Science Unit: *The Journey of the Pacific Salmon*
Lesson 1: *From Stream to Sea*

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. Explore the salmon lifecycle, learning about key stages (eggs, alevins, fry, smolts, adults, spawners)
2. Explore the migratory route of the salmon, linking route to life cycle stages
3. Gain experience linking attributes of the habitat (i.e. water types) to the three broad habitat types (stream, estuary, open ocean)

Background Information

Salmon is the common name for several species of fish of the family Salmonidae. Trout also belong to this family but they differ from salmon in that salmon are migratory and trout typically have a residential behavior. Salmon live in the Atlantic and Pacific Oceans, as well as in the Great Lakes. Typically, salmon are anadromous: they are born in fresh water, migrate to the ocean, then return to fresh water to reproduce. During this migration, salmon live in 3 major habitats: 1) the lake, river or stream with fresh water, 2) the estuary with brackish water, and 3) the ocean with salt water.

Five species of Pacific salmon are native to the waters of British Columbia, Canada: Chinook, Coho, Sockeye, Pink and Chum. Pacific salmon lay their eggs in fresh water (streams, rivers, lakes), where the young eggs hatch into alevins. Alevins are non-feeding as they use their yolk sac for energy. Alevins grow into fry which must feed for survival. When the young fry grown into smolts they are ready to leave the stream for the open ocean via the estuary. When the adult salmon are ready to reproduce, they return to their freshwater natal streams, rivers or lakes to spawn. Pacific salmon die after spawning once (this makes them semelparous). This whole sequence of development from birth to death is called the salmon's "life cycle".

Vocabulary

Word:	Brief definition.
Pacific Salmon	Any of several anadromous salmonid fishes (genus *Oncorhynchus*) chiefly of the northern Pacific including the coho, sockeye, chum, chinook, and pink salmon.
Anadromous	Fish that migrate from the sea to fresh water to spawn.
Semelparous	An organism that reproduces or breeds only once in a lifetime
Habitat	The place where a plant or animal (or any other type of organism) lives.
Stream	A flow of water in a channel or bed; a small river.

Estuary	An inlet of the ocean, especially the wide mouth of a river, where the river meets the ocean.
Ocean	The great body of salt water that covers mores than two thirds of the surface of the earth. The five main oceans are: the Atlantic, Pacific, Indian, Arctic, and Antarctic.
Fresh water	Water that has few dissolved minerals, like salt. Found in streams, rivers and lakes.
Brackish water	Slightly salty water, formed when seawater and fresh water mix.
Salt water	Water that has higher concentrations of dissolved minerals, like salt. Also known as seawater (salinity typically ~35ppt).
Lifecycle	The series of changes occurring in each generation of an animal or plant.
Lifecycle stage	A particular stage of development of an animal or plant.
Eggs	Eggs are laid by female salmonids in the gravel riverbed (in a nest called a red) and the eggs are fertilized by males (sperm called milt).
Alevins	The newly hatched salmon, getting food from the attached yolk sac. Alevins remain protected in the gravel riverbed, until they are large enough to fend for themselves in the stream.
Fry	A juvenile salmonid that has absorbed its egg sac and is rearing in the stream; the stage of development between an alevin and a smolt.
Smolts	Juvenile salmonid which has reared in-stream and is preparing to enter the ocean. Smolts exchange the spotted camouflage of the stream for the chrome of the ocean.
Adults	The adult salmonid that lives in the open ocean.
Spawners	The mature salmonid that returns to the stream to spawn. Many male spawners develop a hooked jaw called a kype during spawning.

Materials

- Lifecycle poster
- Activity Sheets (2)
- tape
- 1L water
- 20 spoons
- Egg to Fry display
- colored pencils
- hula hoops (4-5)
- Salt
- Life cycles stages (8 posters)
- Posters of 6 life cycle stages X 3
- 12 paper/plastic cups
- measuring cup

In the Classroom

Introductory Discussion

1. Review the salmon life cycle and link the life cycle to habitat. Ask students the following questions:
    - What is a salmon?
    - What is a life cycle?
    - What is a habitat?
    - Where do salmon live?
    - What else do you know about salmon?

2. Review the stages of the salmon lifecycle. First, with the large posters of each stage, and then discussing where the salmon live at different stages (using the lifecycle poster). Ask students the following questions:
    - Where does the "X" stage of the salmon life cycle live?
    - What are the 3 main habitats that salmon live in throughout their complete life cycle?
    - What is the life cycle of human beings?
    - What makes a salmon so unique? (highlight anadromous and semelparous life style here)
3. Brief description of the 2 activities:
    - Activity 1: Review the salmon life cycle with a game (A) and a drawing exercise (B).
    - Activity 2: Match the 6 different stages of the salmon life cycle to the correct water and habitat type.
4. Processes of science that the students will focus on:
    - Both the activities are based on observation. Clear and detailed observation with the 5 senses is an important part of being a good scientist. Activity 1 requires good visual observation to find similarities and difference between the 6 life cycle stages and draw these correctly. Activity 2 requires taste and smell to distinguish between 3 types of water.
5. Safety guidelines:
    - No running in the classroom. (Activity #1)
    - Wipe spoons off with paper towel after each tasting. (Activity #2).

Science Activity

Activity #1: The Pacific Salmon Life Cycle (Parts: 1 and 2)

Purpose of Activity: Students explore the many developmental stages of the salmon life cycle, and learn the correct sequence from birth to death.

Methods and Instructions:

Set-up prior to experiment:

A) Prepare cut out pictures of the 6 stages of the salmon life cycle (eggs, alevins, fry, smolts, adults, spawners), enough for teams of 6 for the whole class. Place cutouts in a container. B) Photocopy the "life cycle" activity sheet (Worksheet 1), 1 per student.

In class activity:

1. Each student will choose a piece of paper from the container. Each piece has a picture of one salmon life cycle stage. Each student then finds 5 other students with the stages needed to complete the life cycle. They are finished when the group of 6 is standing in a circle (holding on to the hula hoop) with the life cycle stages in the correct order.
2. After the game, students draw their own salmon life cycle, paying close attention to differences between the stages (overall shape, fin size/shape, coloration, patterns, size etc.). Activity sheet #1.

Activity #2: Salmon and Habitat

Purpose of Activity: Students discover that different life cycle stages are associated with different types of water and habitats.

Methods and Instructions:

Set-up prior to experiment:

A) Prepare 4-5 sets of three jars of water, labeled A, B, C. The jars will contain fresh water (B), brackish water (C) and salt water (A). Be sure to use a measuring cup and measuring spoon as jars A (1/4 cup water and 1/4 tsp salt) and jars C (1/4 cup water, and 1/8 tsp salt) have similar salinities. Provide each student with a spoon and paper towel. Each group of 4-5 students works with one set of jars. B) Photocopy the "Salmon and Habitat" activity sheet (Worksheet 2), 1 per student.

In class activity (students will work in groups):

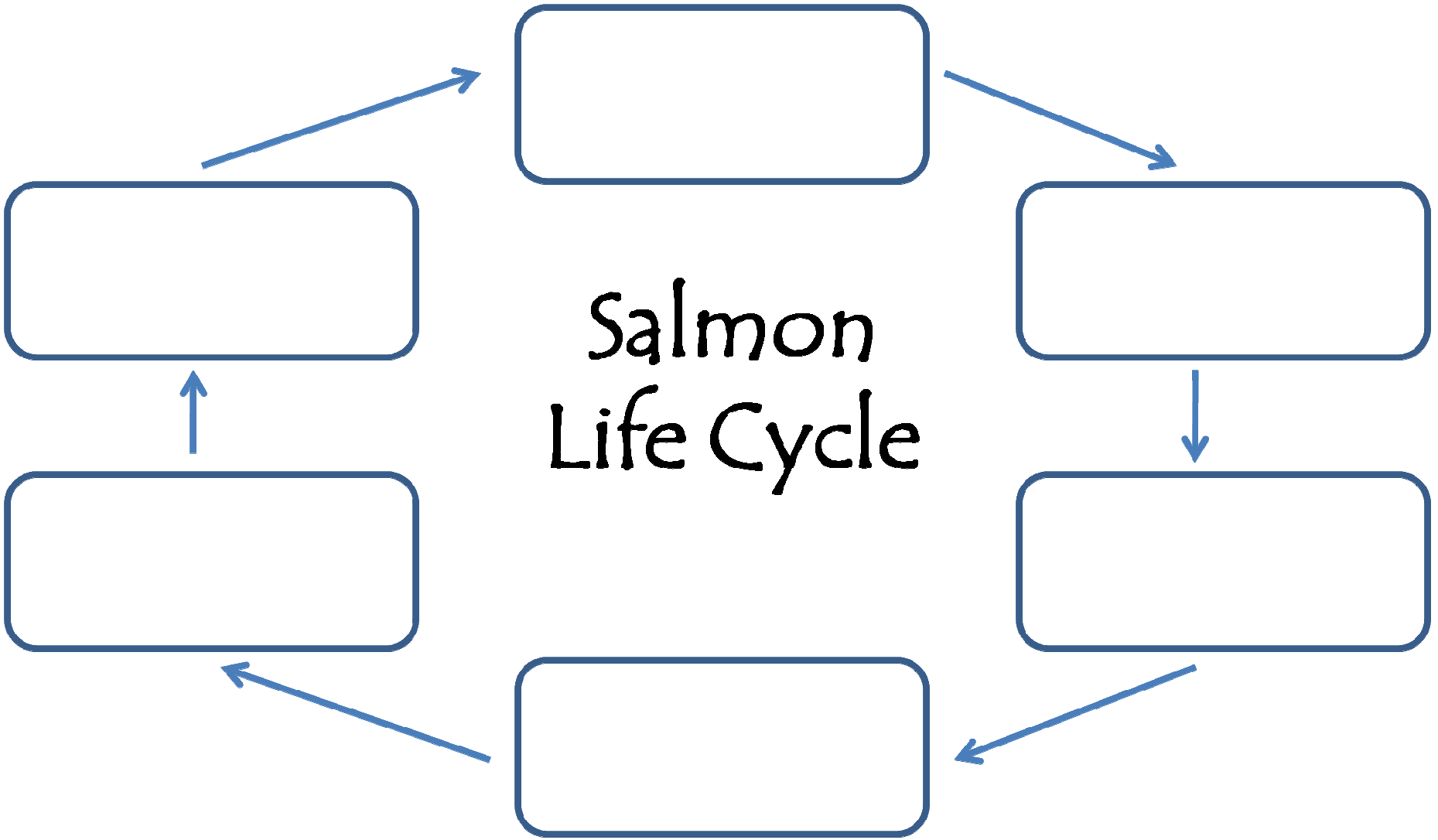
1. Students first taste a small amount of water from each of the 3 jars. They answer question #1 on the activity sheet. Activity sheet #2.
2. After determining that the water differs because of salt content, the students match the correct jar letter (A, B, C) to the correct water type (fresh, brackish, salt). This is Question #2 on the activity sheet #2.
3. Question #3 asks students to link each of the life cycle stages to the correct water type, and in turn link the water types to the correct habitat type.
4. Students complete this activity (Question #4, Activity Sheet #2) by picking one of the 3 habitat types (stream, estuary, ocean) and drawing this habitat with as many other characteristics of the habitat that they can think of (e.g. substrate, predators etc.).

Closure Discussion

1. Ask students to review the life cycle stages, and which habitats these stages live in.
2. Prepare students for week 2: we will examine the first 3 life cycle stages (eggs, alveins and fry) and aspects of their stream habitat in more detail, particularly looking at how vegetation (plants, trees) are important for the young salmon.

References

1. http://www.wdfw.wa.gov/outreach/fishing/salmon.htm. Salmon Facts: An informational guide to our state's natural treasure. Washington Department of Fish and Wildlife.
2. http://www-heb.pac.dfo-mpo.gc.ca/community/education/primary/primary_e.htm#Salmonids%20in%20the%20Classroom-Primary. Stream to Sea for Primary Grades, various resources. Department of Fisheries and Oceans, Canada.
3. http://www.pac.dfo-mpo.gc.ca/fm-gp/rec/species-especes/salmon-saumon-eng.htm. Pacific Salmon: Species Information. Department of Fisheries and Oceans, Canada.
4. http://www.thinksalmon.com/learn/species/pacific_salmon_species/. Think Salmon. Pacific Salmon Species


Salmon
Life Cycle

Salmon and Habitat

Salmon live in different habitats throughout their life cycle.
Today we will explore how the water the salmon live in changes in relation to their life cycle stage.

1. Taste the 3 jars of water. Is the water different? How?

_____

_____

2. Write the letter of the jar beside the matching type of water.

_____ **Fresh water**

_____ **Brackish water (slightly salty)**

_____ **Salt water (very salty)**

3. a) Draw a line to link each of the 6 different stages of the salmon life cycle to the correct water type, and b) link the water type to the correct habitat type.

Life Cycle Stage
Alevins
Adults
Spawners
Eggs
Smolts
Fry

Water type
Fresh Water
Brackish Water
Salt Water

Habitat
Stream
Open Ocean
Estuary

4. Write or draw a picture of some other aspect of <u>one</u> of the salmon's habitat.

Habitat:_____