Skein 1

Overview

Building Knowledge

Overview:
This skein gives students the opportunity to:

- **P / I** Examine and discuss their pre-existing ideas about salmon.
- **P / I** Discuss and review life cycle of familiar plants and animals.
- **P** Observe how organisms relate to their environment at different stages in their lifecycle.
- **I** Discuss and Review the stages of a salmon's life cycle, and the specific needs of each stage.

Big Ideas:

- All living things have a life cycle that is related to their needs and their habitat.
- The stages in a salmon's life form a cycle, but each stage has specific needs and is vulnerable to disruption and mortality of an alevin.

Vocabulary:

salmon, life cycle, egg, alevin, fry, smolt, adult, spawner

Important Standards Netted by Teaching Skein 1

SCIENCE

Fourth Grade	Fifth Grade	Sixth Grade
SA 1.1	SA 1.1	SA 1.1
SA 3.1	SA 3.1	SA 3.1
SC 2.1	SC 2.1	SA 2.2
SC 2.2	SC 2.2	
SC 3.1	SC 3.1	

MATH 3-6	WRITING 3-6	READING 3-6
2.2.2.1	W 1.1	R 2.1
2.2.3	W 2.1	R 2.4
		R 1.5
		R 2.5

BACKGROUND INFORMATION

LIFE CYCLES

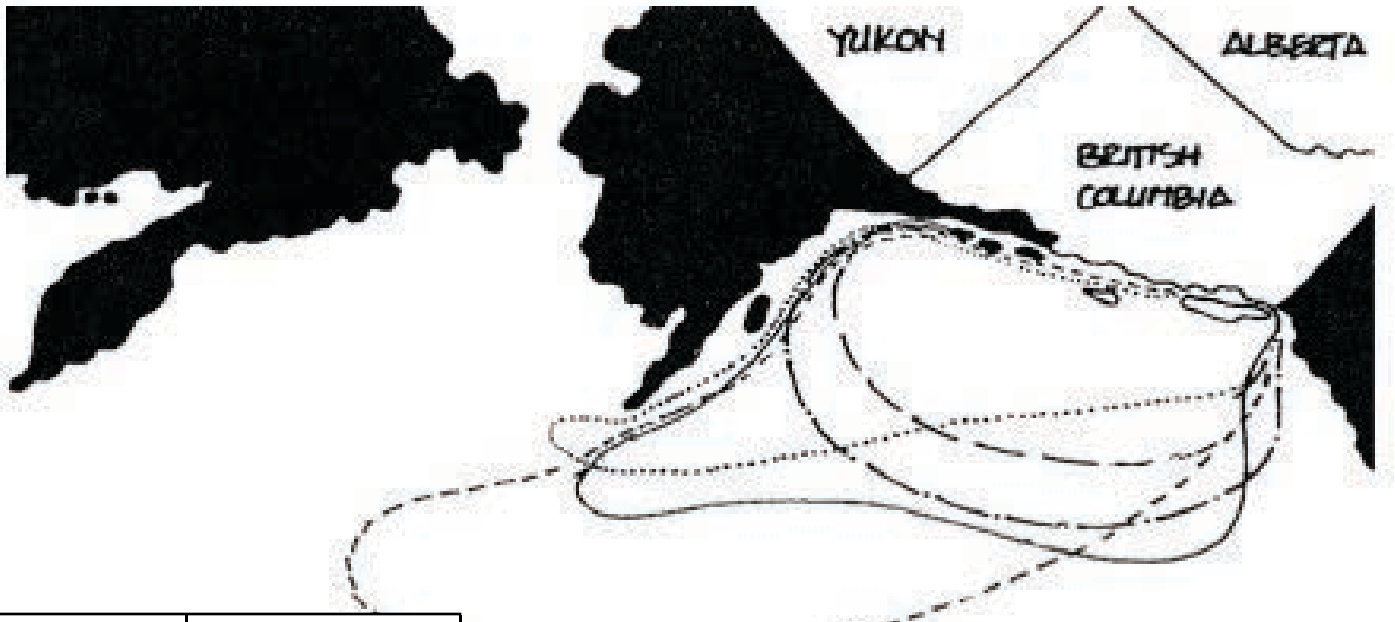
Pacific salmon move through several distinct stages in their lives, as all living things do. Each generation begins a new generation and another set of life stages. We refer to this process as a life cycle. In salmon, each stage of the life cycle takes place in a specific habitat, and has specific needs.

The stages in the life of Pacific salmon are as follows:

- **Eggs:** In late fall, adult salmon deposit thousands of eggs in a redd, a gravel depression in a flowing stream or on a lake shoreline, and cover the eggs with more gravel. The eggs, always sensitive to temperature, are particularly sensitive to movement at this stage, and need to remain undisturbed in the gravel. As cold, clean water containing oxygen flows through the gravel, an embryo develops the fertilized egg, and after about one month eyes become visible. The embryo gets the food it needs from the yolk of the egg, and oxygen from the water. Disturbances such as changing water temperature, speed of water flow and polluted water or silt deposited on the stream or lake bed can destroy the eggs. In early spring, the surviving embryos break through the membrane of the egg and hatch. They can move through the gravel, but they still face many threats: silt can still smother them, changes in water temperature or speed of water flow can be harmful, and predators catch many.
- **Alevin:** (The A is pronounced either AY as in play, or AH as in cat.) Alevin are mobile embryos. The yolk sac is still attached and provides food for the alevin for two to three months as they continue to develop hidden in the gravel. Alevin extract oxygen from the flowing water by using their gills.
- **Fry:** Once the yolk sac has been fully absorbed, the alevin leave the gravel as fry to search for food. They emerge from the stream or lake bed, usually in late spring, and swim to the surface. At the surface, they swallow air to inflate an internal swim bladder, which overcomes their natural body weight and achieves neutral buoyancy, allowing them to move easily up or down in the water. Salmon fry generally swim in a small territory and feed on whatever aquatic organisms drift through it. For protective coloring, they develop dark bars on their skin known as parr marks, which disappear in the next stage of their lives. They spend from a few months to a few years in their natal stream or lake, depending on the species. At this stage, they learn to recognize their natal environment, primarily by characteristic smells created in the water by rocks, plant life, and other aquatic organisms.
- **Smolt:** After their time in a stream or lake, salmon migrate downstream. When they reach the estuary where the river meets the ocean, they spend some time there as smolt adapting to salt water. Smolt gradually develop the ability to swallow salt water and expel the salt in their urine and through their gills. The scales that developed when they were fry turn to a silvery color. Estuary life is rich with abundant food, so smolt can grow rapidly, but estuaries are also home to many predators, such as birds, larger fish, and also to human development.
- **Adults:** Salmon migrate into the ocean, where they grow to adulthood with silvery

bellies and darker backs. Each species migrates to a particular part of the Pacific Coast from California to Northwest Alaska, sometimes ranging thousands of kilometers (km; or miles). They eat smaller ocean fish, krill (tiny crustaceans), and grow to their mature weight. Predators include large fish, fish-eating birds, marine mammals and human fishers. After a time, varying from one to eight years, they return and congregate at the mouth of their river of origin. Salmon seem to use a variety of visual and magnetic clues to navigate the ocean, then rely mainly on their sense of smell to identify their natal stream or lake.

- **Spawners:** When they enter their river of origin in the fall and begin to travel upstream, salmon stop eating and their bodies begin to change. Using stored energy, they travel 30 to 50 km (20-30 miles) upstream per day, often past waterfalls, and fallen obstacles. On the way, they become food for eagles, bears, wolves and people. When they reach the area where they lived as fry, the female digs a redd with her tail and fins. She deposits her eggs and a male releases his milt to fertilize them. The female then covers the eggs with fresh gravel. While a single coho salmon produces about three thousand eggs, other species can produce as many as seven thousand. Both male and female die within a few days of laying and fertilizing the eggs. Their carcasses contribute essential nutrients that fertilize the rearing area for the next generation of fry.



----------	Sockeye Salmon
_____	Chum Salmon
.....	Chinook Salmon
_·_·_·_·_·	Coho Salmon
___ ___ ___	Pink Salmon

BACKGROUND INFORMATION

Salmon Life Cycle Needs and Threats

Life Cycle Stage	Needs		Threats	
	Habitat	Food	Predators	Other
EGG • Head and body formation begin • Organ formation begins • Eyes become visible	• Oxygenated water • Temperature from 5° to 9°C (42° to 50° F) • Silt-free gravel bed • Steady water flow • Stream cover	• Yolk of Egg	• Fish, such as: trout, char, grayling, burbot, whitefish, sculpin and suckers. • Birds, such as: kingfisher, gulls, terns,fish-eating ducks, shore birds, and ducks • Mammals, such as: minks and river otters.	• Gravel movement • Drastic change in water temperature • Drastic change in water level • Siltation • Fine sediment • Disease • Pollution
ALEVIN • Embryo breaks through egg membrane • Oxygen absorbed through gills • Lives in gravel spaces	• Oxygenated water • Temperature from 5° to 14°C (42° to 60° F) • Silt-free gravel • Steady water flow • Stream cover	• Yolk sac	• Fish, such as: trout, char, grayling, burbot, whitefish, sculpin and suckers. • Birds, such as: kingfisher, gulls, terns, fish-eating ducks, shore birds, and ducks. • Mammals, such as: minks and river otters.	• Gravel movement • Drastic change in water temperature • Drastic change in water level • Siltation • Fine sediment • Disease • Pollution
FRY • Inflates swim bladder • Catches food • Exhibits darting reflex • Avoids light • Guards territory • Imprints home scent • Develops scales	• Oxygenated water • Temperature from 5° to 14°C (42° to 60° F) • Even water level and flow • Stream cover	• Larval and adult terrestrial and aquatic insects, (e.g., mayfly, caddisfly, true flies) • Rotting fish carcasses • Fish eggs	• Fish, such as: trout, char, grayling, burbot, whitefish, sheefish, sculpin and northern pike. • Birds, such as: kingfisher, gulls, terns, fish-eating ducks, shore birds, ducks and eagles. • Mammals, such as: minks and river otters.	• Gravel movement • Drastic change in water temperature • Drastic change in water level • Siltation • Fine sediment • Disease • Pollution • Blockage of migration route

Life Cycle Stage	Needs		Threats	
	Habitat	Food	Predators	Other
SMOLT • Migrates to estuary • Adapts to salt water • Scales develop silver color • Increases size	• Unpolluted water in river and estuary • Estuary vegetation for shelter	• Zooplankton (copepods, amphipods, euphausids) • Insects, (e.g., beetles, ants, grasshoppers, caterpillars) • Worms • Sandfleas • Shrimp • Smaller fish	• Fish (saltwater), such as: other salmon, pollock and cod. • Birds, such as: kingfisher, gulls, terns, fish-eating ducks, sea ducks and eagles. • Mammals, such as: otters, seals and whales.	• Filling or dredging of estuary • Pollution of estuary • Diversion of river water
Ocean-Phase Salmon • Migrates into ocean • Increases size • Stocks intermingle, then return to natal river	• Ocean water	• Zooplankton (copepods, amphipods, euphausids) • Larval crustaceans, (e.g., crab, shrimp) • Smaller fish	• Fish (saltwater), such as: other salmon, pollock, cod, lingcod and sharks. • Birds, such as: gulls, terns, sea ducks and eagles • Mammals, such as: seals, whales, sea lions and people.	• Ocean pollution • Ocean temperature change • Fishing
Spawner • Eggs, milt develop • Secondary sexual characteristics develop (color, shape, teeth) • Scales absorbed • Eating stops • Organs degenerate	• Migration route free from obstruction • Oxygenated water • Cool clean water • Silt-free gravel	• None	• Fish: None • Birds, such as: Gulls and Eagles. • Mammals, such as: Seals, whales, sea lions, bears, wolves and people.	• Very high or low water levels • Warm river temperatures • Obstructions (dams, slides, log jams, etc.) • Diseases • Pollution

Building Vocabulary

Materials:

- ✏ Labeled pictures of various plants, animals and fish for each group of students
- ✏ Copies of Handout 1.1, "Salmon Stages," for each group, cut into individual illustrations
- ✏ Salmon science notebook to collect materials related to salmon

Time Required:
One lesson

Level of Conceptual Difficulty:
Simple

Evidence for Assessment:
Monitor student ideas and comments to ensure they understand the meaning of basic salmon vocabulary.

- ☞ Have groups of students sort labeled pictures into categories based on their own criteria.

- ☞ Have groups explain their categories to the class, and identify any words they do not know. Provide a definition for unknown words (see Glossary), and make a salmon dictionary on a chart posted in the classroom. Continue to add words to the dictionary from the skeins that follow.

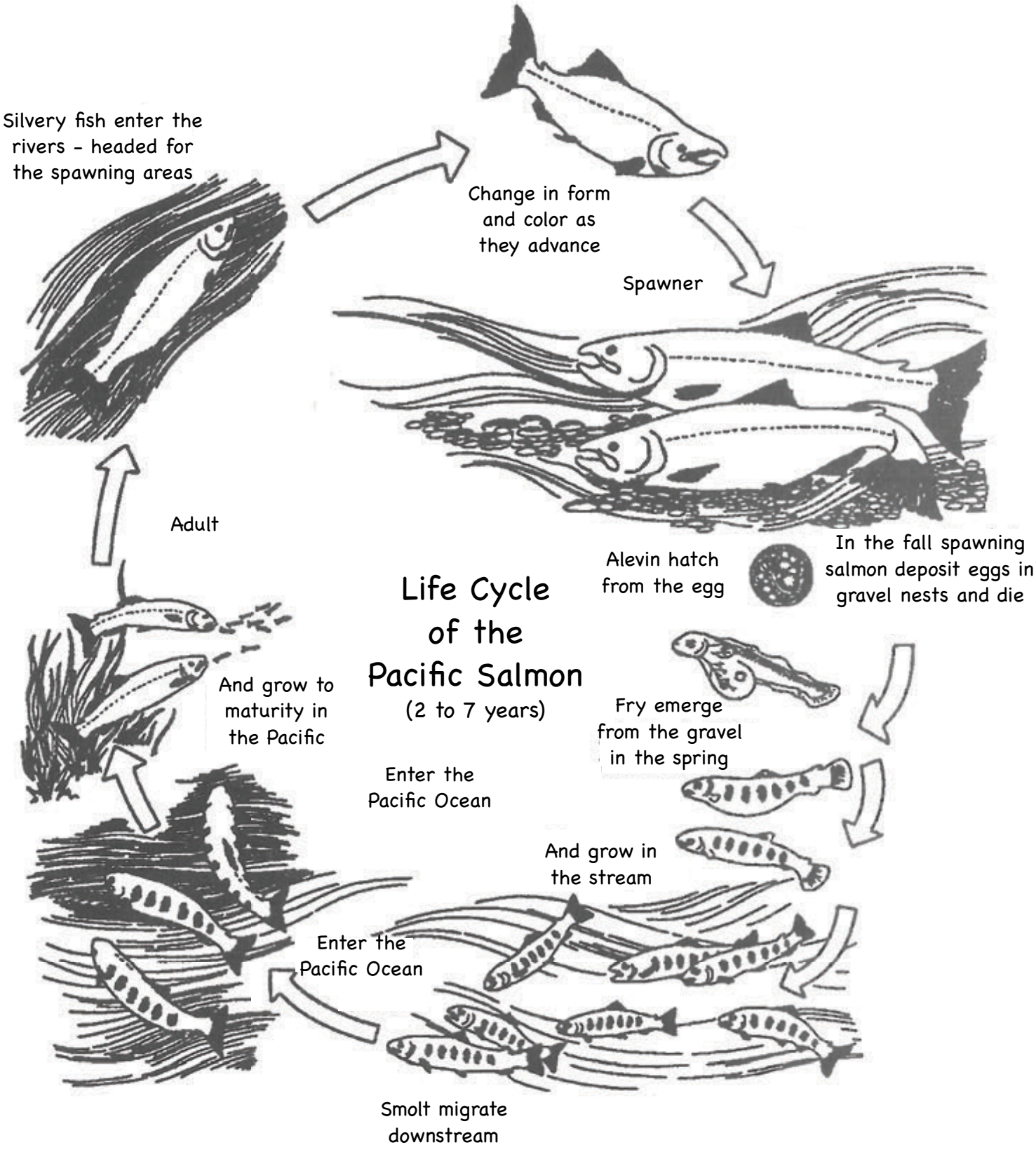
- ☞ Have students select the pictures showing the salmon's life cycle and predict what the stage will be about.
  Salmon stages: egg, alevin, fry, smolt, adult, spawner.

- ☞ Explain that the **Alaska Salmon in the Classroom** activities will look at how salmon develop. If appropriate, outline how you plan to present **Alaska Salmon in the Classroom** throughout the year.

- ☞ Have students write their new words in their salmon science notebook.

Life Cycle of the Pacific Salmon

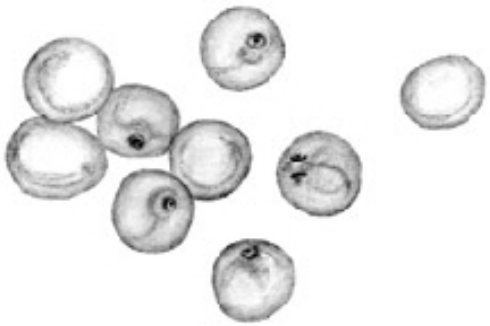
(2 to 7 years)



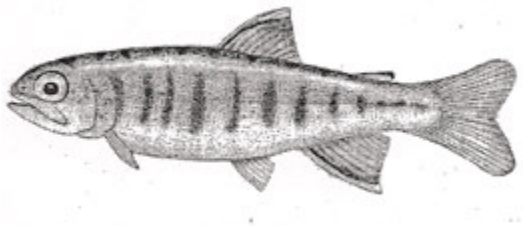
Salmon Stages

Handout 1.1

Illustrations: Karen Uldall-Ekamn

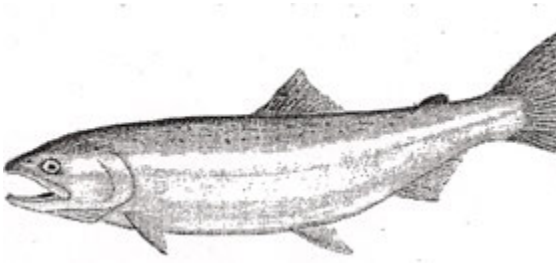


Salmon Eggs



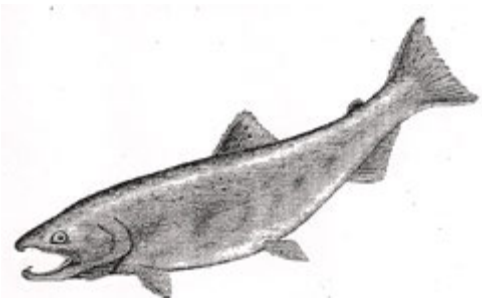
Fry

Alevin



Adults

Smolt



Spawners

Know, Wonder, Learn

Materials:

- Copies of Handout 1.2, "Salmon K-W-L," for each student, blown up on a photocopier to the largest size available
- Chart paper and markers
- Salmon science notebooks to collect and store materials related to salmon

Time Required:
One lesson

Level or Conceptual Difficulty:
Simple

Evidence for Assessment:
Monitor student ideas and review their "Salmon K-W-L" pages to ensure they understand the meaning of basic salmon vocabulary and facts.

- Divide a sheet of chart paper into three columns (or use three sheets) and label them "Know," "Wonder," and "Learn." Ask students to tell the class any facts they know about salmon, that is, things that they know are true. Ask the class if they agree with suggested facts. Write facts that the class agrees about in the column labeled "Know." Write statements that the class does not agree on in the column labeled "Wonder."

- Ask the class if anyone has any questions about salmon that they want to find out about, and add any statements to the column labeled "Wonder." Explain that the class will add to the "Learn" column later.

- Give students a copy of Handout 1.2, "Salmon K-W-L," and have them copy the information from the class chart to their page.

- Store the charts in a salmon science notebook, or post them in the classroom. Refer to the charts periodically as students find out more information through their salmon lessons. Ask students what they have learned to answer their questions and add their information to the column labeled "Learn." Ask if they have new questions to add.

- Have students begin gathering materials from the following skeins for their salmon science notebook, and add them as they complete further activities.

Salmon K-W-L

Handout 1.2

Use a photocopier to blow up this page to the largest format available.

KNOW	
WONDER	
LEARN	

Life Cycles

Materials:

- Large pictures of a baby, a child, a youth, an adult and an elderly person
- Copies of Handout 1.3, "Life Cycles," for each student
- Salmon Life Cycle poster
- Option: Copies of Handout 1.1, "Salmon Stages," for each group, cut into individual illustrations
- Art supplies

Time Required:
One or two lessons

Level of Conceptual Difficulty:
Simple

Evidence for Assessment:
Monitor student discussion and drawings to ensure they can show that plants and animals go through a life cycle in orderly stages.

INTRODUCTION

- With the class, sort pictures showing the stages in the life cycle of a person in chronological order.

DISCUSSION

- Discuss with the class the stages in the life cycle of a person. Draw the stages in a circular diagram as you discuss them. If necessary, prompt students with questions such as the following:

  - What happens when a baby grows older?
    He or she becomes a young child.
  - What happens when a child grows up?
    He or she becomes a teenager or an adult.
  - What happens when an adult gets old?
    He or she gets old and dies.
  - Where does a baby come from?
    From adult parents.

EXPLANATION

- Explain that salmon are a kind of fish that live in many local streams, lakes, and oceans. Use Handout 1.3, "Life Cycles," to show that salmon have a life cycle like other animals and plants.

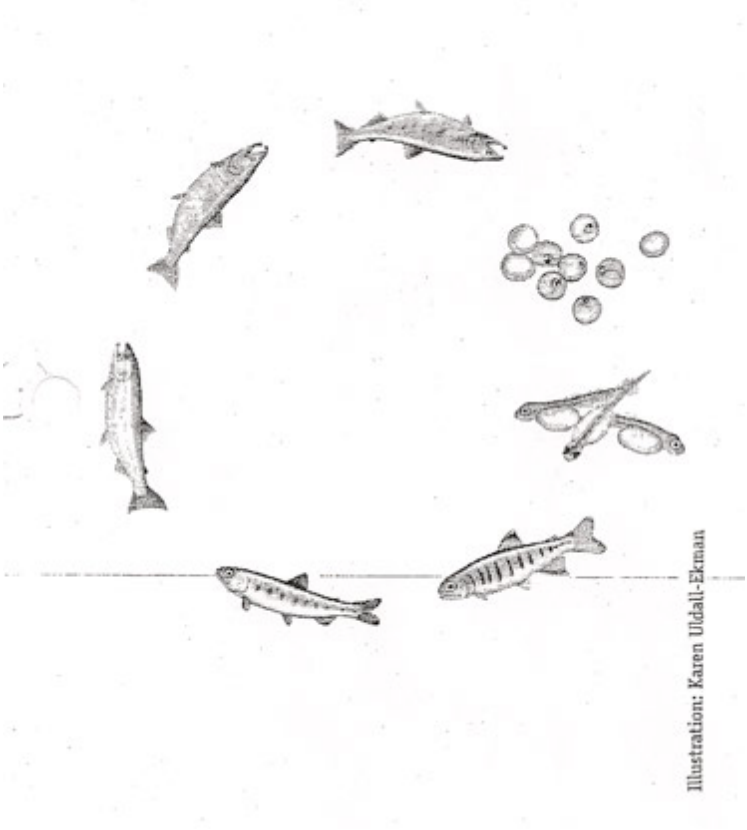
- Explain that all living things have a life cycle, and have students compare the stages of a salmon's life cycle with the stages of a human or another familiar animal.

SUMMATION

- Have students draw or paint the stages in the life cycle of a familiar animal.

LIFE CYCLES

Handout 1.3



Most plants grow from a seed. They grow roots, a stem and leaves. When they get big, they form flowers and seeds. Seeds grow into new plants.

Salmon grow from an egg. They grow gills, fins, a head, and a tail. The salmon leaves the natal stream or lake and migrates to the ocean.

One to five years later they return to their natal stream to lay eggs and complete their cycle. More salmon grow from the eggs.

All living things have a life cycle. First they are born. Then they grow up. They have seeds or eggs or babies. Finally, they die.

Life Cycle Of A Bean

The stages of life of Pacific salmon is similar to those of other plants and animals, including humans. By studying the stages in a plant that students can grow, or stages of growth in their own family members, students can identify similarities in the life cycle of all living things and begin to understand their significances. However, the emphasis should be on drawing parallels with the salmon life cycle. Teachers who have access to a classroom salmon incubator can follow the actual development of salmon eggs in the tank.

Materials:

For each group of students:

- One or more bean seeds
- A paper towel
- A Ziploc® bag
- Water
- Rulers
- Copies of Handout 1.4, "Daily Observations," for each student
- Graph paper
- Writing supplies
- Salmon Life Cycle poster

INTRODUCTION

- Explain that salmon go through life cycle stages like all other animals and plants. In this activity, students will grow a bean seed, because it grows in stages like salmon and other animals.

EXPERIMENT

- Have students observe, measure and describe bean seeds, and record their observations.

- Have students predict what will happen if the beans are kept moist for several days.

- Have students in groups grow a bean seed between sheets of damp toweling in a Ziploc® bag (or by placing them in a clear plastic cup filled with soil, next to the side where students can watch the beans grow). Have them moisten the paper and keep it in an even-temperature location, out of direct sunlight.

- Have students carefully observe the bean each day, and use Handout 1.4, "Daily Observations," to describe, draw, measure, and graph the changes as the bean grows.

DISCUSSION

- Have students compare the growing beans with their original observations and their predictions. Ask students to suggest reasons for any differences between their observations and their predictions. Ask if anyone can describe what would happen to the bean if it were able to continue growing naturally. If necessary, prompt them with questions such as the following:

  - How tall might a bean plant get if it grows in a garden?
    Up to one meter (about 3 feet).
  - What are the parts of a bean plant?
    Roots, stem, leaves, flowers, pods, beans.
  - What does a bean plant need to grow?
    Soil, water, light.

Time Required:
Two lessons, observation time over several weeks, and a follow-up lesson

Level of Conceptual Difficulty:
Simple; young students will need a buddy to help with measurements and recording.

Evidence for Assessment:
Review the charts the students make to ensure they can identify various stages in the life of plants and animals, including salmon.

- How does a bean plant produce new seeds?
  The grown plant makes seeds in a pod.
- What are the steps in the life cycle of a bean?
  It is a seed; it grows roots; it grows above the soil; it grows leaves and stems; it produces new seeds; etc.

SUMMATION

☞ Outline and diagram the stages of a bean seed's life.
Seed, seedling, growing plant, adult.

☞ Review and diagram the stages of a person's life.
Baby, child, youth, adult, old adult.

☞ Review and diagram the stages of a salmon's life.
Egg, alevin, fry, smolt, adult, spawner.

☞ Make a chart with the class listing the stages in the growth of a bean seed, a person, and a salmon. Have students compare the growth of a bean seed and a person with the life cycle of a salmon, as they see it in the poster. If necessary, prompt them with questions such as the following:

- Where on the poster do you see something like the bean seed?
  The egg.
- How is the egg like a bean seed?
  Something grows from it.
- What does the alevin grow into?
  Fry.
- What does the smolt grow into?
  An adult salmon.
- Where do the salmon eggs come from?
  The adult salmon spawning.

DAILY OBSERVATIONS

Handout 1.4

Name
Title

Date _____   **Today I Saw.....**
Date _____   **Today I Saw.....**
Date _____   **Today I Saw.....**
Date _____   **Today I Saw.....**
Date _____   **Today I Saw.....**

Life Cycle Needs

Materials:

- Salmon Life Cycle poster
- Writing supplies

Time Required:

One lesson

Level of Conceptual Difficulty:

Simple to moderate

Evidence for Assessment:

Review student lists and categories to ensure they can identify the needs of various organisms, including water, food, shelter, and air.

INTRODUCTION

- Have students work in groups or as the whole class to make a list of things that a bean needs to survive. If necessary, prompt them with questions such as the following:

  - What does it need to absorb (drink)?
    Water.
  - What does it need for food?
    Nutrients from the soil, water, and sunlight for photosynthesis.
  - What does it need for respiration/transpiration (breathe)?
    Air.
  - What does it need to grow and survive (location)?
    A safe place.

- Have the groups share their lists with the class, and write their suggestions on a chart labeled "Bean Needs."

- Have the groups make a list of things that people need to survive. With older students, ask them to describe how they get the things they need. If necessary, prompt them with questions such as the following:

  - What do people need to breathe?
    Air.
  - What do people need to eat and drink?
    Food and water.
  - What do people need to stay safe?
    Shelter and clothes.

- Have the groups share their lists with the class, and write their suggestions on a chart labeled "People Needs."

RESEARCH/DISCUSSION

- ☞ Have the class use the Salmon Life Cycle poster to identify things that salmon need to survive. Write their suggestions on a chart labeled "Salmon Needs." If necessary, prompt them with questions such as the following:

  - What do salmon need to breathe?
    Dissolved oxygen in the water.
  - What do salmon need to eat and drink?
    Water and food, such as insects and tiny aquatic animals, i.e., zooplankton.
  - What do salmon need to stay safe and healthy?
    Clear streams, lakes and oceans.

- ☞ Have the class identify similar elements from the three lists, put them in categories, such as food, shelter, etc., and give a name to each category. (With younger students, have them cut the words out of a piece of paper, then talk about and sort the words.)

SUMMATION

- ☞ Have students write one or more sentences (or draw a picture) describing each category.

Changing Environment

This experiment demonstrates that if the beans' needs are not met in their environment, they grow poorly or die. It leads to a discussion about meeting the basic needs of salmon.

Materials:

- Two or more bean seeds for each group
- Blotting paper
- Water
- Rulers
- Copies of Handout 1.5, "Comparison Chart," for each student
- Graph paper
- Writing supplies
- Salmon Life Cycle poster

Time Required:

Two lessons, observation time over several weeks, and a follow-up lesson

Level of Conceptual Difficulty:

Moderate; young students will need a buddy to help with measurements and recording.

INTRODUCTION

- Ask students what a bean needs to survive and what would happen if the bean seeds do not get enough of the things they need to survive. With older students, ask how they could test in class what would happen if a bean did not get the things it needs.

EXPERIMENT

- Have students suggest various environments to compare how a bean grows with and without the elements it needs to survive; e.g., with light/without light; with water/without water; with air/without air (in a sealed plastic bag).

- Have groups of students grow bean seeds in paired environments, one with and one without one of the elements they identified. Have them carefully observe the bean seeds each day, and describe, measure and graph what happens in each environment.

- Have students use their "Comparison Chart" to compare each of the pairs of growing beans. Ask older students to suggest reasons to explain any differences, or to explain why differences they predicted are not visible.

RESEARCH/DISCUSS

- Have students list what a salmon needs to survive, and use the Salmon Life Cycle poster to infer what they think would happen to a salmon if elements of its environment were removed (or damaged). If necessary, prompt them with questions such as the following:

  - What would happen if the water in a salmon stream or lake dried up?
    Salmon and their eggs would die.
  - What would happen if the water in a salmon stream or lake became very muddy?
    Salmon and their eggs would smother.

P/I

Evidence for Assessment:

Monitor class discussions and charts to ensure students can identify things that salmon need to survive, including a running stream, ocean, gravel, and food.

- What would happen if the water in a salmon stream or lake was not shaded?
  It would warm the water, and could harm salmon and their eggs.
- What would happen if stream water flowed too fast?
  Eggs, young salmon, gravel and foods might be washed away.
- What would happen if streams were straightened?
  Water velocity would increase.
- What would happen if wetlands were filled in?
  Growing salmon lose important sites that give them shelter and allow them to grow safely.

SUMMATION

☞ Have students suggest ways to protect the things salmon need to grow.
Maintain fresh water flow, avoid pollution, avoid disturbing salmon streams, protect side channels and pools of calm water.

Comparison Chart

Handout 1.5

Name
Title

My prediction is (write or draw your prediction)

In one example, I saw (write or draw size, color or changes)	In the other example, I saw (write or draw size, color or changes)

I think the two examples are different because

Looking Ahead At Salmon Studies

[discussion]

Materials: One copy of Handout 1.6, "Looking Ahead at Salmon Studies," (Parts 1 & 2), for each student

- ✏ Writing supplies

Time Required:
One lesson

Level of Conceptual Difficulty:
Simple

Suggestions for Assessment:
Monitor the class discussion to assess student level of understanding of the language and concepts used in salmon lessons.

DISCUSSION

- ☞ Students complete Handout 1.6, "Looking Ahead at Salmon Studies," (Parts 1 & 2).

- ☞ Class Discussion

SUMMATION

- ☞ Explain that the questions reflect some of the key ideas students will investigate in the Salmon Studies activities which follow. As they do the activities, ask them to look for information that will help confirm or change what they wrote on Handout 1.6.

Looking Ahead at Salmon Studies

Handout 1.6, (Part 1)

Name _____

	What Do You Know About...	What Would You Like To Know About...
The salmon life cycle?		
Salmon needs and threats?		
The water cycle?		
Healthy salmon habitat?		
Salmon anatomy?		

Looking Ahead at Salmon Studies

Handout 1.6, (Part 2)

Name _____

	What Do You Know About...	What Would You Like To Know About...
Incubation?		
Water quality?		
Responsible fishing?		
Stewardship?		

Salmon Life Cycle Chart [build-on-what-you-know]

Materials:

- One copy of Handout 1.7, "Salmon Life Cycle," (Parts 1 & 2), for each student

Time Required:
One lesson

Level of Conceptual Difficulty:
Moderate

Suggestions for Assessment:
Review the lists the groups create and monitor the class discussion to ensure that the students can identify the key factors affecting a salmon's life during each stage.

INTRODUCTION

- Read the background information in each skein to familiarize yourself with the life cycle of the Pacific salmon. This should prepare you to answer any questions students may have as they are introduced to the salmon's life cycle.

- Watch a film of the salmon's life cycle, or read them a book that briefly summarizes the stages in the life cycle of a salmon.

- Give each student a copy of Handout 1.7, "Salmon Life Cycle," (Parts 1 & 2). Have the students fill in the information based on what they have heard or already know about salmon needs and habitat. Tell students that they will add details to the chart and refer back to it as they study other stages in the salmon's life cycle.

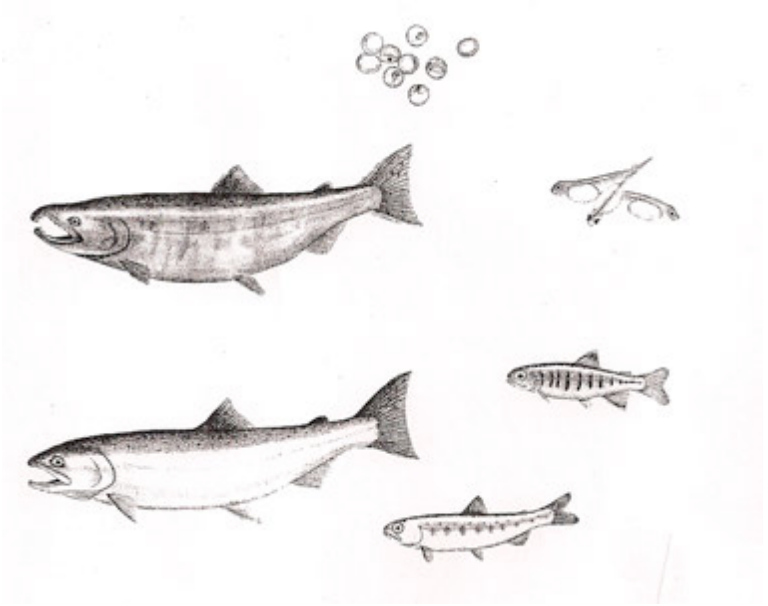


Illustration: Karen Uldall-Ekamn

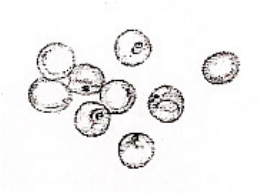
Salmon Life Cycle

Handout 1.7, (Part 1)

Life Cycle Stage	Needs		Threats	
	Habitat	Food	Predators	Other
Egg				
Alevin				
Fry				
Smolt				
Adult Salmon				
Spawner				

Salmon Life Cycle

Handout 1.7, (Part 2)



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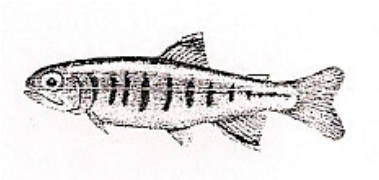

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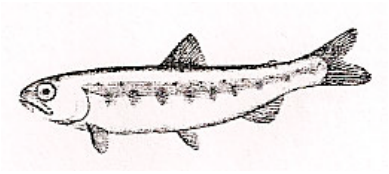

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SALMON LIFE CYCLE

WRAP-UP

REVIEW

- Have students identify life cycle stages, e.g., birth, baby, child, adult, aged adult, death.
- Draw a large circle on the board and ask students to write or draw the stages in the life of a plant or animal.
- Point out that all living things go though a cycle of being born, growing up, having young, growing old and dying.
- Have students move in a circle, acting out the stages in the life of a plant or animal, then returning to the beginning of the circle.

EVIDENCE FOR SKEIN ASSESSMENT

- Have students draw life-sized pictures of each stage of the salmon's life cycle on chart paper and describe (or label) where the salmon live at each stage. Discuss the movement of salmon from stage to stage, to ensure that the students can describe the movement as a continuous cycle.
- Have students review their salmon science notebooks, including their initial questions about what they wanted to learn, and describe what new knowledge they acquired.
- Have students complete a stem sentence, such as, "I used to think… about salmon life cycles, but now I know that…," or, "One thing I learned about salmon life cycles is that…".
- Have students add their materials to their salmon science notebook and write a sentence explaining what they learned.
- Have students make a painting or drawing about the life cycle of a salmon and describe what it shows about what salmon need to survive.
- Have students put pictures from the life cycle of a plant, a human and a salmon in correct order, and explain why the order is correct.

LANGUAGE AND ARTS INTEGRATION

- Have students research the life cycle of the salmon, linking the seasons with what happens in a salmon's life cycle and explaining why each stage takes place when it does.

  The amount of time that it takes a salmon to develop depends on the temperature of the water. Not all salmon spawn in the fall. Each species of salmon has slightly different schedule. Coho salmon spawn in the fall. Eggs and alevin develop under the ice of winter and hatch in the spring when food is plentiful.

- Have students work with the technology lab to develop a multimedia presentation on the salmon's life cycle, and ways of protecting salmon.
- Have students cut out cards with pictures labeled with the stages of a salmon's life and play matching and memory recognition games to reinforce their vocabulary knowledge, e.g., match cards with labels to cards with illustrations, or turn over an illustration card to read the label on the reverse side.
- Have students divide a paper plate into sections and draw a stage in the life cycle of a plant or animal in each section.

HOME CONNECTIONS

- Have students describe to an adult the dangers a salmon faces throughout its life cycle and actions people can take to reduce the dangers.
- Have students describe and act out the life cycle of a plant or animal for an adult and compare it with the life cycle of their family.

SALMON LIFE CYCLE
WRAP-UP

EXTENSION ACTIVITIES

- ☞ Have students write letters to the Alaska Department of Fish and Game and U.S. Fish and Wildlife Service expressing their views on a subject that they have studied.

- ☞ Have students write a short story from the point of view of a salmon. Discuss what anthropomorphism is (viewing nonhuman events from a human perspective). Explain that anthropomorphism can be a powerful tool for understanding, and is widely used in the conventions of folk tales. However, it is important to recognize clear differences between the entities of the wild as metaphors and as beings in their own right, with their own nonhuman qualities.

- ☞ Have students create a hypertext file, multimedia presentation, puppet show or readers' theater representing the life cycle of a salmon.

SUGGESTIONS FOR ASSESSMENT

- ☞ Have students draw a food web representing the salmon's entire life cycle.

- ☞ Using information from the skeins and independent research, have students role play a scenario in which competing groups of people try to find the most appropriate way to protect a salmon spawning stream near a city. Have them compare and evaluate facts and arguments presented in a class debriefing.

- ☞ Have students use the quiz questions they prepared on index cards in previous skeins about the stages of the salmon life cycle. Have them quiz each other by asking the questions or by using a Jeopardy-style format (i.e., giving the answers and asking for a question).

- ☞ Have students draw a cartoon storyline representing the life cycle of a salmon.

- ☞ Have students review their answers and explanations from the "Looking Ahead to Salmon Studies" in Skein 1 and describe how they would answer the questions now, and how they would explain their answers.

- ☞ Have students add their notes, experiment observations, and other materials to a salmon science notebook. Have a conference with students, in which they discuss the materials in their salmon science notebook and the significance of each in understanding the life cycle of a salmon.

HOME AND COMMUNITY CONNECTIONS

- ☞ Have students ask an adult to help them set up a home waste plan, including reduction, recycling, and hazard waste management.

- ☞ Visit your local Alaska Department of Fish and Game or U.S. Fish and Wildlife office and talk to a biologist.

- ☞ Have your parents take you outside to discover some of the local resources. Ask them about what outdoor activities they like to participate in and join in those activities with them.