Science Unit: *The Journey of the Pacific Salmon*
Lesson 2: *The Salmon Stream and Vegetation*

School year:	2008/2009
Developed for:	Grenfell Elementary School, Vancouver School District
Developed by:	Jean Marcus (scientist), Jane Hughes and Gary Loong (teachers)
Grade level:	Presented to grade 3; appropriate for grades 2 – 5 with age appropriate modifications.
Duration of lesson:	1 hour and 30 minutes

Objectives

1. Review the Pacific Salmon stream life cycle stages: eggs, alevins, fry.
2. Discover the many connections between vegetation (trees, plants) and salmon.
3. Explore how riparian vegetation helps maintain healthy Pacific Salmon stream habitat by building a model stream.

Background Information

Salmon depend on vegetation, particularly trees and bushes, for a healthy stream habitat and for a well-functioning food web. In the stream, salmon require cool water with ample oxygen, clean (non-silty) water so the eggs develop properly, and areas for young salmon to use as shelter. Riparian vegetation provides shade, keeping the stream water cool. Trees and plants also increase water quality by filtering the water before it enters the stream and decreasing the amount of soil that is eroded from stream banks when it rains. This is very important, because eggs are easily smothered in their nests (redds) by silt and sediment. Redds can also be harmed by mountain bikers, hikers, domestic animals and horses crushing them. In addition, fallen trees and branches create woody debris in the stream which provides fry with safe places to hide.

After fry emerge from the gravel streambed and start to feed, the food they need also depends on nearby trees and plants. For example, leaves from trees and bushes fall into the water and provide food to insects such as “shredders”, tiny plant-eating bugs that hover at the water’s surface. These shredders in turn are important food for young salmon such as fry and other birds and animals. If there is no or little stream-side vegetation, then insects such as the shredders will die and an important food source for the young developing salmon disappears.

Riparian habitat loss along rivers and streams (and estuaries and bays) is one of the most serious problems facing salmon. People are responsible for many causes of this vegetation loss, due to activities such as logging and the building of logging roads, farming and urban development that creates many impermeable surfaces. The good news is that we now understand the detrimental effects of these types of activities and many groups of concerned citizens and scientists are working hard to protect our riparian habitats and salmon.

Vocabulary

Word:	Brief definition.
Riparian area	Area of land next to streams, rivers, lakes and ponds which is full of trees, bushes and other vegetation that offers critical fish and wildlife habitat and water quality.

Emergence	The act of salmon fry leaving the gravel nest.
Streambed	The stream bottom.
Redd	The nest of various fish such as salmon and trout.
Water quality	The degree of water "health", including silt/sediment content, oxygen concentration and the amount of harmful substances such a pesticides.
Woody debris	Logs of dead branches that fall into or hang into rivers and streams and provide cover for fish, and provide food for insects and plants that fish feed upon.
Food web	A group of interrelated food chains, showing who eats who.
Silt	A sedimentary material consisting of very fine particles intermediate in size between sand and clay.
Impermeable surface	A surface that does not allow water to penetrate (e.g. concrete, asphalt).

Materials

Journey of the Pacific Salmon Board Game

- game board (Worksheet 2)
- stream question cards (Worksheet 3)
- 4 magnets
- dice

Model Salmon Stream

- large, rectangular, Tupperware container x2
- turf or another material to simulate vegetation
- Watering can, with a sprinkler nozzle
- sand (~1 liter) for stream side simulation and rocks/gravel (~ 2 cups) for streambed simulation
- small plastic trees to insert into turf
- red beads (to simulate salmon eggs)
- Activity Sheet (Worksheet 1)

In the Classroom

Introductory Discussion

1. Scientist reviews the stages of the salmon life cycle that live in a stream and shows different pictures of salmon streams. Ask students the following questions:
    - What do you see in the stream? Describe the pictures one by one. Be sure to include pictures of a salmon redd (nest), pictures of the eggs, alevins and fry, and pictures which highlight stream-side (riparian) vegetation.
    - Do you think these features are important to salmon? Why or why not?
    - What type of stream do you think salmon like the best? Why?
    - What types of stream do you think salmon would not like? Why?
    - How can people help protect salmon streams?
2. Scientist reviews the major stream features that are important for salmon, with particular attention to healthy riparian areas which are beneficial to salmon because they improve their habitat:
    - Stream-side vegetation provides shade, shelter and insects for fry to eat

- Stream-side vegetation also helps water quality by filtering water before it reaches the stream and decreasing erosion of soil into the stream

3. Brief description of the activities:
   - Activity 1: Building 2 model salmon streams, one with and one without riparian vegetation
   - Activity 2: The Journey of the Pacific Salmon board game
4. Processes of science that the students will focus on:
   - Activity 1 requires students to make a prediction (what do they think will happen?) and then conduct an experiment and observe the results. The prediction and observation are recorded and the scientist can review the scientific method to explain how experiments allow us to objectively assess our prediction.

Science Activity

Activity #1: Model stream with and without riparian vegetation

Purpose of Activity: To explore how stream-side vegetation affects the amount of sediment in a stream after it rains.

- We will build 2 streams: both have rocks/pebbles on the bottom with beads to represent salmon eggs, and sand on one side to represent the riparian (stream-side) area. One model stream will have turf to simulate vegetation and the other model will not have turf. Students predict what will happen when water is poured over the sand to simulate rain.

Methods and Instructions:

Set-up prior to activity:

Assemble all materials (see Model Stream Materials above) and photocopy Worksheet1, one per student. Divide the class into two groups; Group 1 builds a model stream WITHOUT simulated riparian vegetation and Group 2 builds a model stream WITH simulated riparian vegetation.

In class activity, students will work in groups:

1. Each group assembles ONE model stream. Position the container on an angle widthwise (place a book under one end). Fill the bottom 1/2 of the container with gravel to simulate the streambed. Place a handful of red beads in the rocks to simulate salmon eggs. Next place sand in the upper half of the container to simulate the stream bank. Group 2 (who is building a stream with riparian vegetation) adds a piece of turf in-between the sand and rocks and inserts fake trees into the turf.
2. After the model streams are complete, have students predict what will happen when they pour water over the stream bank to simulate a rain fall (Worksheet 1, first box).
3. One volunteer student from each group then pours water (using a watering can with a sprinkler nozzle) gently over the sand. All students observe closely what happens.
4. Students then fill out the remainder of Worksheet 1.
5. Note this activity is explained in greater detail in “Salmonids in the Classroom: Primary” (see Protecting the Eggs section, page 44).

Activity #2: The Journey of the Pacific Salmon board game (Stream Habitat – Out).

Purpose of Activity: To review the day’s lesson in a fun and engaging way.

Methods and Instructions:

Set-up prior to activity:

Assemble all materials (see Board Game Materials above) and print the board game (Worksheet 2) in a size large enough for students to see it easily when it is hanging on the classroom wall. Hang the board game on a magnetic classroom board. Print and cut out the stream questions (Worksheet 3) and place them in an envelope.

In class activity:

1. Divide the class into 4 teams. Have each group pick a team name and assign a playing piece (a magnet works well if the game board is posted on a magnetic board). Places all playing pieces in the START position.
2. Explain that this is the first week we are playing the board game. Explain that today we will play the STREAM section. The game questions reflect what we have explored and learnt in today's lesson. The rules of the game are as follows:
    a. The first team rolls the die and moves forward X squares by the number rolled. A volunteer from the team then picks a stream question from the envelope and reads the question to the class. The team has 1 minute to decide how they will answer the question. If their answer is correct, they roll again. If incorrect, the scientist asks the rest of the class if they know the answer. Either a student or the scientist explains the correct answer to the class, and then the next team goes. Each team stops playing when they reach the end of the stream section.
    b. For the next 3 lessons we will end each day with playing this game. Next week the class will play the ESTUARY section, the following week the OCEAN section and the following week the STREAM IN section (note that an Estuary In section is present on the game board, but this section can be skipped by asking the students one question and if they answer it correctly they progress to the start of the STREAM IN section).

Closure Discussion

The board game is an effective way to review the lesson. After the board game, explain briefly the intent of next week's lesson: to review smolts, the life cycle stage that lives in the Estuary, and to explore how salmon farms located in estuaries can negatively impact young smolts swimming to sea due to increased sea lice infections.

References

1. Salmonids in the Classroom: Primary. A Teachers Resource for Studying the Biology, Habitat and Stewardship of Pacific Salmon. To download the entire package, see: http://www-heb.pac.dfo-mpo.gc.ca/community/education/lessonplans/sicprimary/downloads/english/sic_primary_all.pdf
2. Burns, J.E. 1970. The importance of stream-side vegetation to trout and salmon in British Columbia. Fisheries Technical Circular No. 1, BC Fish and Wildlife Branch. For an online version, see: http://www.wccportal.com/tburns/articles/Stream/stream.html
3. Capital Regional District, Pacific Salmon. The website includes many facts and focuses on the Victoria, BC area. See http://www.crd.bc.ca/watersheds/protection/wildlife-plants/salmon.htm

Name: _____

Model Salmon Stream Experiment

Check the type of model stream your group is building:

€ My model HAS stream-side vegetation.

€ My model DOES NOT HAVE stream-side vegetation.

When we pour water over the stream bank, my prediction is:
(write or draw your prediction)

In <u>my</u> model stream I saw:
(write or draw the changes you observed)

In the <u>other</u> model stream I saw:
(write or draw the changes you observed)

I think salmon prefer streams with / without (circle one) stream-side vegetation because

What is the scientific name for a salmon nest?	Five eggs will produce about ____ fry.
What do alevins eat? Be careful, this is a tricky question!	How do the dark marks on the side of the fry (called parr marks) help the small salmon survive?
What is a “shredder” and what does it eat?	Do bears eat salmon fry? Why or why not?
Why is a “shredder” important to fry?	Does a fry have the same shaped tail as an adult salmon?
What is the area with trees and plants along side the stream called?	Name one way that people can protect the salmon’s stream habitat.
Why are stream-side trees and plants important for salmon? Give 1 reason.	Why are stream-side trees and plants important for salmon? Give 1 reason.
What is one way that a salmon’s nest can be damaged?	Do salmon eggs, alevin and fry like warm water? Why or why not?
Why do salmon prefer clean water with little silt?	What life cycle stage do fry grow into?

The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream
The Salmon Stream	The Salmon Stream