an additional three miles along Blue Slough. Allow approximately 20 minutes for the 1/2 mile interpretive trail and two or more hours to hike the interpretive and extended trail and back.

HOW TO USE THE ACTIVITIES

Field visits tied with classroom learning help make lessons more relevant and have a significant impact on student learning. To this end, this teacher's guide contains:

- ▶ Pre-site visit activities that set the stage for understanding wetland issues and functions,
- ▶ On-site visit activities that deepen awareness and knowledge of the wetland, and
- ▶ Post-site visit activities that help synthesize experience and knowledge.

For more information and to schedule a trip to the surge plain, call Birdie Davenport, DNR Natural Area Manager at 360-577-2025.



JANET PEARCE

Pre-Site Activities

Teacher's Guide to the
Chehalis River Surge Plain
Natural Area Preserve

4th to 8th Grade

Chehalis River Surge Plain | Site Map and Driving Directions

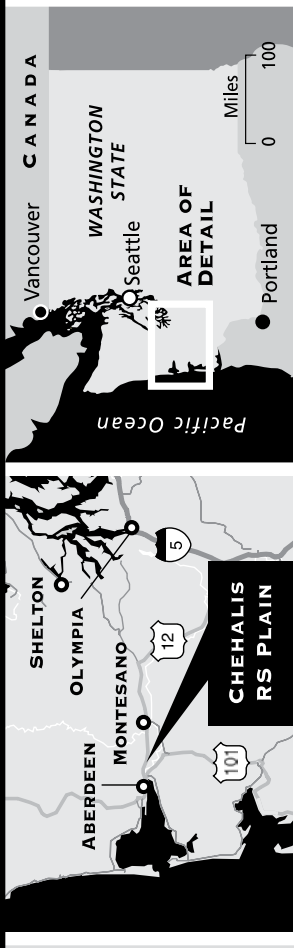
From Montesano (or I-5 via Highway 8)

From the US 12/107 junction, go south and west on 107 for 3.9 miles. Turn right at Preachers Slough Road. Drive past the trailhead to the parking area on the left.

From Cosmopolis

From east city limits, head southwest on US 101 for 3.6 miles. Turn left onto 107; travel 4 miles. Turn left on Preachers Slough Road. The parking area is past the trailhead and to the left.

-  Accessible Trail
 -  Trail
 -  Interpretive Sign
 -  Viewpoint
 -  Toilet
 -  Accessible
- Total Trail Length:
3.5 miles
(5.6 Km)



You are here

Background Information



GINA BLUM

Estuarine and coastal wetlands are considered by many to be the most productive ecosystems in the world. They also are the most ecologically diverse and seriously threatened ecosystems on the Pacific Coast.

Referred to as “nurseries of the sea,” estuaries provide transition areas for salmon to travel to and from the ocean, food sources for fish and marine mammals, and resting and refueling areas for resident and migratory birds. Nearly 500 fish and wildlife species rely on wetlands for part or all of their life cycles.

Estuaries have historically also been popular places for development. Two-thirds of the world’s population lives within 50 miles of a coast. Since the early 1800s, Washington’s urban areas have lost between 90 and 98 percent of coastal wetlands.

Because the value of wetlands and their overall environmental importance have been recognized only recently, the nation has a 200-year history of wetland conversion. Today, there is heightened awareness and knowledge of the important roles wetlands play, resulting in increased protection for remaining wetland and estuarine ecosystems.

Coastal wetlands provide critical habitat for a large variety of plants and animals that are specially adapted to the mix of fresh and salt water. Flooded with nutrients and plant debris from the sea and from the river, coastal wetlands are prime nurseries for many species of fish, shrimp and crab. Some wetland inhabitants that depend on these small organisms and animals supporting the food chain include larger fish, otters, raccoons and nesting waterfowl.

Freshwater wetlands also thrive with microscopic to large lifeforms. Not only do wetlands provide wildlife habitat, they also filter out pollutants, buffer inland areas from storm, wave and flood damage, and support food production for humans. Wetlands provide habitat for 75 percent of the state’s commercial fish and shellfish.

The Chehalis River Surge Plain Natural Area Preserve is a large wetland area at the lower end of the Chehalis River, just upstream from where the river empties into Grays Harbor. Sitka spruce and western red cedar thrive in the wet soils where fresh and salt water mingle. The Preserve contains the largest and best quality tidal surge plain wetland in the state. The site protects sloughs that are



▲ Blue Heron

Background Information | Cont.



▲ Lower Chehalis Indians used shovel-nose canoes for traveling and fishing on the river. The shovel-nose canoe has curved ends that push swiftly flowing water away from the prow. Shovel-nose canoes were rarely taken beyond Cosmopolis because they were considered unsafe for ocean travel.

important for sheltering young salmon and other fish. The surge plain also supports osprey, bald eagles (a federally threatened species), and Olympic mudminnows (a state sensitive species).

The wetland acts as a sponge within the landscape that spreads out the water and controls flooding naturally. Altering this wetland function can cause the water to overflow in areas that were once safe from flooding.

The soils are constantly soaked by fresh water from the sloughs. Special wetland plants thrive in this type of habitat. Characteristics typical of wetland plants are hollow stems that can stand up in very moist soil, such as cattail; shallow-rooting systems, such as Skunk cabbage; or wide bottomed stems that can stand in very wet soil, such as Sitka spruce.

The riparian area is the vegetated zone near the banks of water such as streams, sloughs, rivers and lakes. Riparian zones are one of the most critical areas for protecting waterways. The native plants in riparian areas absorb pollutants and sediment that run off the land.

The Chehalis River area has a rich history of human use. The Lower Chehalis Indians were attracted to the surge plain to fulfill many of their needs. For example, the inner core of cattail was ground into flour, and the fluff from the mature flower heads was used to fill bedding and diapers. Other parts of the plant were used as artful tools and trade items.

The area also supported pioneer settlement and logging. Many pilings still exist in the sloughs and main river channels throughout the surge plain, remnants of an intricate network of

log booms built to hold huge rafts of timber harvested from the surrounding forests. The area has experienced little development because of the very moist conditions and flooding.

Wetland weeds pose a serious threat to the Chehalis River system. Some of the species are well-established, others have recently invaded, and one species is present farther upriver but has not yet been found in the surge plain.

Purple loosestrife (*Lythrum salicaria*) is a threat to the surge plain ecosystem because it has the ability to crowd out native plant species and form solid stands along riverbanks and in low areas. This weed has invaded certain areas of the Chehalis River, but most of the surge plain currently is in good condition and needs to be protected from new invasions.

Parrot feather (*Myriophyllum aquaticum*) is an aquatic weed that was recently discovered in the Chehalis River near Centralia. This weed most likely came from people dumping their unwanted aquarium plants in the river. Parrot feather grows in slow moving or stagnant water, such as sloughs. It changes the river ecosystem by altering the temperature of infested waters, which could cause problems for fish that need cool water.

The surge plain is protected for the native plants and for the animals that rely on those plants. This protection provides opportunities to study a natural ecosystem that has not been seriously altered or destroyed. Today, the surge plain offers a unique and wonderful place to explore, learn and enjoy.

Be Prepared



FIELD TRIP ORIENTATION

Before taking a field trip, it is helpful to discuss with students where you're going and what you'll see. The map on page 10 will help give the class a sense of direction and scale, as well as show the length of the interpretive hike.

There is one vault toilet at the trailhead next to the Preacher's Slough parking area, and there is parking for several cars and one bus. This Natural Area Preserve **does not have drinking water available**, so consider bringing some from school. Also, there is no public telephone on site. Cellular phone service may be available, depending on service provider. The parking lot marks the beginning of the interpretive trail.

APPROPRIATE CLOTHING

Discuss with the class the importance of wearing layers of clothing when going on a long walk outside. It may be cool in the morning but warm in the afternoon. Layers of clothes will allow for many types of weather conditions and unanticipated weather changes. Depending on the time of year,

WHAT TO BRING

- ▶ Clipboards (along with a large bag to cover clipboard if it rains)
- ▶ Pencils (pens will not work on wet paper)
- ▶ Journals
- ▶ Drawing paper
- ▶ Plastic bags for trash/gloves for picking up trash
- ▶ First Aid Kit
- ▶ Binoculars/Cameras
- ▶ Cellular Phone
- ▶ Drinking water
- ▶ Plant, bird and animal identification books

raingear may be necessary. Also, encourage students to wear comfortable shoes for walking on a trail. Sandals and dress shoes are not appropriate. The trail is 1/2 mile each way.



Outdoor Manners

LUIS PRADO



Explain to the class what a Natural Area Preserve is (see the Introduction and Background Information).

It is a special place designed to protect rare or uncommon plant and animal habitat.

What behavior is appropriate for this Natural Area Preserve? It differs from a park, because the primary purpose of the preserve is to protect special plants, such as the trillium and animals such as the band-tailed pigeon, whereas parks, school grounds and backyards are meant for recreation and playing.

When visiting a natural area, calm, observant behavior is appropriate. Good manners are key to seeing the unexpected. Ask students to share or write on the board what they think might be appropriate behavior for this site.



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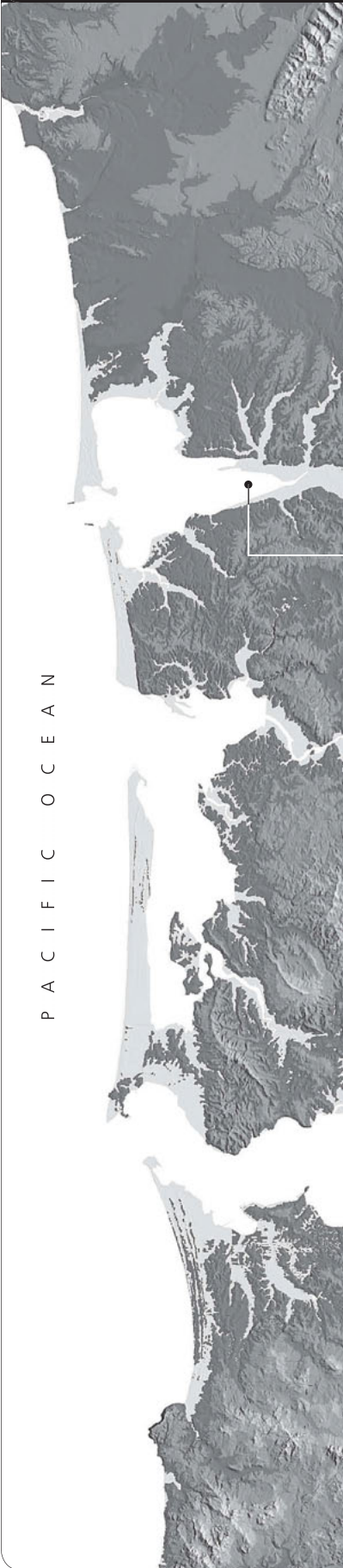
▲ Yellow-rumped Warbler



Have each student draw a picture of different activities that are appropriate in different places and write a statement about it. Behavior in an NAP could be contrasted with behavior in parks, schoolyards or their own backyard. They can also create an outdoor manners book to share with younger students.

As guests in this habitat the students are expected to act accordingly:

- ▶ Stay on the trail. Taking shortcuts can cause damage to plants. Also avoid steep banks.
- ▶ Carry out your trash and, if possible, take out litter that might have been blown in or left by others. Plants are to be viewed and explored, but not picked.
- ▶ Please speak softly. Loud noises scare away wildlife that the students came to experience.
- ▶ Respect wildlife; do not harass any living creatures.
- ▶ Throwing things, such as rocks and sticks, could scare animals and possibly hurt fish and other wildlife.



Glossary

Aquifer—a formation of permeable rock, gravel or sand that contains or conducts groundwater and provides a source of water for wells and springs.

Biodiversity—the variety of plants and animals and the ever-changing ecological world in which they live.

Chehalis—this term is used to describe a local tribe and means shining sands.

Ecosystem—all living things linked together by energy and nutrient flow in an area of any size.

Estuary—an area in a bay or river mouth where salt water mixes with fresh water.

Ethnobotany—the study of how and why humans use plants in their local environment.

Habitat—an area that provides an animal or plant with adequate food, water, shelter and living space.

Migration—a group of birds or other animals moving to another region or climate during the change in seasons.



Navigable Waters—waters that are deep and wide enough to allow boats to pass through.



▲ Purple Loosestrife
 enemies to compete with or to control aggressive growth.

Noxious weeds—non-native plants introduced through human actions that have no natural



Pollutants—harmful chemicals or waste materials that have been released into the water, land or air.

Riparian Area—the vegetated zone along the banks of streams, rivers, wetlands and lakes.

Sediment—soil, sand, and minerals on land, sometimes washed into water after a rain.

Slough—a slow-moving side channel off of a river that contains deep mud or mire.



Surge Plain—a unique area where tidal salt water surges or pushes fresh water out over wetlands.

Watershed—The area of land that drains into one body of water, such as a river, lake or bay.

Wetland—an area where water covers the soil or is present near the surface of the soil almost year-round. It contains soggy soil and special plants adapted to survive in that soil.

Wetlands Match-Up

- ▶ Copy the Background Information and Glossary at the beginning of this section to give to your students.
- ▶ Go over the Glossary list with the class. Have students look up alternative definitions of the Glossary words in a dictionary.
- ▶ The Glossary list can also be used as a spelling test to help students prepare for the Wetlands Match-up activity on the following page.

JANET PEARCE



ANSWERS TO THE WETLANDS MATCH-UP

- 1 **E** Chehalis
- 2 **A** Wetland
- 3 **L** Slough
- 4 **F** Riparian area
- 5 **D** Surge Plain
- 6 **H** Aquifer
- 7 **G** Biodiversity
- 8 **M** Navigable waters
- 9 **N** Sediment
- 10 **C** Watershed
- 11 **J** Habitat
- 12 **K** Migration
- 13 **I** Pollutant
- 14 **B** Estuary
- 15 **O** Noxious Weeds
- 16 **Q** Ethnobotany
- 17 **P** Ecosystem



RELATED WEB LINKS

from the National Audubon Society - What is a wetland anyway?:

<http://www.audubon.org/campaign/wetland/ecosystem.html>

from Office of Wetlands, Oceans and Watersheds from Environmental Protection Agency:

<http://www.epa.gov/owow/>

from National Estuary Program:

<http://www.epa.gov/nep/>

from Beavers: Wetlands and Wildlife Home Page:

<http://www.beaversww.org/>

Wetlands Match-Up

GINA BLUM



Match each vocabulary word (left column) with the correct definition by putting the letter in front of the word next to its meaning.

- A** Wetland
- B** Estuary
- C** Watershed
- D** Surge Plain
- E** Chehalis
- F** Riparian area
- G** Biodiversity
- H** Aquifer
- I** Pollutant
- J** Habitat
- K** Migration
- L** Slough
- M** Navigable Waters
- N** Sediment
- O** Noxious weeds
- P** Ecosystem
- Q** Ethnobotany

- 1** ____ the name of a local tribe, which means shining sands.
- 2** ____ areas where water covers the soil, or is present near the surface of the soil almost all year and supports special plants that can survive in soggy soil.
- 3** ____ a slow moving side-channel off of a river that contains deep mud or mire.
- 4** ____ the vegetated zone near the banks of water such as streams, sloughs, rivers and lakes.
- 5** ____ a unique area where the saltwater tidal current surges or pushes fresh water out over wetlands.
- 6** ____ a source of groundwater for wells and springs.
- 7** ____ the variety of plants and animals and the ever-changing ecological world in which they live.
- 8** ____ waters that are deep and wide enough to allow boats to pass through.
- 9** ____ soil, sand, and minerals washed from land into water, usually after a rain.
- 10** ____ the area of land that drains into one body of water, such as a river, lake or bay.
- 11** ____ an area that provides an animal or plant with adequate food, water, shelter and living space.
- 12** ____ a group of birds or other animals moving to another region or climate during the change in seasons.
- 13** ____ harmful chemicals or waste materials that have been released into the water, land or air.
- 14** ____ an area in a bay or river mouth where salt water mixes with fresh water.
- 15** ____ non-native plants introduced through human actions that have no natural enemies to compete with or to control aggressive growth.
- 16** ____ the study of how and why humans use plants in their local environment.
- 17** ____ all living things linked together by energy and nutrient flow in an area of any size.

Wetlands Metaphors

MATERIALS

A large pillowcase, bag, or box to hold the following items:

- ▶ sponge
- ▶ small pillow
- ▶ soap
- ▶ eggbeater or mixer
- ▶ small doll cradle
- ▶ sieve or strainer
- ▶ paper coffee filter
- ▶ antacid tablets
- ▶ small box of cereal

OUTCOME

Students will describe the characteristics of wetlands and demonstrate their understanding of the importance of wetlands to wildlife and humans.

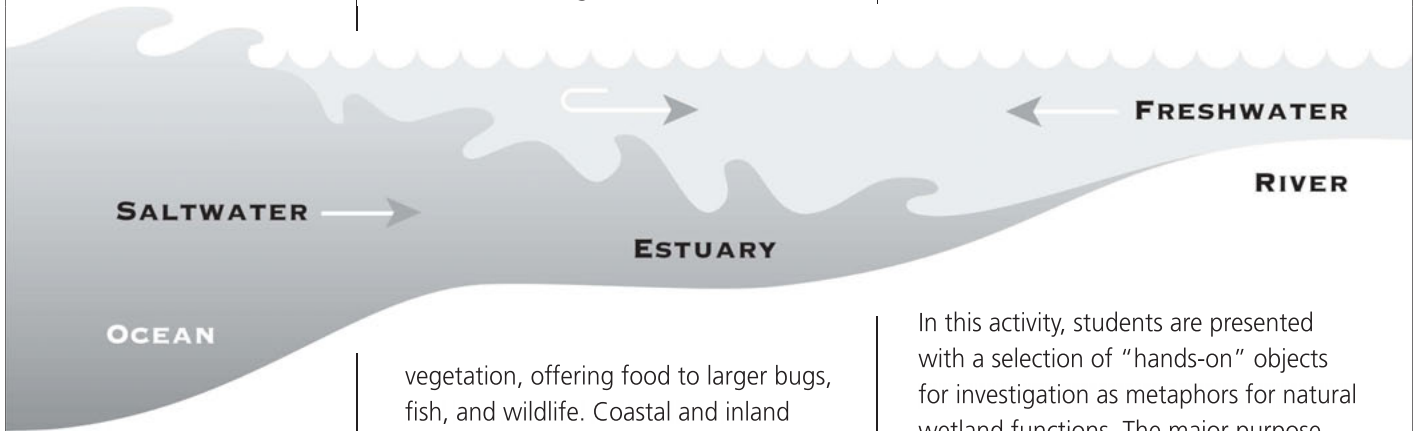
BACKGROUND

“Wetland” is a general category for many different kinds of wet areas, including freshwater and saltwater marshes, wet meadows, swamps, bogs and other places in the landscape where water collects year-round or intermittently. Wetlands are uniquely important to plants, animals, people and the surrounding environment.

Because of the abundance of food, vegetative cover (shelter) and water found there, most wetlands are rich with diverse species of fish and wildlife. In coastal estuaries and marshes—such as Willapa Bay—millions of microorganisms live in the mud, grasses and other

up the river and sloughs, the fresh water is pushed up and out, and spreads throughout the surge plain into the marsh areas and often up into the grassy upland areas.

During torrential floods, water slows as it reaches the surge plain, spreading through the miles of side channels and acres of marshes, grasses and shrubs. Floodwater soaks the wetland plants, sediments settle, and the thick organic soil soaks up all it can. Water is stored in the plants and soil so when the tide comes in, the amount of flooding in areas surrounding the surge plain is reduced.



vegetation, offering food to larger bugs, fish, and wildlife. Coastal and inland marshes provide year round habitat as well as breeding, resting and wintering habitats for hundreds of thousands of migratory birds.

The surge plain is part of the estuary, with rich mud in its sloughs and diverse vegetation that supports many animals.

Because ocean water contains salt, it is denser than fresh water and is therefore heavier. As the ocean tidal waters surge

In this activity, students are presented with a selection of “hands-on” objects for investigation as metaphors for natural wetland functions. The major purpose of this activity is for students to develop an appreciation and understanding of wetlands through the power of metaphor, linking the characteristics and natural functions of wetlands to familiar objects of everyday life.

CONTINUED ON NEXT PAGE

Wetlands Metaphors



▲
Mystery
metaphor container

PROCEDURE

- ▶ Prepare a "Mystery Metaphor Container" (pillowcase, bag or box). It should be possible for a student to put his or her hand into the container to pull out an object.
- ▶ Discuss the varieties of wetlands found in your local area. Ask students to imagine what the environment is like in a wetland. Then invite them to share or write on the board what they think wetlands look like. They can describe a wide range of elements from the plants and animals to the smells and sounds that are found in wetlands.
- ▶ Using their list as a point of reference, help students identify which plants and animals are most likely to be found in a wetland.
- ▶ Bring out the "Mystery Metaphor Container" and tell the students that everything in the container has something to do with a wetland. Have students divide into groups of four. Announce that when it is their turn, you want a representative of each group to draw an object from the container. Then, as a group, they must figure out how the object could represent what a wetland is or does.
- ▶ Ask each group to report their ideas to the class.

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METAPHORIC OBJECT	WETLAND FUNCTION
Sponge	absorbs excess water caused by runoff; retains moisture even if standing water dries up (e.g., sponge placed in a small puddle of water absorbs water until saturated, then stays wet after standing water has evaporated).
Pillow	is a resting place for migratory birds.
Mixer/egg beater	mixes nutrients and oxygen into the water.
Cradle	provides a nursery that shelters, protects and feeds young wildlife.
Sieve/strainer	strains silt, debris, etc., from water.
Coffee filter	filters smaller impurities from water.
Antacid tablets	neutralize toxic substances.
Honey Nut Cheerios	provides nutrient-rich foods.
Money	provides value to humans in flood control services, pollution filtration, production of fish and wildlife



RELATED WEB LINKS

from Discover Wetlands from Washington State Department of Ecology:
<http://www.ecy.wa.gov/programs/sea>

Going with the flow

OUTCOME

Students will demonstrate how water flows through the watershed and will understand the effects people can have on water quality and water quantity.

MATERIALS

- ▶ One 8.5 x 14 inch piece of paper and one 8.5 x 11 inch piece of white paper for each student.
- ▶ Three different colors of non-waterproof markers; these markers must run when made wet.
- ▶ Several spray bottles of water.

An alternative would be to use three different colors of Kool Aid and mix them separately in three spray bottles.



TOURISM

▲ Manure from cattle, horses, or other livestock poses a significant threat to water quality.

PROCEDURE

Rain and melting snow travel through the watershed, from the highest peaks to the lowest points in the landscape, forming lakes, rivers, bays and wetlands. Along the way, sediments and dissolved minerals are picked up, carried by the water, and deposited in these bodies of water. Pollutants are also picked up, carried and deposited by flowing water.

- ▶ Discuss with your students that a watershed is an area of land from which rain and snow drains into one body of water, such as a river, lake or bay. All students live in a watershed.
- ▶ Have students read the Background Information (p.19). Discuss what makes a healthy wetland. Native wetland plants that live in the moist soil, such as skunk cabbage and cattails, soak up contaminants and help purify the water.
- ▶ Ask your students if they think farming would be successful in areas such as the Chehalis River Surge Plain. Why or why not?

Due to the constant water flow inside the wetland, the soils are very moist and in the past, many crops, such as corn and potatoes, could not grow successfully.

However, certain types of plants, such as skunk cabbage, can grow in wet



areas such as these. What adaptations have plants made for these wet conditions? For example, the hollow stems in cattails can withstand very moist soil.

There are several factors that influence wetlands. Human effects usually have the most negative impact. Discuss with your students the effects humans have on watersheds.

What simple choices can we make in our daily activities to protect the quality of water that we drink and the water that fish and other wildlife rely upon?

SOME EFFECTS FROM HUMAN ACTIVITIES INCLUDE

- ▶ Fertilizers, pesticides, cow manure and failing septic tanks are sources of pollutants that can flow down river. A healthy wetland can soak up some of these and other pollutants, including sewage waste, toxic substances and silt.
- ▶ Invasive noxious weeds, such as purple loosestrife and parrotfeather, can crowd out native vegetation. These weeds can clog waterways and change the path of water and increase the chance of flooding.
- ▶ Building dikes to help prevent damage from flooding in certain areas often causes flooding elsewhere.
- ▶ Development and impervious surfaces cause rainwater to flow faster and in greater amounts to the wetland, picking up and carrying pollutants along the way.

CONTINUED ON NEXT PAGE

Going with the flow



Build a watershed model and mark its relevant points with water-soluble markers. Then lightly spray the model with water.



PROCEDURE

- 1** Crumple up the 8-1/2 x 11 inch piece of paper into a tight ball. Don't flatten it out completely, but gently open up the paper, using the 8-1/2 x 14 inch piece of paper under the spraying area as a drip pan. The highest points on the crumpled paper represent mountaintops, and the lowest wrinkles represent valleys.
- 2** Choose one color of water-soluble marker and use it to mark the highest points on the map. These points are the mountain ridgelines.
- 3** Choose a second color to mark the places where there are different bodies of water such as a creek, river, lake or estuary.
- 4** With a third color mark four to five places representing human settlements: houses, shopping centers, office buildings, schools or grocery stores.
- 5** Use the spray bottles to lightly spray the finished watershed model. (This step requires very little water.) The spray represents rain falling into the watershed. Discuss any observations about how water travels through the system.

QUESTIONS

- 1** Besides the water turning color, what happened when water was sprayed on your watershed model?
- 2** What happened to the water that fell on ridge tops? What path did the water follow?
- 3** Define the term "watershed." How many watersheds formed on your model?
- 4** Visualize your model as an actual land form. Did any lakes, rivers or streams form on your model? On another piece of paper, draw a portion of your model as a landscape with lakes, rivers and streams.
- 5** Did you place the human settlements in stable and secure locations? What would indicate whether you did or didn't? Were there any buildings in the path of the flowing

water? What might happen to buildings that are in the way of a raging river or a washed-out hillside? How would the flow of water through a watershed affect your choice of building sites?

- 6** How might the water flow affect salmon? (Are there salmon in your watershed? Or did there used to be? If so, have they been affected in some way?)
- 7** Seeing the rainwater "wash" over the spots representing houses, shopping centers and farms, and seeing the water "change color," how might pollutants near the top of the watershed affect land near the bottom of the watershed?
- 8** How is your watershed model like the watershed that you live in? How are they different? Where does your local watershed begin or where are its headwaters? Into what body of water does your watershed ultimately drain?



RELATED WEB LINK

from the California Association of Resource Conservation Districts:
<http://www.carcd.org/wow/wow.htm>

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SOCIETY FOR ENVIRONMENTAL EDUCATION

▲ Canadian Goose

MIGRATING BIRDS THAT RELY ON THE SURGE PLAIN

- ▶ Canadian Goose
- ▶ Turkey Vulture
- ▶ Barn Swallow
- ▶ Common Raven
- ▶ Varied Thrush
- ▶ Ruby-crowned Kinglet
- ▶ Yellow-rumped Warbler
- ▶ Townsend's Warbler
- ▶ Evening Grosbeak

OUTCOME

The purpose of this activity is to demonstrate how birds survive and why places like natural areas are needed for their survival. Natural areas are places that birds can go to rest, eat, sleep or just survive.

Migratory birds need places to rest and feed. Some of the longest migrations are made by shorebirds that nest in the arctic tundra of northernmost Canada and winter as far as the southernmost part of South America, a one-way distance of up to 10,000 miles.

PROCEDURE

- ▶ Have students think of going on a long car trip. What do you need? You will need a rest stop, food, water, a place to sleep at night, and protection. How do migratory birds use the surge plain? What parts of the surge plain ecosystem do they use?
- ▶ Using the map on the following page, show your students the various pathways that a migratory bird might take.
- ▶ Assign a migrating bird from the list to the left to each student or to small groups of students to research. Have students write a story about the assigned bird, answering

questions such as what is their bird's travel pattern, where does it stop to sleep, what does it eat along the way, what months of the year does it travel, how far does it fly, and where does it spend most of its time? In addition to visiting the surge plain, does the bird visit a local wildlife refuge such as Nisqually Wildlife Refuge or Bowerman Basin?

CONTINUED ON NEXT PAGE



JANET PEARCE



RELATED WEB LINKS

National Wildlife Federation:

<http://www.nwf.org/>

National Wildlife Federation:

<http://www.nwf.org/backyardwildlifehabitat>

Cool Quiz Network:

<http://www.coolquiz.com/trivia/explain/docs/birds.asp>

Grays Harbor Audubon Society:

<http://www.ghas.org/birdspot.html>

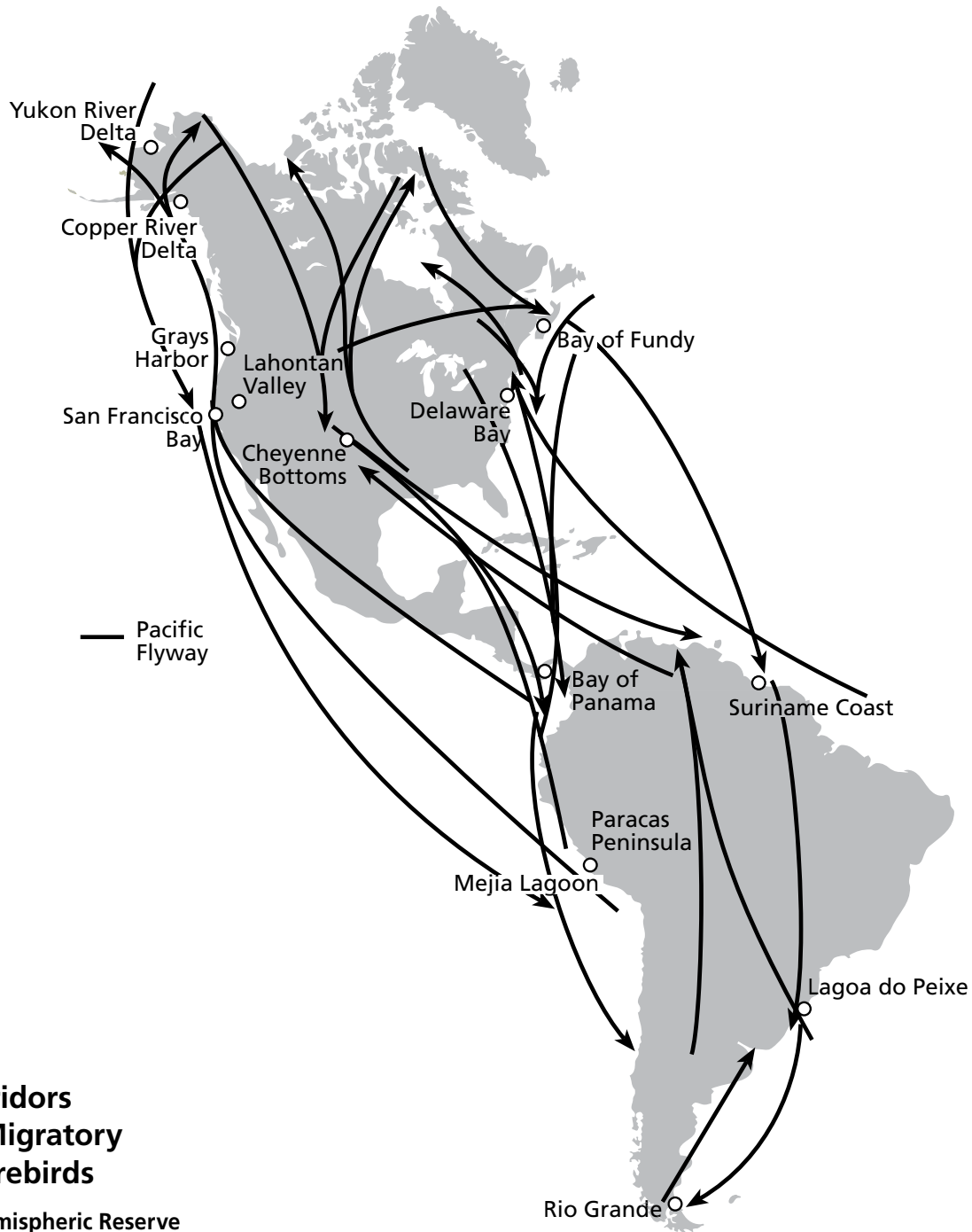
Bowerman Basin area for birding:

<http://www.ghas.org/bowerman.html>

Birder's World Magazine:

<http://www.birdersworld.com>

Migrating with the Change of Seasons



Corridors of Migratory Shorebirds

○ Hemispheric Reserve

Consists of either 250,000 birds or at least 30 percent of a species moving along a corridor.

DATA SOURCE: AMERICAN SCIENTIST, VOLUME 75.

Salt Marsh Players



▲ Washington's rivers are corridors for the flow of nutrients, sediments and fish.

MATERIALS

- ▶ Photos, slides or a video of salt marshes and organisms that live in the salt marsh (optional)
- ▶ Copies of the *Salt Marsh Players* Character Cards (make duplicates for larger classes)
- ▶ 4"x 6" index cards
- ▶ Glue
- ▶ Scissors
- ▶ String
- ▶ 2 cardboard tubes (such as paper towel tubes)
- ▶ Blue cloth, or a piece of blue ribbon approximately 12 feet long and 1 foot wide (use the paper towel tubes to roll the cloth like a scroll)
- ▶ Soap bubble bottle and bubble maker

OUTCOME

By physically enacting behavioral strategies of salt marsh organisms encountering high and low tides, students are introduced to the complex and interrelated world of animal and plant adaptations. Students will demonstrate how various salt marsh plants and animals adapt to environmental conditions. They will recognize various plants and animals that live in salt marshes.

BACKGROUND

Salt marshes are grassy wetland habitats that occur within temperate estuarine environments. In the United States, marshes exist on the Atlantic and Pacific coasts and the shores of the Gulf of Mexico. They are part of the intertidal zone (the area between high and low tide) and are flooded once or twice a day by incoming tides.

The dominant plants of a salt marsh include grasses and algae. These plants seasonally die and regenerate, adding tremendous amounts of detritus (decaying organic matter) to the food chain. Scavengers and bacteria break down the detritus into nutrients and minerals. These provide the nutritional foundation for a complex food web, including fish, crabs, shellfish and larger animals.

The pulsing action of tides delivers and distributes nutrients that plants and animals can consume. The comings and goings of tides also pose great challenges to salt marsh life. Regularly, a salt marsh is flooded with salt water during high tide. When the tide recedes, the land becomes exposed, and fresh water runoff often flows through the marsh. Not only are organisms exposed to varying degrees of moisture but also changes in salinity and temperature. In the case of the surge plain, the saltwater surge of the tide pushes the fresh water to the

top and it then spreads out over this vast wetland.

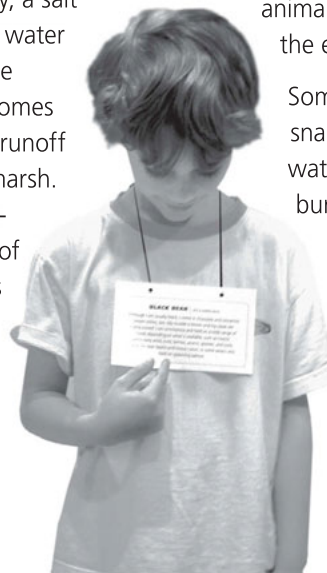
This produces an obvious distribution of plants and animals that are adapted to specific conditions within the marsh. This situation is called zonation and is often described as:

- ▶ High Marsh—covered briefly each day by the tides, and
- ▶ Low Marsh—beneath the level of the tide for many hours each day.

The area that is never exposed to the air is called the subtidal zone. Both the high marsh and low marsh comprise the intertidal zone.

This altering environment requires resident plants and animals to adapt, both physiologically and behaviorally. Changes in physiology, like marsh plants' ability to excrete salt, have evolved over long periods of time. Behavioral responses, like crabs burrowing into the mud at low tide, allow animals to adapt quickly to changes in the environment.

Some salt marsh species, like marsh snails, move away from incoming water. Others retreat into underwater burrows and remain inactive during high tides. Still others adjust their activities to suit the varying degrees of salinity or temperature. Salt marsh residents may have to adapt to both water and land conditions within the same day!



CONTINUED ON NEXT PAGE

Salt Marsh Players



▲ Blue Heron

PROCEDURE

- ▶ Ask students to list human behavioral responses to environmental change. What do we do in response to heat or cold? How do we prepare for a flood, cope with lack of food, or respond to physical pain?
- ▶ Have the class brainstorm some obvious behavioral adaptations of common animals to the environment (pet dogs begging for scraps from the table, cattle seeking shade, birds migrating away from extreme cold or hot conditions).
- ▶ Describe, display pictures of, or show a video of salt marshes and the organisms that reside there. Have students list some basic characteristics of the salt marsh and some plants and animals they think may live there. Explain that the marsh is flooded by the tide each day. Have students list ways they think plants and animals adapt to life in the salt marsh.

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STEPS TO FOLLOW

- 1** Hand each student a Salt Marsh Player Character Card, string, and a large index card. Ask students to read the cards and draw a picture of their character on the index card. Glue the pictures to one side of the index cards and the descriptions to the other, punch two holes, and thread the string so that the cards can be worn around the neck.
- 2** Designate a section of the classroom, at least 12 feet x 15 feet. One end of the area will be a body of water (subtidal zone), and the other end is upland. The marsh is located between the two. Low marsh lies near the subtidal zone and high marsh near the upland.
- 3** Ask the water characters to unroll the scroll of water and take their places at low tide. Tell them to read their cards aloud and to make gentle wave motions with the fabric.
- 4** Ask, "What makes waves?" Wind is the obvious answer but waves can also be created by the tide's change of direction. Have the student holding the wind card read about making waves, then make blowing sounds, dancing around while the waves move.
- 5** Taking turns, all the students representing plants should read their Salt Marsh Players Character Cards and move into the appropriate area of the marsh. Each animal character does the same. Fish live in the water, moving forward and back with the tides. The rest of the animals take their low tide positions.
- 6** When all are in place, tell the wind to blow again. Ask, "What makes the tides move in and out?" Sun and moon should read their Salt Marsh Players Character Cards, and then stand on chairs making circles above their heads with their arms, indicating a full moon and bright sun.
- 7** Have the oxygen character enter the water and read his or her Salt Marsh Player Character Card aloud. Tell students that

wind churning the water helps mix oxygen into the water. Have the oxygen character blow soap bubbles while the wind howls.

8 Tell the characters to get ready to perform together. Remind students to notice what the other characters are doing. Announce that the sun and moon are high in the sky, the wind begins to blow, waves start moving gently and plants sway.

9 After several minutes, say, "The tide is rising!" The water characters salt marsh characters should walk very slowly toward the high marsh, with fish, crab, and oxygen following behind. Remind plants that since they are rooted in the ground, they must stand in place but should bend and sway in response to wind and water movement; plants should duck below the scroll of water as it passes. Animals should adopt high tide behavior (as described on their Salt Marsh Players Character Cards).

10 As the water reaches its high mark (just past the high marsh), announce "It is high tide!" Ask the characters to explain their behavior briefly. Now reverse the sequence and have the water retreat back to low tide while players adjust their behaviors.

The performance may be videotaped.

Have students write character sketches and locate materials from home to create costumes to dramatize the hardships and rewards of their existence. They may wish to do additional research. They should include ways that plants and animals adapt to the changing tides. They may be interested in learning how people adjust who live in tidal or storm-prone areas (houses on stilts, boats instead of cars, etc.).

Students may wish to choreograph a modern dance interpretation with their salt marsh players. This may be performed for school and community members.

EXTENSIONS

Take a field trip to the Chehalis River Surge Plain Natural Area Preserve and have students look for plants and animals from the play.

Salt Marsh Players | Character Cards



RED OSIER DOGWOOD

CORNUS STOLONIFERA

I am a deciduous, many-stemmed shrub 3'-19' tall. My stems and twigs are dark red when young. As I mature they become a grey-green and then red again in the fall and winter. My fruits are berrylike and either white or lead colored at maturity. I also have beautiful, small, white flowers.



CATTAIL

TYPHA LATIFOLIA

I often grow tall to cover large areas of wetlands, lakes and rivers. I have brown cylindrical flower spikes that can be more than one foot long, and I provide protective cover and nesting areas for animals and birds.



BLACK BEAR

URSUS AMERICANUS

Although I am usually black, I come in chocolate and cinnamon brown colors, too. My muzzle is brown and my claws are highly curved. I am omnivorous and feed on a wide range of foods depending on what is available, such as insects (particularly ants), nuts, berries, acorns, grasses, and roots. I also like deer fawns and moose calves. In some areas I also feed on spawning salmon.

LADY FERN

ATHRYIUM FELIX-FEMINA

I am a lady in lace with bright green leaves. I love rich, moist soil that is in partial shade.

Salt Marsh Players | Character Cards



RACCOON

PROCYON LOTOR

Though I do not live in the salt marsh,
I do come here to hunt for dragonflies, crabs, oysters,
clams, fish and other good bits of food.
I am not fond of swimming so when the tide rises,
I leave the marsh for higher ground.



SKUNK CABBAGE

LYSICHTITUM AMERICANUM

No, I am not a skunk relative but I do have a foul,
skunk-like odor. I'm common in swampy areas and have a
beautiful appearance of a bright, yellow hood.
Although I am cabbage-like in appearance when my fruit
ripens in the autumn, I have no close relationship
to the cabbage family.



RIVER OTTER

LUTRA CANADENSIS YUKONENSIS

I am an aquatic member of the weasel family.
I have a seal-like shaped, tapered tail for swimming.
My small eyes and ears are located high on my head, allowing
me to remain low in the water. When I submerge, they close.
I can travel hundreds of yards underwater and remain
submerged up to four minutes at a time.



SALMONBERRY

RUBUS SPECTABILIS

Sometimes I am confused with blackberry
but my thorns are much weaker. My flowers are pink
to reddish purple, and my fruit is orange to red
in color and tart. I am fond of moist or wet sites,
and often I form a dense thicket.





WESTERN RED CEDAR

THUJA PLICATA

My bark is stringy, tearing off in long strips, and I have drooping branches that turn up at the tip. My trunk spreads out at the base as if I have big feet. My needles are scale-like and lie in pairs, overlapping like shingles, with a very strong aroma.



SUN

I help to drive the tide. The sun's gravitational pull occurs as the Earth rotates daily on its axis. This causes the water to "pile up," making a high tide, and then later to pull away from shore, causing a low tide. I am about 30 percent responsible for the changing tide. (You will stand on a chair and make a big circle above your head with your arms and "shine" over the marsh.)



SITKA SPRUCE

PICEA SITCHENSIS

I am the tallest conifer in North America and have a life span of almost 800 years. Because of my high moisture requirements, I prefer to live in the fog belt and along inlets and streams. I just love areas that have moist, well-drained soils.



MOON

I am the major force driving the tide. I create a gravitational pull as I rotate around the earth. This causes the water to "pile up," making a high tide, or to pull away from shore, causing a low tide. I am about 70 percent responsible for the changing tide. (You will stand on a chair and make a big circle above your head with your arms and "shine" over the marsh.)

Salt Marsh Players | Character Cards



GREAT BLUE HERON

ARDEA HERODIAS

I am a large, beautiful bird that wades gracefully in the shallow water, hunting for food. With my long neck and long, pointed bill I snatch fish, crabs, water insects and even small mammals out of the water. As the tide comes in, I move to higher parts of the marsh to stay in shallow water. Sometimes I just fly away.



BALD EAGLE

HALIAEETUS LEUCOCEPHALUS

I have a white head, neck and tail but am otherwise blackish-brown. I sit at the top of the food chain, which can make me more vulnerable to toxic chemicals in the environment, since each link in the food chain tends to concentrate chemicals from the lower link. I can possibly live up to thirty years but will probably live closer to twenty years.



WIND

I help the sun and moon to drive the tide in and out. If I blow very hard, I can force the water to come in or go out farther than usual. I also add oxygen to the water, which helps to make the water healthy and keeps plants and animals alive. Sometimes I can be very noisy as I sweep across the marsh.



WATER

H₂O "SALTY"

I am on the move daily, and I am the tide. When it is time for the tide to rise, I move slowly into the low marsh, and then up into the high marsh. At the high tide point, I stop and rest a minute, then turn in place and move slowly "out to sea." (You will need a partner to help you make and move the strip of "water.")



Salt Marsh Players | Character Cards

So



SALMON

ONCORHYNCHUS

Like many kinds of fish, I use the wetland as a nursery area, a protected place to raise my young (called “fry” or “fingerlings” at different stages). My tiny offspring dart in and out of the wetland plants as they move with the tides. (Remember, fish filter oxygen from water with gills)
These hungry youngsters find logs of food here.



OXYGEN

O₂

Water must contain me to support all the living things that live in it. As the tide moves in and out, I move along just behind that water line, showering all things I encounter with bubbles. Bubbles are made by carbon dioxide gas (which contains O₂) that animals exhale, or by the oxygen given off by underwater plants.

Recipe for a Wetland

▼ Cattail field



MATERIALS

- ▶ Mural Paper
- ▶ Colored Markers or Crayons
- ▶ Paint
- ▶ Smocks

OUTCOME

Students will become familiar with the elements that define a wetland. The major elements are soil and water. Specific plants can grow in the moist soils.

PROCEDURE

Ask your students to think of what elements exist in a wetland.

As they discuss this in class, list these elements on the board. After the discussion, have each student or small groups of students create a mural of what a wetland might look like.

Keep the murals, as students will use them again after their visit to the surge plain.

POSSIBLE ELEMENTS INCLUDE

- ▶ Animals (wood duck, geese, osprey, bear, river otters)
- ▶ Plants (cattail, trillium, skunk cabbage, salmonberry)
- ▶ Trees (Sitka spruce, Western red cedar)
- ▶ Water
- ▶ Soil
- ▶ Activities that are appropriate for a natural area (hiking, exploring)
- ▶ Boardwalks
- ▶ Trails



On-Site Activities

Teachers Guide to the
Chehalis River Surge Plain
Natural Area Preserve

4th to 8th Grade

Who Has Been Here? Part 1



GINA BLUM

MATERIALS

- ▶ Blank paper for notes and drawings.

OUTCOME

The purpose of this activity is to help students understand the issues of managing a natural area preserve and what human destruction can do to wetlands. These natural areas are places that will help protect fish and wildlife habitat.

PROCEDURE

Have your students keep track of signs of human activity as they travel through the surge plain.

There are signs of human history in the Natural Area Preserve, such as

- ▶ Pilings
- ▶ Railroad parts
- ▶ Large Sitka Spruce
- ▶ Litter
- ▶ Houses
- ▶ Restored wetland area
- ▶ Roads, trails
- ▶ Structures
- ▶ Vandalism

- ▶ Have your students write down what they observe. What are the positive and negative effects on the surroundings? Would it be worthwhile to remove any of these signs of humans? Notice the pilings in the sloughs. Would this be an element to remove? If the pilings were removed, would creosote contaminate the water or can pilings support plants and animals? Can human activities help restore the area? Was this area a good place to live in the past?



- ▶ After writing down all that is observed, have your students keep this list for a post-trip mural activity.



Sitka Spruce

Biodiversity Bingo



Check off as many items as you can find. Draw examples and write descriptions in the appropriate box. **If you do not know what it is that you are looking at, simply describe it and draw it. The goal is to fill in every box.** Be sure not to pick or collect anything! Use extra sheets of paper for additional notes and drawings.



**3 DIFFERENT SIZED LEAVES
FROM THE SAME PLANT**

**3 DIFFERENT COLORS
ON 1 PLANT**

**3 DIFFERENT KINDS OF BARK
FROM TREES**

3 DIFFERENT SIGNS OF ANIMALS

3 DIFFERENT WATER CHANNELS

3 DIFFERENT FLOWERS OR FRUITS

3 DIFFERENT KINDS OF LEAVES

3 DIFFERENT TEXTURES

3 DIFFERENT SHAPES

Speaking of Sloughs



MATERIALS

- ▶ Blank paper for notes and drawing.

OUTCOME

Students will gain knowledge of how watersheds function and why water quality is important. Students will also learn why native plants are important to that water quality.

While on the viewing platform at the end of the 1/2 mile trail, discuss with your class the various things that can affect wetlands, such as aquatic weeds or pollution that is carried by water to the wetland.

Standing on the platform, the water you are facing is Preachers Slough. To the left of the platform is an area of the wetland that has been restored with native plants.

Explain that a slough consists of slow-moving water and that it is important for fish to rest. The wetland plants that cover the sloughs create good homes for salmon and help absorb pollutants.



PROCEDURE

Describe to your class how tides affect the wetland. The fresh water is pushed up and out over the area as the tide comes in. As your class overlooks Preacher's Slough, discuss the importance of the slow-moving sloughs for salmon.

This wetland acts as a flood plain for excess water. The plants can absorb pollutants that flow down the river. Discuss the importance of the wetland plants covering the sloughs to cool the water for salmon.

- ▶ What is a healthy wetland?
- ▶ If the wetland was not healthy, what problems might occur?
- ▶ Ask the students what watershed they live in.
- ▶ Does the water from their watershed eventually flow into the Chehalis River Surge Plain?
- ▶ What animals live here?
- ▶ What might these animals eat?
- ▶ What color is the water when it floods?
- ▶ Is the tide coming in or going out?
- ▶ What happens to the fresh water when the salt water comes in?



◀ American Black Bear



RELATED WEB LINK

from the California Association of Resource Conservation Districts:
<http://www.carcd.org/wow/wow.htm>

Post-Site Activities

Teacher's Guide to the
Chehalis River Surge Plain
Natural Area Preserve

4th to 8th Grade

The Historic Side of the Chehalis Surge Plain



Divide class into small groups and assign each group one of the historic topic cards. Have students write a story about the subject and develop visual aids to assist in sharing the story with the rest of the class. These visual aids can be pictures they draw or cut from a magazine or newspaper.

▼ Union Pacific train crew and agent in Cosmopolis station, about 1910.

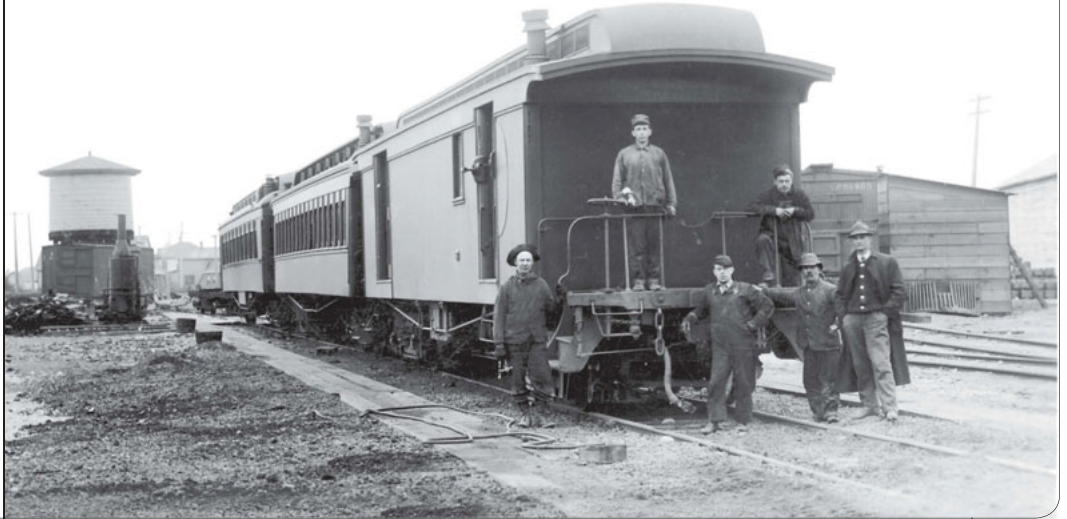


PHOTO COURTESY OF BRIAN FERRIS

Obnoxious—Noxious Weeds

Noxious weeds are non-native plants that, generally, have been introduced to Washington through human actions. Because of their aggressive growth and lack of natural enemies in the state, these species can be highly destructive, competitive or difficult to control. They impact agricultural fields to reduce crop yields; they destroy native plant and animal habitat; they damage recreational areas and clog waterways; they lower land values; and some are toxic/poisonous to humans and animals.

Native plant and animal species suffer because noxious weeds crowd them out. When native plants disappear, so do some animal habitats. Some of these weeds thrive in wet soil and eventually create large mats that can choke waterways

and shade out algae and other vital components of the food chain. People dumping the contents of their aquariums into waterways have brought parrotfeather to areas, including the Chehalis River Surge Plain. Purple loosestrife was brought in from Europe to grow in gardens. It quickly escaped and now grows rapidly in wet soil. Because of the destruction they can cause, it is now illegal to import noxious weeds.

These weeds upset the balance of natural ecosystems.

- ▶ Why? What characteristics make them successful competitors with native plants?
- ▶ Can you guess how these noxious weeds might be spread?
- ▶ How do they invade?

- ▶ What is the difference between noxious and invasive?
- ▶ Draw a picture of a noxious weed such as parrotfeather or purple loosestrife and the effects it might have on a wetland and its functions.



RELATED WEB LINK

WA State Department of Agriculture, Aquatic Noxious Weeds

<http://www.agr.wa.gov/PlantsInsects/weeds/>

Chehalis River Council

<http://www.crcwater.org/newsltr/news200210.html>





Preachers Slough

Discuss how Preacher's Slough received its name. In 1859, Preacher J.S. Douglas got lost when rowing down the river. He made a wrong turn into this slough and was late for a chicken dinner. It is very easy to get lost when navigating waterways, because the sloughs look alike with the same type of plants, trees and other characteristics.

- ▶ Write a fictional story from the perspective of the preacher.
- ▶ What was he thinking?
- ▶ What was he feeling, emotionally and physically?
- ▶ What did he see and hear and smell?
- ▶ When did he realize he was lost?
- ▶ Create a poster of Preacher Douglas' pathway from the Chehalis River into the sloughs of the surge plain.



RELATED WEB LINK

Montesano Library

<http://www.timberland.lib.wa.us/>



Railroad

The interpretive trail along the Chehalis River Surge Plain was once a railroad for Union Pacific and Milwaukee Road. Numerous landslides and washouts caused Union Pacific to reroute its trains to the north side of the river. That area is dryer and more stable than the slough, and less vulnerable to the effects of flooding.

- ▶ Create a story about what was transported years ago, and where the train might have traveled—where it might have come from, and where it was going.

One of the major products was logs, and products milled from logs.

- ▶ Draw a chart with illustrations of the step-by-step process of growing trees, harvesting forests, taking logs to the mill, lumber to the store, and then to your home to build something.



RELATED WEB LINK

Union Pacific Railroad

<http://www.uprr.com/aboutup/history/>





Ethnobotany

Ethnobotany is the study of how people of a particular culture and region make use of native plants.

The Chehalis Indians came to the surge plain to gather plants, such as the cattail. The inner core of the new stems was used as food. The root-like rhizomes were ground into flour. The leaves could be woven into baskets and mats. Fluff from mature flower heads filled bedding and diapers.

Sitka spruce creates the perfect musical pitch. This tree is sometimes used to create parts of violins, guitars and pianos. It is most abundant in the surge plain because this

type of tree thrives in rich, moist soils. Because of its high moisture requirements, the Sitka spruce occurs in the fog belt and along inlets and streams. It prefers moist, well-drained soils. It grows in pure stands, but is more often mixed with other species of the Pacific coast.

There are edible plants and berries that exist in wetlands such as salmonberry and blackberry.

► What could you eat in order to survive in the wetland? There are also plants that have medicinal value and ceremonial value, such as cattail.

► What could be some of those values and uses of wetland plants that humans may draw on?



RELATED WEB LINK

Washington Native Plant Society

<http://www.wnps.org>

University of Washington

<http://www.washington.edu/research/pathbreakers/1930a.html>



Farming

Farming was not successful in the surge plain because most crops, such as wheat, corn, or root crops such as carrots, could not grow in such moist soil.

However, wetlands could be a great place for growing cranberries. Typically, a farmer would have to flood the bogs in order for the ripe cranberries to float to the top.

► Could tidal activity flood the surge plain and substitute manmade flooding for cranberries?

Rice is another crop that can grow well in wetland conditions. Rice plants can have an important head start over a wide range of competing weeds, which leads to higher amounts of rice.

Imagine you are a pioneer family.

► What would you need to survive?

► Would you build a home or farm in the surge plain? If, so, how would you do it?

► Build a farm replica, or draw an aerial view of a farm that might represent the wetland area years ago.



RELATED WEB LINK

History and General Information on Rice

<http://www.riceweb.org>

Environmental Protection Agency's (EPA) List of Wetlands Plants

<http://www.epa.gov/glnpo/greenacres/wetland.html>



Wetlands Quiz



ANSWERS TO THE WETLANDS QUIZ

- 1 C
- 2 E
- 3 F
- 4 E
- 5 C



▲
Who made this
basket and how did
they make it?

OUTCOME

This activity will help students gain comprehensive knowledge of wetland functions.

1. We have about

- A all,
- B most,
- C half, or
- D none,

of the wetlands in the continental United States that were here when European settlers arrived on the continent.

2. What are the main ingredients for making a wetland?

- A Water
- B Special soil
- C Trees
- D Animals
- E A & B

3. There are plants in wetlands that people use for

- A Food
- B Medicine
- C Clothing
- D Building a home
- E Making arts & crafts
- F All of the above

4. Wetlands help the water cycle by

- A Soaking up rainwater
- B Slowly releasing rainwater
- C Storing water
- D Reducing the effect of floods
- E All of the above

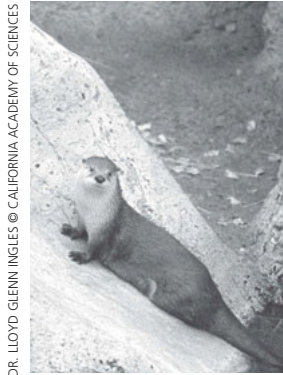
5. When fresh and salt waters meet, what happens?

- A Nothing
- B Fresh water sinks to the bottom
- C Salt water sinks to the bottom
- D Both B and C

This activity was created by
Nancy Sturhan — DNR Forest
Practices Division



Who Has Been Here? Part 2



DR. LLOYD GLENN INGLIS © CALIFORNIA ACADEMY OF SCIENCES

▲ River Otter

OUTCOME

This activity will allow students to be creative. There are good and bad elements surrounding the wetland. An understanding of what takes place in a natural area is critical when learning to manage land. Natural and human destruction can occur. With proper management, humans can help protect fish and wildlife and the plant communities that they need to survive.

From the on-site activity, *Who Has Been Here*, have your students construct a mural from the list they created while at the surge plain.

The human history could be a positive or a negative characteristic in the wetland. Have your students cover both aspects.

With this mural the students can cut pictures out of magazines and newspapers or simply draw another mural.

QUESTIONS TO CONSIDER

- ▶ Compare this mural to the one you made before visiting the surge plain.
- ▶ What did you leave out in your first mural?
- ▶ What did you take out on the second mural?
- ▶ What did you have on both murals?
- ▶ Were you more aware of what takes place in a wetland after your visit to the surge plain?
- ▶ Was your first mural as detailed as the second?

▼ Union Pacific, Northern Pacific, and Milwaukee Road engines at their shared facility in Hoquiam, 1945.



RELATED WEB LINK

from the California Association of Resource Conservation Districts:
<http://www.carcd.org/wow/wow.htm>

Issues for a Wetland Debate

TED BENSON



▲ Dredging

EXAMPLES OF INFLUENCES

- ▶ Noxious weeds
- ▶ Pollutants
- ▶ Dredging and filling
- ▶ Replanting/restoration
- ▶ Roads, railroads, trails
- ▶ Houses
- ▶ Litter

OUTCOME

This activity helps increase students' awareness on issues related to wetland management.

PROCEDURE

- ▶ Divide your class into several groups. Have each team prepare a presentation of the importance of wetlands and human-made influences that we can control (see list on left).

States, territories, and tribes identify nonpoint source (NPS) pollution as the Nation's leading source of surface water and ground water quality impairments. When properly managed, wetlands can help prevent NPS pollution from degrading water quality. Wetlands include swamps, marshes, fens and bogs.

Properly managed wetlands can intercept runoff and transform and store NPS pollutants like sediment, nutrients, and certain heavy metals without being degraded. In addition, wetlands vegetation can keep stream channels intact by slowing runoff and by evenly distributing the energy in runoff. Wetlands vegetation also regulates stream temperature by providing streamside shading. Some cities and transportation organizations have started to experiment with

constructed wetlands as an effective tool to control runoff and protect urban streams.

Improper development or excessive pollutant loads can damage wetlands. Degraded wetlands can no longer provide water quality benefits and become significant sources of NPS pollution. Excessive amounts of decaying wetlands vegetation, for example, can increase biochemical oxygen demand, making habitat unsuitable for fish and some other aquatic life. Degraded wetlands also release stored nutrients and other chemicals back into surface water and ground water.



RELATED WEB LINKS

U.S. Environmental Protection Agency

<http://www.epa.gov/OWOW/NPS/>

Washington State Department of Ecology

<http://www.ecy.wa.gov/programs/wq/nonpoint/education.html>

Extra Activities



▲ Volunteer

EXTENSION OF ACTIVITY

- ▶ Have your class create a website for the Chehalis River Surge Plain Natural Area.
- ▶ Students can also learn how to create natural areas in their own backyard. Simply log onto <http://www.nhq.nrcs.usda.gov/CCS/Backyard.html> (Natural Resource Conservation Service) for good information on backyard landscaping.

OUTCOME

Students will gain a better understanding of preserving unique lands such as natural area preserves. Preserves protect the best remaining examples of many ecological communities including rare plant and animal habitat. These lands are the highest quality, most ecologically important sites for protection as natural area preserves. The resulting network of preserves represent a legacy for future generations and helps ensure that blueprints of the state's natural ecosystems are protected forever.

Natural areas provide unique opportunities for research and education by protecting relatively undisturbed native communities, wildlife habitat, and populations of rare plants. These communities serve as a baseline for comparison with managed or altered environments. Research conducted by colleges and universities contributes to the understanding of these resources and may enhance restoration and management of altered ecosystems.

- ▶ Have your students share opinions on caring for natural areas. Should the state preserve unique lands such as the surge plain? If so, why? And how much of the land should be protected? How is your community affected or helping to conserve resources?
- ▶ Have your students analyze the language of the legislation from the Wilderness Act. Explain the difference in protecting national parks and protecting natural areas. What is the history of protecting lands? Why were they protected?
- ▶ Create a diorama of a wetland, including compatible human use and development. Conduct a restoration

project, build appropriate bird houses, plant appropriate plants, or do on-going monitoring of a wetland.

- ✉ Write a letter or send an e-mail to Birdie Davenport at the Department of Natural Resources explaining your opinion on the importance of natural area preserves.

Birdie Davenport

Dept. of Natural Resources
Pacific Cascade Region
601 Bond Road
P.O. Box 280
Castle Rock, WA 98611

E-mail address:
roberta.davenport@wadnr.gov

RELATED WEB LINKS

Washington State Department of Natural Resources Natural Areas Program

<http://www.dnr.wa.gov/base/programs.html>

State Parks Homepage

<http://www.parks.wa.gov>

Stories of Interest in the Drops of Water Newsletter

<http://www.crcwater.org/index.html>

Water Issues from the Environmental Protection Agency

<http://www.epa.gov/>

National Parks Service

<http://www.nps.gov>

Washington State Department of Fish and Wildlife, Wildlife Science

<http://wdfw.wa.gov/wildlife.htm>

Evaluation of the CRSP Packet

Name ▾

Phone Number ▾

Email ▾

School ▾

Grade Level ▾

What subject(s) do you teach? ▾

When did you visit the Surge Plain? ▾

I did ____ (did not ____) use the materials in this educational guide. ▾

From this guide, which activities did you use with your students? ▾

How many students received instruction? ▾

Which activities did they like best or were most useful? ▾

Which activities were least helpful? ▾

Did you share information from this guide with other teachers? ▾

Specific comments for improvement ▾



Please return this form to:

Birdie Davenport
Natural Areas Manager
Dept. of Natural Resources
Pacific Crest District
Summit Unit
P.O. Box 280
601 Bond Road
Castle Rock, WA 98611

Or send this information by e-mail to:
roberta.davenport@wadnr.gov

Region Reception:
360-577-2025
Voice mail:
1-888-437-6171 # 5002
website: <http://www.dnr.wa.gov/nap>

