

Journey of the *Oncorhynchus*

A Story of the Pacific Northwest Salmon

Teacher's Guide to Storybook

DAY FOUR

By midnight the next day, Hydroid and the Hood River chinook are moving past Portland and Vancouver. Other young salmon have joined them, including wild spring chinook from the Sandy River. The fish are growing quickly. By now they are able to catch and eat small freshwater shrimp. Their bodies seem to be changing by the minute. They are sleek and silver and six inches long. They are becoming *smolts*.

The smolts have traveled past many other cities, but none as large – and with as much pollution – as Portland and Vancouver. In cities, rainwater hits parking lots and streets. Instead of soaking into the ground, water shoots straight into the nearest storm drain. From there it goes into the river. Along with it comes water leaking from old garbage dumps, detergent from washing machines, fertilizers and poisons from gardens and lawns. Hydroid sniffs the water. Someone has recently changed the oil in a car and poured the oil down the sewer. Hydroid coughs on the oil fumes and quickly steers the Hood River smolts away.

Just past Portland, a huge number of fish come swimming in from the left. Most are chinook from the hatcheries of the Willamette River. Hydroid and the Hood River smolts have seen these kind of fish before. They came from the Washington and Oregon along the Columbia River. Hatcheries replaced streams that were either flooded when the dams were built, or were paved over when cities were built. People hoped to replace the wild fish they lost with hatchery fish. But hatchery fish don't learn how to find food or hide from danger. Not as many survive the journey compared to the wild chinook from Hood River.

Among the Willamette fish are some smaller salmon. Hydroid realizes these small fish are wild *coho* salmon. The coho may be smaller, but they are just as smart as the Hood River fish. They spend a year in the ponds and side

streams of the Clackamas River learning the ways of the wild before they begin their journey to the sea.

It's close to dawn. Hydroid spots a fat fly bobbing on the water above. One of the hatchery fish sees it too. Hydroid notices a shiny spot on the fly and tries to warn the young fish away. Too late. An angler catches the young salmon. It's really too small to be eaten. But the stress of being caught on a hook and hauled out of the water is enough to kill the young fish. The Hood River chinook learn another lesson.

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Teacher's Guide to Storybook

DAY FIVE

It's a beautiful day in late June. The river has suddenly become wide and shallow. And it tastes different – it's salty! The Columbia River is meeting the Pacific Ocean. The area where the salt water of the sea mixes with the fresh water of the ocean is called an *estuary*. By now the silvery salmon have changed completely inside. The salt water feels good to them. And there is so much to eat. So many tiny animals float in the water, it looks like soup. The young chinook dash this way and that, snapping at all the fat fine food in front of them. As they do they move further and further out into the Pacific. Suddenly, from the depths comes a huge fish. The Hood River fish scatter, but not before one ends up in the mouth of the predator.

The bright June sun warms the water making Hydroid feel lighter and lighter. Hydroid evaporates and is soon floating in the air above the Pacific Ocean. Far below, Hydroid sees the ocean currents welling up, bringing even more food to the Hood River chinook. The fish are so filled with joy, they leap right out of the water, wriggling and jumping on the ocean waves. Of the 5,000 eggs in their nest, only 200 made it to the sea. The survivors are glad to be alive. They are big enough now to eat small fish and other sea creatures. The chinook regroup and swim head on into the cool ocean currents, following the schools of anchovies, herring and shrimp that will lead them north to the waters off Alaska.

Hydroid drifts north too, joining the water vapor in the air. Hydroid knows the salmon's trip will be a long one. Most of those entering the sea will not survive to be adults. Look! There below, a boat is stretching a long fine net along the water. The Hood River fish are small enough to swim through the openings in the net. This time next year, some will not be as lucky. They will be larger. They will find themselves among the fish now being pulled onto the deck of a fishing boat.

Over the months, the chinook swim past Vancouver Island and the Queen Charlotte Islands off the British Columbia coast. That summer they reach the Gulf of Alaska where they will stay for the next two years. Once each year, clouds of bright red *sockeye* swim through the school of chinook. The sockeye are returning to rivers in southern Alaska and in British Columbia. When the chinook swim close to shore, they sometimes run into *chum* and *pink* salmon. Chum and pinks spawn along the coast of Alaska and Canada. Chum are sometimes called dog salmon. Alaskans used to feed the fish to their sled dogs. Pinks have strange humped backs. The sockeye, chum and pink salmon are about half the size of the growing chinook.

By their third year, a secret signal from Nature turns the chinook south, back toward the Columbia. Hydroid's friends are now three feet long. Each weighs 20 pounds or more. Eating sea creatures like shrimp – shells and all – has turned their flesh bright pink. Their skin is two-toned with a dark greenish back and silver sides and belly. Their backs and sides are freckled with dark black spots as camouflage. The marks on one fish are deep and ugly. These are not spots, but old wounds made by the teeth of a sea lion. That was a narrow escape.

The fish follow the shoreline south. They are a few miles off the coast, but they can almost taste the waters of the Columbia River. They are swimming fast and eating faster.

DAY 5

TEACHER NOTES

OREGON COAST FIELD TRIP

EMERGENCIES

Historic Museum (503) 861-2000, Manager's Office (503) 861-3170.
Columbia Memorial Hospital in Astoria located between 21st & 22nd,
on Exchange Street.

Estimation Game: Challenge students to estimate the length of the bus in meters. (Winners will be announced at the beginning of lunch.)

Bus Activities: Students can complete games and/or activities in their student workbook during the bus ride.

OBJECTIVE(s): After completing the activities on this field trip, students will be able to:

- ◆ apply what they have learned in the classroom to their local and regional communities.

MATERIALS:

35 adhesive name tags	First Aid Kit
2 ropes (each ~20 meters long)	36-8 oz plastic cups
36-12 oz plastic cups	4 traffic cones
1 jump rope (10-15 feet long)	2 cardboard boxes
50 white (3' x 5") index cards	50 pink (3" x 5") index cards
100 pairs of latex gloves	10 gallon size plastic bags
60 large SOLV plastic trash bags	6 buckets

BACKGROUND INFORMATION:

FORT STEVENS

Fort Stevens was constructed during the Civil War and remained active until shortly after World War II. From 1887 to 1904, the fort experienced a massive development program, including the construction of eight concrete gun batteries. Although the guns have all been removed, nearly all the batteries remain. After the army coast artillery abandoned Fort Stevens, nearly all of the buildings in the fort area were demolished.

The Museum and War Games Building constructed in 1911 was first used as an enlisted men's dormitory. After World War II, it was converted to a War Games center with plotting equipment and communications with the various artillery batteries. When the fort became inactive, this building was used by the Corps of Engineers as their offices, and presently houses the military museum and historical office.

THE PETER IREDALE (viewing point to see the mouth of the Columbia River)

The Peter Iredale was built in Maryport, England in 1890. The ship was 287 feet long, 30 feet wide and 23 feet deep and could carry 1994 tons. It was a frequent visitor to the Puget Sound and the Columbia River. On the final trip in 1906, the Peter Iredale was sailing from Australia to Portland to pick up a load of wheat. Captain H. Lawrence offered his crew a bonus if they could trim five days off the journey between Salina Cruz, Mexico and Portland, Oregon. From Mexico to approximately 100 miles south of the mouth of the Columbia River brought perfect weather. However, the ship encountered dense fog as they approached the mouth of the Columbia. The final sequence of events on October 24 and 25, was later described by Captain Lawrence:

"I picked up Tillamook Light at 2 am and immediately called all hands to set all sails, intending to stand off for the mouth of the Columbia and pick up a pilot by day. A heavy southeast wind blew and a strong current prevailed. Before the vessel could be veered around, she was in the breakers and all efforts to keep her off were unavailing.

The first shock sent the mizzen top hamper overboard, and when she struck again, parts of other masts snapped like pipe stems. It was a miracle that none of the crew was killed by the falling masts as the ship pounded in the surf. After the crew had escaped the danger of the falling debris, all hands were summoned aft as the vessel ran up on the shelving sands with little violence. I told them to abandon ship. The Point Adams surf boat was soon alongside and took all hands quickly and safely ashore."

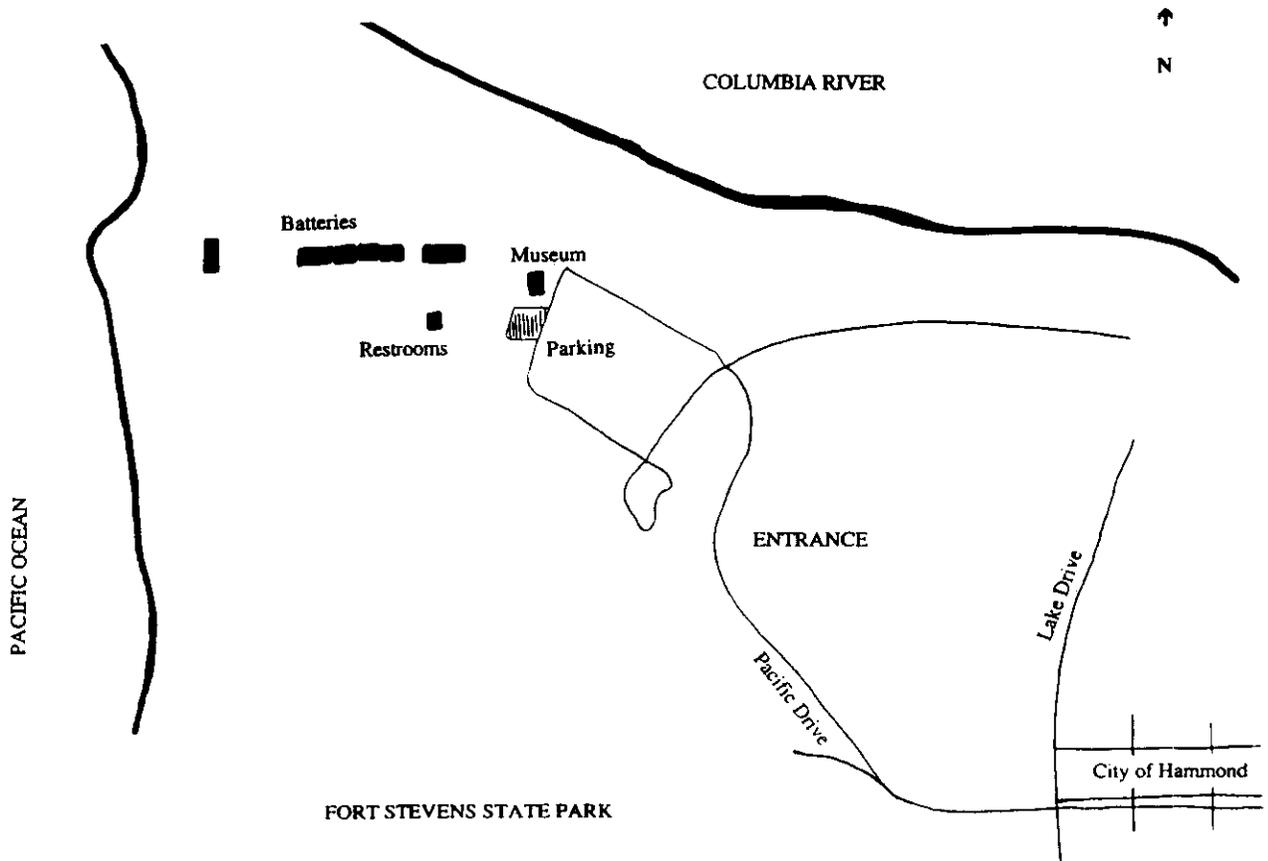
PROCEDURE:

1. Upon arrival at **Fort Stevens State Park**, students tour the Museum and the War Games Building as well as view an eight minute film entitled The Firing of the Gun. Immediately following, each group will tour the underground battery and the surrounding outside batteries. Each group will be led by a historian from the Museum.

2. **Sand Castle Contest** - Each team will work with their counselor to create an animal out of sand. The sand sculpture should not exceed the dimensions of two meters long, two meters wide, and one meter height (2 meter x 2 meter x 1 meter). Each team will have the same materials to start with: 1 bucket, 6-8 oz plastic cups, 6-12 oz plastic cups. The team members can use any other item found at the beach to decorate their animal. For example, shells for eyes, drift wood for arms/legs, etc.

3. **The Salmon Game** - Refer to Day 3, the field trip to Oxbow Park, to review the instructions for this game. Materials needed are: 4 traffic cones, 1 jump rope, 2 cardboard boxes, a whistle, and 50 white (3" x 5") index cards, 50 pink (3" x 5") index cards, 2 ropes (each ~20 meters long).

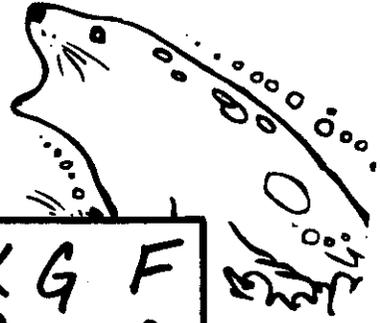
4. **The Beach Clean-Up** - Each team will be given three large SOLV garbage bags. Each person will need to wear latex gloves during the clean-up. It is very important to stress to each student that if they find any dangerous debris such as medical waste, syringe, nails, glass, dead animals, etc. that they **do not** pick it up. They need to alert the adult in their group who should make the decision whether to pick it up or contact the director. It is also important that after the clean-up is over, that all the latex gloves be collected and disposed of. All trash bags should be piled together for pick up by the Fort Stevens State Park personnel. The competition will be won by collecting the most trash. Extra points will be given to the team that finds the most cigarette butts, one of the most numerous types of trash on the beach (gallon size plastic bags will be provided for this part). Extra points will be given to the team that finds the most Styrofoam and plastic.



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OREGON COAST WORD SEARCH



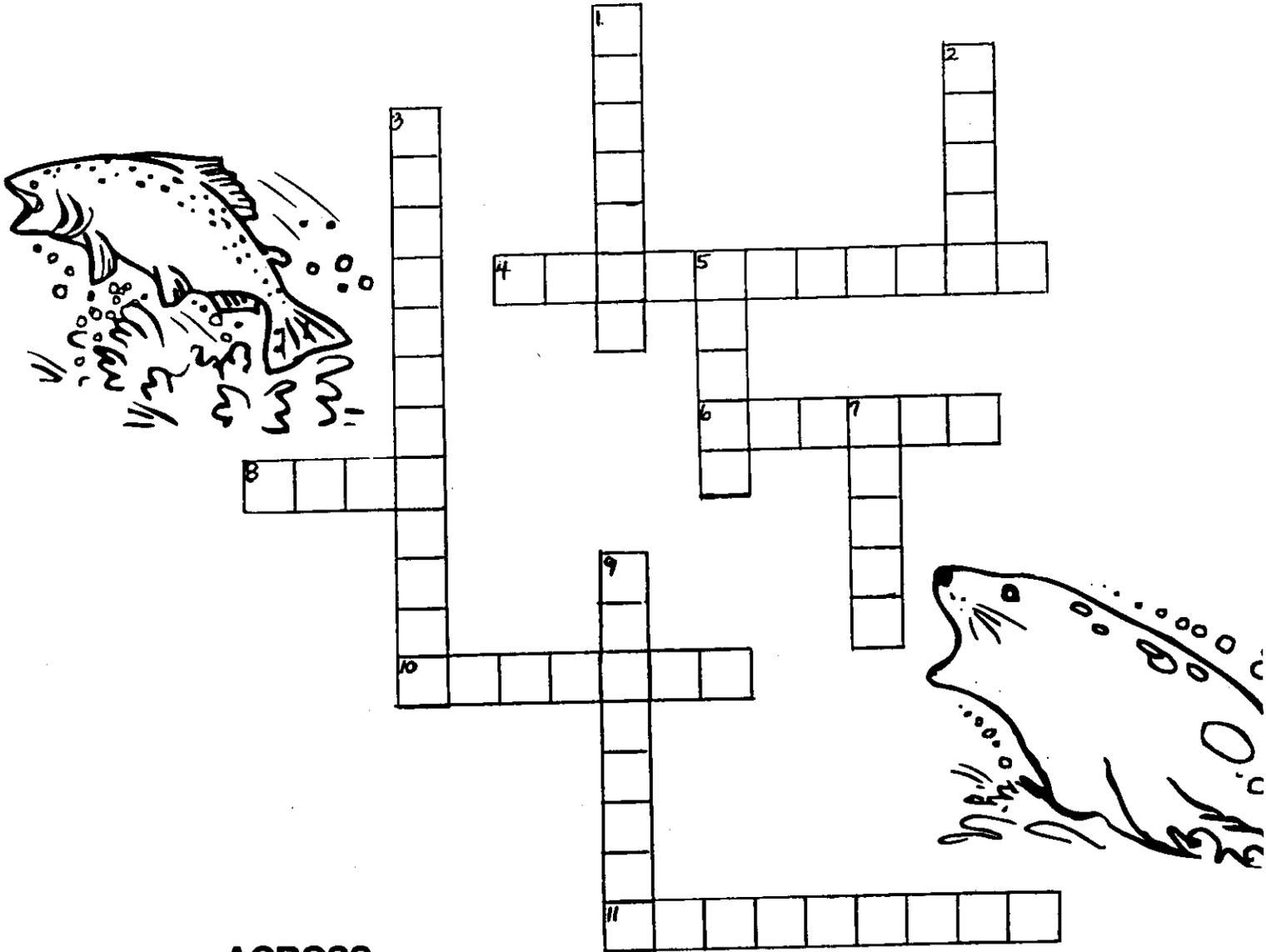
R	M	K	U	S	E	A	G	U	L	L	H	K	G	F
E	J	S	E	A	L	X	Q	X	O	O	W	P	N	O
T	V	E	A	W	S	N	W	D	S	C	J	E	X	R
T	I	A	V	N	O	E	I	R	L	E	W	Q	L	T
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K	R	G	J	Q	D	P	T	V	D	U	A	Z	E	B
T	C	O	L	U	M	B	I	A	R	I	V	E	R	F
U	F	S	E	L	A	H	W	R	E	L	L	I	K	E

Ocean
Gill Netter
Smolt
Killer Whale
Waves
Seal

Estuary
Columbia River
Tides
Kites
Sand Castles
Fort Stevens

Seagull
Seashells
Driftwood
Peter Iredale

OREGON COAST CROSSWORD



ACROSS

4. The place we will tour today is _____.
6. Another name for garbage.
8. Surfers surf on a _____.
10. Where salt water and freshwater meet at the mouth of a river.
11. What you collect on the seashore--also used to protect soft-bodied sea life.

DOWN

1. Concrete buildings or gun houses. Used in a flashlight.
2. Large body of salt water.
3. Ship that wrecked near Fort Stevens.
5. The stage of a salmon's life cycle when they reach the sea.
7. The rise and fall of the ocean, either high or low.
9. White and grey birds present on the coast.

SALMON LIFE CYCLE WORD SCRAMBLE

Directions: Unscramble the salmon life cycle words below.

- | | |
|----------------|-----------|
| 1. WAPNSNGI | 1. _____ |
| 2. NKOIHOC | 2. _____ |
| 3. LMSOT | 3. _____ |
| 4. IEAVNL | 4. _____ |
| 5. YEDE GEG | 5. _____ |
| 6. LKOY ASC | 6. _____ |
| 7. CEKESYO | 7. _____ |
| 8. AGMINIROT | 8. _____ |
| 9. DEDR | 9. _____ |
| 10. YFR | 10. _____ |
| 11. ARPR | 11. _____ |
| 12. RTYTBARUI | 12. _____ |
| 13. DOOSNRMUAA | 13. _____ |
| 14. IKPN | 14. _____ |
| 15. OUCH | 15. _____ |



ACTIVITY 6-2: SALMO BINGO

OBJECTIVE(s): After completing the activity, students will be able to:

- ◆ review vocabulary presented throughout the curriculum.

MATERIALS:

500 poker chips

extra game cards

PROCEDURE:

1. In this activity, students will create their own SALMO bingo cards with the vocabulary words used throughout the curriculum. Students will play bingo by matching the terms on their cards with the definition that is read out loud by the instructor.
2. Before beginning the game, have students randomly write the following 24 words in the squares on their SALMO card located in the student workbook. There are two SALMO cards in their student workbooks. The SALMO game words and definitions are:

WORDS	DESCRIPTIONS
fry	tiny salmon which are about an inch long.
acid	lemon juice and orange juice are examples of this.
alevin	small fish that uses a yolk sac for its food.
metric	a system of measurement based on the number ten.
chinook	largest of the Pacific Salmon.
pH	a color scale that describes how acidic or basic a substance is.
prey	an organism that is eaten by a predator.
pumice	a volcanic rock that floats on water.
redd	a nest where salmon lay their eggs.
predator	organism that kills and eats another organism.
volcano	a vent in the earth's crust through which lava and ash are ejected.
scale	able to tell the age of a fish.
smolt	silver colored fish traveling towards the ocean.
magma	molten rock that is under ground.
Loo-Wit	Mount St. Helens, Keeper of the Fire.
swim bladder	helps a fish move up and down in the water.
parr	small salmon with distinct stripes on its sides.
lava	molten rock that is on the surface of the ground.
estuary	place where a river or stream meets an ocean.
Celsius	metric unit for temperature.
gills	used by fish to breath.
hypothesis	an educated guess.
Lorax	wants you to save the forests.
Bigmouth Minnow	predator of young salmon.

- You may play as many games as time permits. Students should use poker chips to mark each selection. Their game cards can be reused for additional games. Instructors should be reminded to scramble the order in which they read the definitions.

CONCLUSION:

Instructors should bring closure to this activity by reviewing the terms that seem difficult for the students.

ACTIVITY 6-3: THE SURFACE WATER VIDEO

SCIENCE CONCEPTS/PROCESSES: Cause and Effect, Cycle, Interactions

OBJECTIVE(s): After completing the activity, students will be able to:

- ◆ understand that nature and humans can be the cause of surface water pollution.
- ◆ understand the difference between non-point source and point source pollution.

MATERIALS:

Surface Water Video 40 "After the Flush" brochures

VCR/TV 2 "After the Flush" Posters

BACKGROUND INFORMATION:

The most common type of surface water pollution is called non-point source pollution. Non-point source pollution is defined as pollution that doesn't enter surface water at one particular spot. Examples of this type of pollution are fertilizing crops, rain that carries oil from city streets to storm drains, and acid rain.

Point source pollution can be defined as pollution that gets into surface water at a particular point. Examples of point source pollution are pipes depositing waste into rivers, illegal dump sites, and landfills.

PROCEDURE:

1. In this activity, students will view The Surface Water video (contact City of Portland Environmental Services (503) 823-7740 for video information). The video covers the many causes of pollution and discusses the terms non-point source and point source pollution.
2. This video provides an introduction to the next activity, storm drain stenciling. After the video, hand out a copy of the "After the Flush" brochure and using the poster size copy review the information presented.

CONCLUSION:

Instructors should bring closure to this activity by asking students to do the following:

- ◆ Define non-point source pollution and point source pollution and give examples of each.

ACTIVITY 6-4: STORM DRAIN STENCILING

SCIENCE CONCEPTS/PROCESSES: Cause and Effect, Cycle, Interactions

OBJECTIVE(s): After completing the activity, students will be able to:

- ◆ inform their community of the importance of ensuring a clean water resource for salmon as well as all living things.

MATERIALS:

6 traffic cones
12 stencils
12 safety vests
6 brooms

informational door hangers
6 cans of spray paint
40 pairs of latex gloves

PROCEDURE:

1. In this activity, students will be locating storm drains in their community and marking them with a sign stating: "**Dump No Waste --Drains to Streams.**" The sign also includes a picture of a fish. As some students stencil the storm drains, others will deliver informational door hangers that will explain why the storm drains are being stenciled. This activity is designed to heighten their awareness of the fact that what goes down the storm drains eventually ends up in the streams and rivers.
2. Students will be in their groups with their counselor. Each group will need: a supply of door hangers, two safety vests, a traffic cone, a can of spray paint, brooms, a fish stencil, a pair of latex gloves for each student, and a plastic garbage bag.
3. A map will be provided to each group. On the map you will find the designated storm drains and area that your group is responsible for. It is very important that the students who are stenciling the drains wear the safety vests. Place a traffic cone two-three feet from the storm drain to alert oncoming motorists. Clean off the drain before stenciling.
4. The spray paint you will be using is a non-toxic water soluble and will wash off in about a year.
5. The students delivering door hangers are to always be in sight of their counselor. When delivering the door hangers, hook them on the door knobs of homes. **Do not ring the door bell or knock.** If there is a fenced yard, hook the hanger on the gate of the fence, **do not enter the property.**
6. This activity educates the students and the community about protecting our surface water. Long after the camp is over, the storm drain stenciling will remind students of their contribution to save the salmon.

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DAY SIX

It's April and another rainy spring season in the Pacific Northwest. Hydroid has completed its circle in the air above the Pacific Ocean. Ahead, it sees a group of clouds forming, ready to hit the coast with rain. Below, Hydroid sees that nine of the Hood River chinook have managed to avoid all the ocean's perils to come back to the Columbia.

Their timing is just right. One month earlier, they would have found an occasional shadow of a boat overhead or a person standing on the shore. They would have found anchovies, shrimp and other tasty treats. But each treat would hide a hook with a line attached, a line waiting to pull a prize chinook into a net, onto the deck of a boat and in front of a camera as a trophy in the hands of a happy angler. The boats and anglers left less than two weeks before the Hood River chinook came into the river.

The clouds ahead of Hydroid meet a cold draft of air and a heavy rain drenches Oregon and Washington. The river rises and the chinook meet the current head on. It's been four years since they've been in fresh water. Suddenly, they are no longer hungry. Their seafood feast has made them fat. All they want to do is swim, quickly, up the river to home, to their little stream off Hood River. The chinook around them have the same desire. As they move up the Columbia, they stay low to avoid barges and boats. They steer clear of the warm water released by factories and power plants near Longview, Kelso and Rainier.

At Longview, Hydroid sees a small group of chinook take a left turn up Washington's Toutle River. At Portland, another group takes a right. The surviving Willamette chinook are heading back to their hatcheries. The Hood River fish push straight ahead, toward home.

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DAY SEVEN

The Willamette River spring chinook run is the pride of Portland. Anglers boast that Portland is one of the few cities in America where you can take your pole, head to a bridge downtown and catch a salmon. That wouldn't have happened twenty years ago. In the 1970s pollution made the Willamette a stinking mess. Sewers overflowed and dumped waste into the river. Chemicals made water plants grow like weeds. The weeds choked the water and the fish that tried to swim through them.

Scientists worked with the mayor and the people of Portland to clean up their river. New hatcheries were built to bring back the river's salmon. Today, people play and ski and try to live as close to the river as possible. And as many as 200,000 adult salmon return each year to the Willamette.

Not all make it back to their hatcheries. Just south of Portland is Willamette Falls. But it's not the steep waterfall that worries the fish. It's the shadow of a wall of boats filled with fishermen. And there is something new for the Willamette fish. A strange-looking net sweeps through a pool of water at the base of the falls. The pool is the best place for a salmon to leap over the first step of the falls. The person at the other end of the net knows what he is doing. That person is a member of the Yakama Indian Tribe. His net is called a dip net. For thousands of years, the tribes have used their nets on the Columbia River. The salmon they catch are part of their culture and religion. This year they hope to take more than 2,000 salmon back to their longhouses. But salmon runs have never been lower. They catch 1,000. They hope to catch a few more from the Willamette for their sacred ceremonies.

Tribal members build an 18-inch wide wooden bridge out from the rocks next to the falls. A fisherman ties one end of a rope to his waist, the other end to a tree and walks to the end of the plank. He stands all day, sometimes

all night, sweeping the water with a net at the end of a 25-foot pole. He stays until he has enough fish for his family and his tribe. This year, he may stay until the end of May and the end of fishing season. Even the Willamette River run is low this year. Only 50,000 chinook return to the falls.

And what happened to the little coho from the Clackamas River? While chinook may spend three years in the ocean, coho most often spend only one year. Two years ago, the coho came back as adults. Seventy-five of them made their way to the mouth of the Clackamas River below Willamette Falls. Fifty of them survived to return to their home streams, build redds and lay eggs. In fact, the eggs they laid hatched long ago. Another generation of wild coho has already left the Clackamas and is on its way to the sea.

S A L M O

		FREE  SPACE		

STORM DRAIN STENCILING

Activity: Students take responsibility for helping their stream environment by teaching others in their community about the hazards of inappropriate storm drain dumping. Using spray paint and stencils (a very popular activity) students stencil the words "DUMP NO WASTE, DRAINS TO STEAM" by as many city storm drains as time and energy allow.

Length of time: Flexible

Number of participants: Maximum 30, recommend breaking down into groups of 4 with one adult supervising each group.

Age Range: 2nd grade through high school.

Pre-field trip preparation:

1. Lead a group discussion of the impacts of erosion from landscaping and construction; the dumping of toxic waste, i.e. motor oil, anti-freeze, paint, detergents, etc. in to the local storm drain; and the negative impact from the over usage of fertilizers and pesticides.
2. Contact Environmental Services (503) 823-7740 If residing in the city of Portland to reserve paint, stencils, vests, cones, and other necessary supplies. If residing elsewhere, call your local water bureau or environmental service to arrange for supplies. Most cities do have a stenciling program in place.

Post-field trip preparation: Report the number of drains stenciled and their location to your local water bureau or environmental services.

WHY STORM DRAIN STENCIL?

Every year people pour hazardous chemicals, pesticides, paints, antifreeze and used motor oil down storm drains. Most of them don't realize that those drains dump their waste materials directly into our streams and ground water. While some of the drains go to waste treatment plants, those facilities are not equipped to handle these hazardous wastes.

The dumping of hazardous wastes into the storm drains is damaging our water quality. It can affect fish and wildlife. For example, only one pint of motor oil can cause a slick the size of two football fields on calm water.

Storm drain stenciling is one way to remind people that storm drains are for rain water only. The Stenciling Project will not only involve citizen groups and students but will also serve to educate neighborhood residents by providing them with important informational materials. It will provide a visual reminder for up to a year that pollution prevention is important.

THE STREAMWALK GAME

Activity: Primarily geared as an outdoor stream evaluation activity, but can be adapted for the indoor classroom in case of rain or lack of transportation.

Length of time: 1 hour

Number of participants: Maximum 30, recommend adult supervision on a 1:5 ratio.

Age Range: 1st through 5th grade

Field trip preparation: Recommend checking site prior to trip for: safe access, i.e. no steep embankments; enough room for group to stand and record data comfortably; and an interesting stream area to study. An area with an example of a run, pool and riffle area on the stream is ideal for elaboration on fish habitat.

ABOUT THE GAME

The Streamwalk Game fosters a child's natural curiosity about the living world. Children seem to intuitively know the health of a stream. They know pollution is not good and they know pollution is not right, but they don't have the reasoning or the tools to explain their knowledge. Using the Streamwalk Game, youngsters can go to a stream to determine whether the stream is healthy or unhealthy and to understand more of the components that go into keeping a stream healthy. The game enables them to quantify something they may already know intuitively.

The United States Environmental Protection Agency developed a program called Streamwalk to give citizens, ranging from 6th grade to adult, the ability to monitor and assess streams. The Streamwalk Game follows a similar yet much simpler format which allows younger children to gain exposure to scientific procedures for evaluating a stream, including the data gathering process.

Currently the Streamwalk Game is only available to students within the city of Portland who arrange a field trip in conjunction with Environmental Services. Students who complete the program also receive a Streamwalk detective pencil and button as a special memento of their experience. Call the City of Portland Bureau of Environmental Services at (503) 823-7740. This program resource is provided free to groups from schools or community education locations within the city of Portland.

Instruction for Streamwalk Game

1. There are 12 cards in each folder. If you are in an urban area, remove Card 12 (cows in stream) from the folder. If you are in a rural area, remove Card 7 (pipes dumping in stream) from the folder. There must be an uneven number of cards for the best results in the clue card section.
2. Read the Murky Water Mystery story aloud. It is a short story about Brown Beaver and the animals in the stream neighborhood who are upset about the increasing pollution around their homes. They need a private detective. that's where the players come in.
3. Either with a group leader or breaking down into smaller student groups, have a volunteer reporter from each group fill out an investigation report. All of the group should come to consensus on determining the data collected about the surrounding stream neighborhood.
4. Explain to the group/s the usage of the clue cards. Each card has a blue side (healthy) and a brown side (unhealthy). Read each card and look at your stream. Which side does your stream best match? If it is the blue side, place in the blue side of the folder. If your stream matches the brown side, place it in the brown side of the folder. Then count the number of blue cards chosen and compare it to the stream rating guide and determine if your stream needs help, could go either way, or is looking good.
5. Finally, search the Super Sleuth page to discover all the ways that students can be water quality stewards and make an ongoing commitment to help their stream neighborhood.
6. Pass out reward buttons and pencil for those who complete the program.

Optional activities: After doing a visual analysis of your stream, have students do a pH and temperature test of the stream to determine some of the invisible water quality conditions that exist in you adopted stream.

Using The Streamwalk Game Indoors

If you don't have a stream appropriate to visit, you can make one. have your group make a list of things that might be found along a stream. On large piece of butcher block paper draw two winding lines paralleling each other the entire length. This represents a stream. Using a variety of materials, have the children create a stream. Creating the stream can be a one-class activity or many-class activity. Once the stream is created, follow the for The Streamwalk Game.

*The Streamwalk Game was developed by the City of Portland Environmental Services with grant assistance for the U.S. Environmental Protection Agency.

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Teacher's Guide to Storybook

DAY EIGHT

The story of the Toutle River salmon is very different from the Willamette, Clackamas or Hood River stories. But the chinook that swam up the Toutle 14 years ago did not live to tell the tale. It happened on a nice day in May 1980. Scientists were keeping a close watch on the mountain they call St. Helens. The Indian Nations have long known this mountain. They called it Loo-Wit, the keeper of the fire. The mountain had been quiet for many years, but in early March it began to awaken. Lava began to push on the north side of the mountain. Earthquakes rumbled through the area. Small eruptions came from the mountain's peak. But what was about to happen would change the lives of the salmon and many other animals for a long time. On May 18, at 8:32 a.m., the mountain blew its top. Hot ash covered the Northwest from Washington to Montana. Hot mud flowed down the sides of the mountain. The blast blew down all the trees in its path. The hot mud washed the trees into the Toutle River. It boiled and buried everything in its path, including the river's brave salmon.

No one thought the salmon would ever return to the Toutle. But the salmon proved them wrong. Within two years, chinook found their way again to the river's mouth and began building their nests. Today the scars of the blast remain, but the Toutle's salmon have returned.

ACTIVITY 8-4: RACE TO THE REDD GAME

SKILLS: Counting, Reading, Discussion, Cooperation

OBJECTIVE(s): After completing the activity, students will be able to:

- ◆ review the many dangers salmon can face throughout their life cycle.

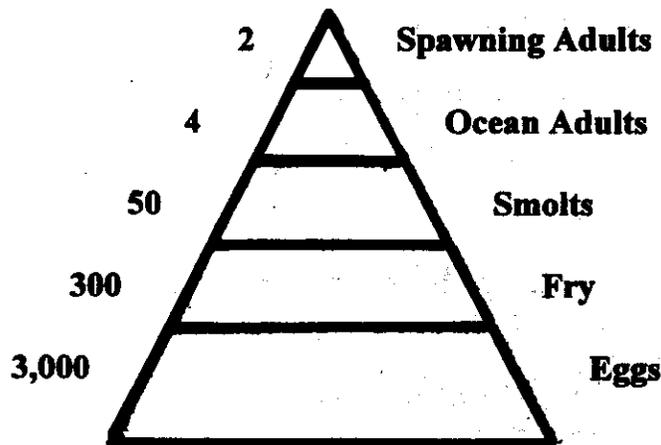
MATERIALS:

9 Race to the Redd game boards

9 bags of marker pieces/die

BACKGROUND INFORMATION:

Salmon - Survival Statistics



PROCEDURE:

1. Review salmon life cycle before beginning the activity..
2. In this activity, students will play the game Race to the Redd (From Washington State Department of Environmental Education Curriculum Guide "Clean Water, Streams, and Fish."). While playing this game, students will review the many dangers salmon can face throughout their life cycle.
3. Students should play the game in groups of four.

CONCLUSION:

Instructors should bring closure to this activity by making a class list of the possible causes of death for salmon at each stage of their life. Examples of natural causes are: landslides, floods, predators, etc. Examples of human caused problems are: pollution, dams, road building, etc. Instructors should also discuss the survival statistics. Did everyone make it to the redd?

Salmon Survey: This post-test is designed to evaluate the acquired knowledge of the students regarding the Pacific Northwest Salmon. Students should be given approximately **15 minutes** to complete the survey. Students can draw or write information on the survey sheet. It is important that each student complete the bottom portion which includes their name, camp and date. A pre-survey was administered on Day 1 of the camp. The comparison of the pre- and post- surveys will be an important tool in the evaluation process.

Journey of the *Oncorhynchus*

A Story of the Pacific Northwest Salmon

Teacher's Guide to Storybook

DAY NINE

Hydroid has joined other water droplets to form a cloud over Mount Hood. Below, the final seven Hood River chinook are facing the last step last part of their journey home. The Toutle River chinook are building new homes in their damaged river. The Willamette River chinook are fighting the falls and fishermen. At the same time, the Hood River chinook are coming face to face with a big wall. The wall is all across the river. It is the front of Bonneville Dam.

The fish must get past the dam. They search for the fastest water. The water is flowing over a set of stairs built by the same people who built the dam in 1937. The fish use all their strength and jump through the water over each of the smooth, flat steps. It's hard work. Two of the fish don't make it. The other five swim past a window. A person on the other side of the window counts the fish as they pass. Once again the Hood River chinook are in the large lake of Bonneville Dam's reservoir. They rest for a moment. The water is slow. The fish are confused, but soon they move on up the river. They rest no more. They do not eat. Not far is the smell of home.

Three of the chinook make it to the mouth of Hood River. They are weak from their travels. Their skin is dark. The male's snout is curved into a hook. They are thinner than when they entered the Columbia. Yet the sides of two of the fish are bulging. These are females full of eggs. They are in a hurry to build their nests.

Still they wait two days for rain to raise the water level. The river changed in the four years they were gone. This winter, loggers cut a stand of trees from the side of the mountain. A farmer cleared forty acres of land to put in a new orchard. Others sent their cattle into the stream to drink. The cattle hooves trampled the stream bank and killed the plants, leaving a trail of mud. Spring rains washed a heavy load of dirt and fertilizer into the river.

The water must run higher to clean the river of this pollution. The clouds next to Hydroid help. They brush the top of Mount Hood and unleash fresh water down the mountain side, through the streams and to the waiting fish. The fish begin to move up the river.

Journey of the *Oncorhynchus*

A Story of the Pacific Northwest Salmon

Teacher's Guide to Storybook

DAY TEN

One good thing happened while the fish were away. Workers built a small ladder to cover the waterfall they passed when they were just fingerlings. What was once a four-foot wall is now just four small steps. But even these are too much for one of the females. She dies at the base of the ladder. The other two move on. They have just one mile to go. There is not much time now. They must get home soon.

And there it is. A right turn and they are home at last. The stream of their birth. They were once little fish here. Now they are adult salmon, nearly four feet long. The female chooses a shallow spot in the shade of a clump of grass. The water runs fresh, but not too fast. She begins to build her nest. The male stands guard close by. For the next hour, she moves over her chosen spot, flipping her tail to move the gravel into place. After each pass, she inspects her work. She moves her body through the redd to test her work. Finally it feels just right. She settles in one last time. The male swims up close to her and presses her side with his body. She lays her eggs. About 5,000 small pink eggs float down from her body into the spaces between the rocks of her nest. At the same time, milt pours from the under side of the male. The milt spreads to cover the eggs and fertilize them. The female moves upstream of the nest. With one last effort, she flips up fine pieces of gravel to cover and protect her eggs.

Their work done, the fish rest for awhile in the stream. In a few days, they die. Hydroid watches as their bodies drift down the stream to become food for the crows, raccoons and smaller creatures of the water. These small creatures are food for the Hood River chinook that hatch next year. By dying, the adults nourish their young. The droplet has been watching the fish so closely that it has not noticed that its cloud has moved closer to the mountain.

The cloud brushes against the tip of Mount Hood. A gentle rain falls on a small stream low on the mountain's northeast slope, 50 miles east of Portland, Oregon. Several drops hit the arching blades of grass shading a shallow pool at the edge of the stream.

ELECTRIFYING FISH FACTS

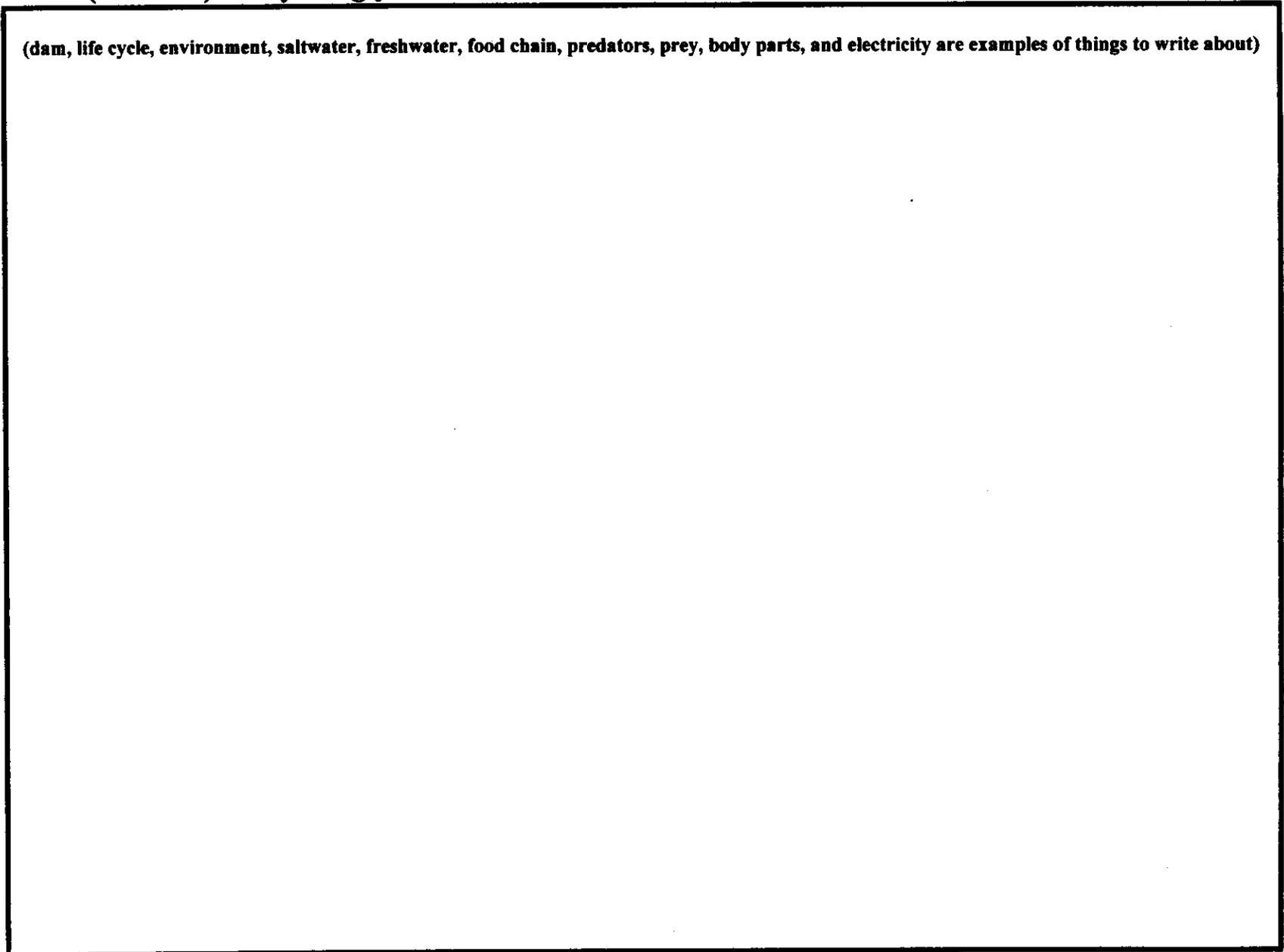
1. Chinook
2. Coho
3. Sockeye
4. Chum
5. Pink
6. Fry
7. Anadromous
8. Smolt
9. Alevin
10. Redd

Called King Salmon, are the longest lived and the largest of the Pacific Salmon.	
Called Silver Salmon, turn muddy red when they begin their spawning run.	
Called "Reds", turn red with green heads during spawning.	
Called Dog Salmon, develop a very hooked jaw with fierce teeth at spawning time.	
Called Humpies or Humpback, the smallest of the Pacific Salmon. The males develop a grotesque humpback during spawning.	
Young salmon that no longer have a yolk sac and have left the gravel bed.	
A fish that lives part of its life in freshwater and part in saltwater.	
A salmon that has spent over one year in the stream and is ready to go to the sea.	
The newly hatched salmon with its yolk sac still attached.	
The gravel bed in the stream where the salmon deposit their eggs.	

2-132

Draw (or write) everything you know about the Pacific Salmon.

(dam, life cycle, environment, saltwater, freshwater, food chain, predators, prey, body parts, and electricity are examples of things to write about)



2-134

Name _____ Camp _____ Date _____

DAY 10

TEACHER NOTES

WASHINGTON PARK ZOO FIELD TRIP

Estimation Game: Challenge students to estimate the number of threatened and endangered species in the state of Oregon. (Winners will be announced at the beginning of lunch.) The answer is 29. There are twelve threatened species and fifteen endangered species in the state of Oregon.

Bus Activities: Students can complete games and/or activities in their student workbook during the bus ride to the zoo.

OBJECTIVE(s): After completing the activities on this field trip, students will be able to:

- ◆ apply what they have learned in the classroom to their local and regional communities.

MATERIALS:

Prizes for Scavenger Hunt

35 No. 2 pencils

BACKGROUND INFORMATION:

Extinction is the final step in the evolutionary process. Thousands of species of animals and plants flourished and disappeared long before humans became recognizable. Dinosaurs, mammoths, and sager-toothed tigers all became extinct a long time ago. More recently, the dodo bird, the sea mink, and the passenger pigeon have become extinct. Extinction has been going on since life began on the Earth. But today, extinction is happening faster than ever before.

The terms threatened and endangered describe wildlife species in danger of extinction. There are more than 600 endangered or threatened species in the United States today. Endangered species are those plants and animals that are so rare they are in danger of becoming extinct. Threatened species are plants and animals whose numbers are very low or decreasing rapidly. Threatened species are not endangered yet, but are likely to become endangered in the future.

There are over 29 animal species listed as threatened or endangered in the state of Oregon. The northern spotted owl, western snowy plover, loggerhead sea turtle, sea otter and the wolverine are threatened. The gray wolf, green sea turtle, Brown pelican, Columbian white-tailed deer are endangered.

PROCEDURE:

1. Upon arriving at the zoo, each adult should pick up a map of the zoo. Use the map to locate the area your group will start.
2. Each group of student (A, B, etc.) will include one team from each of the two camps. Each group of students will experience all the exhibits at the zoo. The in which each group will go through the zoo exhibits is listed below.

<u>Group</u>	<u>Morning Stations</u>	<u>Afternoon Stations</u>
A	1, 2, 3,	4, 5
B	2, 3, 4,	5, 1
C	3, 4, 5,	1, 2
D	4, 5, 1,	2, 3
E	5, 1, 2,	3, 4

3. WASHINGTON PARK ZOO STATIONS

It is very important to following the order listed. The number represents where your group will start.

STATION 1: Start with **THE BIG CATS**. Answer questions 1-15.

STATION 2: Start with **BEARS**. Answer questions 16-30.

STATION 3: Start with **PRIMATES**. Answer questions 31-53.

STATION 4: Start with **AFRICA**. Answer questions 54-75.

STATION 5: Start with the **ZOO TRAIN**. The train will run to the Washington Park Station above the Rose Gardens.

4. When your groups have completed all of the stations return to the grassy area between the elephant exhibit and the AfriCafe. At approximately 2 pm, the final prizes will be awarded to the groups for the Zoo Scavenger Hunt. If time permits, students can sign autographs as the groups arrive.

STUDENT ACTIVITY SHEET 10-1

SCAVENGER HUNT
(WASHINGTON PARK ZOO)

Find the answers to the following questions as you walk through the zoo.

BIG CATS

A. SIBERIAN TIGER

1. What kind of food (diet) do these cats eat? _____
2. What is the genus name of the Siberian Tiger? _____

B. LION

3. What is the scientific name (genus and species) of the lion? _____
4. Lions travel in groups called _____.
5. What type of habitat do these animals prefer? _____

C. COUGAR

6. What is the scientific name of this cat? _____

D. SNOW LEOPARD

7. Why is this animal endangered? _____
8. Why is the long tail of the snow leopard so fluffy? _____

E. JAGUAR

9. Where does the Jaguar live in the wild today? _____

**** Note! Buy Brazil Nuts and save a jaguar.** No one knows how to grow brazil nuts commercially. They all come from wild trees in the tropical rain forests of South America. By buying them, you are encouraging preservation of forests that are home to jaguars and other species.

 Put a star next to the cat that is native to Oregon.

INSECT ZOO

10. Stop and check out the Walking Sticks. Where are these animals found in the wild?
11. Name one type of food that is eaten by the Australian Walking Stick.
12. Name two types of spiders.

PENGUINS

13. Where is the natural home of the Humboldt Penguins?
14. All penguins live in the _____ hemisphere.
15. Where do penguins lay their eggs?

BEARS

A. RED PANDA

16. Describe the habitat that the pandas live in?

B. POLAR BEAR

17. Why is the Polar Bear's nose black?
18. List three types of food that these animals eat.
19. What five countries are working together to save the Polar Bears?
20. What color is the Polar Bear's skin and why is it this color?
21. Describe the fur of the Polar Bear.

C. SUN BEAR

22. What is the normal habitat for this bear?
23. What adaptation does this animal have for finding its food?

BEARS - CONTINUED

D. KODIAK BEAR

24. The Kodiak Bear is the largest meat eating bear. How much can it weigh?
25. Where can you find this animal in the wild?

E. ASIATIC BLACK BEAR

26. This bear is an omnivore. What does that mean?

F. SPECTACLED BEAR

27. Why is this bear endangered?

28. This bear is also called _____.

** This bear is the only bear found on the South American continent.

G. AMERICAN BLACK BEAR

29. What type of habitat does it prefer to live in?
30. The American Black Bear can be found in what other colors?

PRIMATES

A. WHITE-CHEEKED GIBBON

31. The White-Cheeked Gibbon is native to _____.
32. Gibbons swing from tree to tree, this behavior is called _____.

B. SIAMANG

33. Siamangs are native to _____ and _____.
34. How do they communicate?

C. MANDRILL

35. What type of habitat do these primates prefer?

D. CHIMPANZEE

36. What is the scientific name of this monkey?

PRIMATES - CONTINUED

E. MARMOSETS/TAMARINS

37. These smallest true monkeys are found in _____ and _____

F. FRANCOIS' LEAF MONKEY

38. Why is this monkey highly endangered?

G. ORANGUTAN

39. Why is the Orangutan endangered?

H. HANUMAN LANGUR

40. In India, these monkeys are called _____.

I. COLOBUS MONKEY

41. These monkeys are the most arboreal of the African monkeys. What does arboreal mean?

J. RINGED-TAILED LEMUR/RED RUFFED LEMUR

42. Both of these monkeys are native to the island of _____
which is located off the coast of _____

ELEPHANT MUSEUM

(Lilah Callen Holden Elephant Museum)

43. True or False. The American Mastodont has been found in the Portland area?

44. How does the Mastodont size compare to the present day elephant.

45. The large tusks present in the Mastodont skeleton are made of plastic. Why is this so?

ELEPHANTS

46. When was Packy born?

47. Why is the Asian elephant endangered?

48. Female elephants are pregnant for how many months before giving birth?

49. How many pounds of food does one elephant eat in a day? List the types of food elephants eat.

****Note - There are only two kinds of elephants, African and Asian. They are easy to tell apart. The African is larger and has bigger ears. The trunk of the African has two lips, while the trunk of the Asian has one.**

ALASKAN TUNDRA

A. MUSK OX

50. Another name for the Musk Ox is _____.

B. GRAY WOLF

51. How do adult wolves carry food back to their young?

C. GRIZZLY BEAR

52. How many years can a Grizzly Bear live?

53. A newborn Grizzly cub weighs only _____ pounds.

AFRICA

A. THE AVIARY--BIRD WALK

54. Be sure to visit the aviary, how many different birds can you see?
55. The African Jacana or lily trotter is one cool bird. Who carries the young birds around until they are ready to go out on their own?

B. BLACK RHINOCEROS

56. What type of habitat does the rhino live in? _____
57. Why is it endangered? _____

C. HIPPOPOTAMUS

58. What is the genus name of the Hippopotamus? _____
59. Why are their eyes, ears, and nostrils high on their head? _____
60. An adult male can weigh as much as _____ Kg or _____ pounds.

D. HARTMANN'S MOUNTAIN ZEBRA

61. Zebras travel in herds of _____ animals.
62. Zebras can go without water for _____ days.
63. Why are these animals highly endangered?

E. RETICULATED GIRAFFE

64. The Giraffe can run up to _____ miles per hour.
65. Why do they have such long necks?

F. IMPALA

66. These animals can jump _____ feet in length and _____ feet in height.

AFRICAN RAIN FOREST

A. MONGOOSE

67. These animals are _____ eaters.

68. While hunting, the mongoose communicates by _____.

B. FRUIT BATS

69. True or False. These animals are mammals.

70. List three types of fruit that these bats eat.

C. CAPE CLAWLESS OTTER

71. These otters use their broad teeth to eat _____ and _____.

D. AFRICAN ROCK PYTHON

72. How does a python capture its food?

E. WADING BIRDS OF THE AFRICAN RAIN FOREST

73. List three types of birds found here.

F. LUNGFISH

74. Why is this fish called a living fossil?

G. LEECH

75. What do these parasites live on?

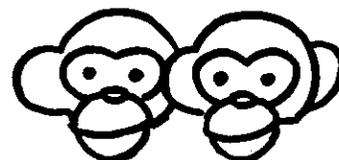
ZOO ANIMAL WORD SEARCH



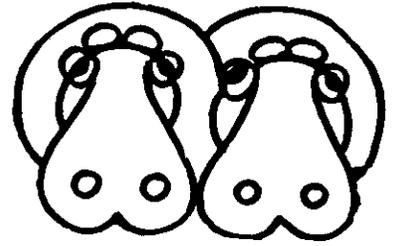
Orangutan
Polar Bear
Monkey
Fruit Bat
Lizard
Golden Eagle

Rhinoceros
Penguin
Lion
Snow Leopard
Lemur
Bengal Tiger

Black Bear
Panther
Elephant
Falcon



ZOO ANIMAL WORD SCRAMBLE



Directions: Unscramble the words below.

1. NOARTAUNG 1. _____
2. NFOACL 2. _____
3. TENLEAHP 3. _____
4. RLUEM 4. _____
5. DLRIAZ 5. _____
6. YMEOKN 6. _____
7. NPIEUNG 7. _____
8. RPEAHNT 8. _____
9. SROHRIENCO 9. _____
10. NLOI 10. _____
11. RPAOL RBAE 11. _____
12. KBCLA REAB 12. _____
13. LBAEGN RTEIG 13. _____
14. NGEODL EELAG 14. _____
15. WSON DLREAPO 15. _____

Answers to word scrambles and crosswords.

WORD SCRAMBLES

Oregon Coast: 1. seagull, 2. tides, 3. kites, 4. seal, 5. waves, 6. estuary, 7. driftwood, 8. ocean, 9. Columbia River, 10. sand castles, 11. smolt, 12. Peter Iredale, 13. sea shells, 14. Fort Stevens, 15. killer whale.

Salmon Life Cycle: 1. spawning, 2. chinook, 3. smolt, 4. alevin, 5. eyed egg, 6. yolk sac, 7. sockeye, 8. migration, 9. redd, 10. fry, 11. parr, 12. tributary, 13. anadromous, 14. pink, 15. coho.

Wildlife: 1. wildlife, 2. snag, 3. silt, 4. osprey, 5. predator, 6. chinook, 7. ecosystem, 8. huckleberry, 9. Douglas fir, 10. tracking, 11. kingfisher, 12. great blue heron, 13. temperature, 14. dissolved oxygen, 15. prey.

Zoo: 1. orangutan, 2. falcon, 3. elephant, 4. lemur, 5. lizard, 6. monkey, 7. penguin, 8. panther, 9. rhinoceros, 10. lion, 11. polar bear, 12. black bear, 13. Bengal tiger, 14. golden eagle, 15. snow leopard.

CROSSWORDS

Chemistry: Across 2. metrics, 6. indicator, 7. Celsius, 8. chemical, 9. temperature, 11. acid, 12. neutral. Down 1. balance, 3. thermometer, 4. dissolved oxygen, 5. graduated cylinder, 10. base.

Mount St. Helens: Across 1. ash, 2. lava, 3. plates, 4. Toutle, 7. Cascades, 8. crater, 9. dome, 10. Loowit. Down 1. mudslide, 3. pumice, 5. lava tube, 6. volcano.

Oregon Coast: Across 4. Fort Stevens, 6. trash, 8. wave, 10. estuary, 11. sea shells. Down 1. battery, 2. ocean, 3. Peter Iredale, 5. smolt, 7. tides, 9. seagulls.