

Overview:

Students investigate salmon life cycle stages and their relationship to parts of the watershed. They use cards to generate questions and ideas, and work cooperatively to research the salmon's life journey through a watershed, answer the questions and gather evidence for their claims. They share and discuss their findings with the class, and demonstrate their knowledge by making posters.

(Note: This is the third investigation from the science unit "Rivers to the Sea and Back Again." Online investigation can be found at <http://seagrant.uaf.edu/marine-ed/curriculum/grade-3/investigation-3.html>.)

Objectives:

The student will:

- use different resources (books, websites, posters, models, etc.) to research the salmon's life journey through a watershed;
- present findings in front of the class as a member of a group; and
- create a poster that explains the salmon life cycle stages and where each takes place within the watershed.

Targeted Alaska Content Standards:**Science**

- [2] SA1 Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.
- [2] SA2 Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- [2] SA3 Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues.
- [2] SB2 Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one places or system to another, may be unavailable for use, and is ultimately conserved.
- [2] SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.
- [2] SC3 Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

Targeted Alaska Grade Level Expectations:**Science**

- [3] SA1.1 The student develops an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [3] SA1.2 The student develops an understanding of the process of science by observing and describing their world to answer simple questions.
- [3] SA2.1 The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by answering, "how do you know?" questions with reasonable answers.
- [3] SA3.1 The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by: observing local conditions that determine which plants and/or animals survive. (L)
- [3] SC1.2 The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution by: describing how some traits (e.g., claws, teeth, camouflage) of living organisms have helped them survive as a species.
- [3] SC3.2 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by organizing a simple food chain of familiar plants and animals (L)

- [3] SD2.1 The student demonstrates an understanding of the forces that shape the Earth by: identifying and comparing a variety of Earth's land features (i.e., rivers, deltas, lakes, glaciers, mountains, valleys, and islands)
- [3] SG4.1 The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by: asking questions about the natural world.
- [4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate.
- [4] SA2.1 The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by
- [4] SA3.1 The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive. (L) supporting the student's own ideas with observations and peer review. (L)
- [4] SC1.1 The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by showing the relationship between physical characteristics of Alaskan organisms and the environment in which they live.
- [4] SC2.2 The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by describing the basic characteristics and requirements of living things.
- [4] SC3.1 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by identifying examples of living and non-living things and the relationship between them (e.g., living things need water, herbivores need plants).
- [4] SC3.2 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by identifying a simple food chain of familiar plants and animals, diagramming how energy flows through it; describing the effects of removing one link.

Materials:

- Scissors, glue, pencils and crayons
- Large piece of white drawing or construction paper
- Science notebooks
- Children's books about the salmon life cycle
- Salmon life cycle posters
- TEMPLATE: "KWL Chart"
- STUDENT INFORMATION SHEET: "Salmon Life Cycle Cards" (one per student)

Prior Student Knowledge:

From Investigations 1 and 2, students should have an understanding of what a watershed is and be able to identify various features of a watershed. They should understand that watersheds, rivers, wetlands and the one big ocean of the world are an interconnected system. Some knowledge of predators and simple food chains is also necessary.

Activity Preparation:

1. Read through the instructions and background/resource information. Background can be found online (<http://seagrant.uaf.edu/marine-ed/curriculum/grade-3/teacher-background.html>).
2. Become familiar with the following vocabulary words used in this lesson: alevin, fry, parr marks, redd, smolt, spawn and watershed.
3. Print and copy (on double-sided sheets) the Life Cycle Card Sheets, one for each student.

4. Prepare chart paper or chalkboard for KWL activity.
5. Collect resources and display them throughout the room to heighten student curiosity upon arrival.
6. Choose activities to use for "Elaboration."
7. Load websites onto class computers as needed.

Activity Procedure:

Engagement: (30 minutes)

1. Using a KWL chart (K-W-L is a 3-column chart that helps organize and record Before, During, and After knowledge of a topic or concept. This technique can be done with the whole class on the overhead, chart paper, or chalkboard. Students can create the table in their science notebook or complete one provided by the teacher, cut it out, and paste it into their notebook), brainstorm with the class to establish what students learned about watersheds in Investigation 2 and how they think salmon might fit into a watershed. Ask "How do you know . . ." to information or claims students make about salmon in a watershed.
2. Divide the class into small groups of 3-4 students. Have students cut out the six stages from the Life Cycle Cards. Using the six life cycle cards and their science notebooks, students investigate the proper order of the salmon life cycle as well as make predictions about where in the watershed each stage takes place.
3. Students record questions in their science notebook about the salmon life cycle, or journey through the watershed, that arise from the small group discussion. An example might be, "I wonder if salmon ever live in lakes?"
4. Ask groups/students to share some of the questions from their science notebooks, and update the KWL Chart with students' questions. Ask students how they might find answers to their questions or show evidence for information they claimed to know.
5. Save the Life Cycle Cards for later use.

Exploration: (3-6 class periods)

1. Using a variety of available classroom resources (books, websites, posters, models, etc.) have students work cooperatively to research the salmon's life journey through a watershed to answer their questions and gather evidence for their claims. Prompt students to look for predators and note them as they surface. Using their science notebooks, ask students to record interesting information and evidence that they discover from their explorations.

Useful websites:

The Salmon Story: (<http://www.genetics.cf.adfg.state.ak.us/kids/salstory.php>)

This site has easy-to-read information and photos about each stage of the salmon life cycle.

Life Cycle of an Alaska Salmon: (<http://www.fishex.com/seafood/salmon/salmon-life-cycles.html>)

Great photos and information about each stage of the life cycle.

Alaska's Salmon Habitats: (<http://www.sf.adfg.state.ak.us/statewide/AquaticEd/adfgteacherguide/chapter3.html>) This site shows the different areas of the watershed where salmon spend some part of their life.

StreamNet: (<http://www.streamnet.org/SLC.html>) This site has a nice life cycle image, salmonid fact sheets, and salmon life history profiles.

Printable Posters:

Life Histories of Salmonids Found in Alaska: (http://www.sf.adfg.state.ak.us/region2/ie/sicc/salmon_p.cfm)

Several color and/or black and white posters can be printed for use in the classroom

Explanation: (30 minutes + time for reading aloud)

1. Allow time and support for students to share their findings within their small group. Small groups should summarize what they learned in their science notebooks.
2. Collaboratively, students should decide on a way to display their findings in order to explain and share with the whole group. Allow time for each small group to report back to the whole group, updating the KWL chart as they share their information and new questions.
3. Have a class discussion on predators. Ask students about the predators that they discovered while doing their research. List predators on the board. Some examples are seals, sea lions, terns, northern pike, bears, eagles, and humans.

4. You may also wish to discuss the variety of obstacles that salmon face at the various stages of their life cycle. Some examples are polluted waters, fish farming, water volume or flow, dams, invasive species, sport fishing, commercial fishing, hatchery fish, and climate change.
5. Enhance and reinforce student research by reading aloud about salmon, their life cycle, and their habitat from one of the following books:
 - Life Cycle of a Salmon* by Bobbie Kalman.
 - Life Cycle of a Salmon* by Angela Royston.
 - Salmon Forest* by David Suzuki.
 - Salmon Stream* by Carol Reed-Jones.
 - A Salmon for Simon* by Betty Waterton.
 - Swimmer* by Shelly Gill.
 - Red Tag Comes Back* by Fred Phleger.

Elaboration: (20 minutes)

1. Ask students to apply what they have learned by creating a poster that explains the salmon life cycle stages and where each takes place within the watershed. Students may use their six life cycle stage cards (from Engagement) and a large piece of paper to design/illustrate the watershed. Students may paste the life cycle stage cards in the proper order to begin. They may then decide on the proper illustration, placing the salmon within the correct area of the watershed.
2. Ask students to share and explain their posters either in their group or to the class.
3. Choose games and activities to help students enhance and reinforce their learning. Below are some suggested activities including whole class movement games, small group board games, and individual or partner Internet games.
 - Hooks & Ladders (playground game)*: (<http://www.issaquahfish.org/yourhatchery/materials.html>) Go to The Salmonid Life Cycle. Find and print Hooks & Ladders (pp. 19-23). You may wish to eliminate the turbine to make the game more relevant to salmon streams in Alaska.
 - The Salmon Challenge (online)*: (<http://www.kingcounty.gov/environment/animalsAndPlants/salmon-and-trout/salmon-challenge.aspx>)
 - Find Your Way (online)*: (<http://www.pbs.org/wgbh/nova/hokkaido/migration.html>)
 - Lines & Ladders*: (<http://www.sf.adfg.state.ak.us/region2/ie/eggcam/pdfs/lineladder.pdf>) Board game may be printed and laminated for future use.
 - The Salmon Migration Game*: (<http://seagrant.uaf.edu/bookstore/pubs/SG-ED-34.html>) Board game may be purchased for \$10
 - "Trees to Seas: Journey of the Wild Salmon Board Game"*: (http://www.dnr.wa.gov/Publications/rp_urban_salmingameintro.pdf) may be printed and laminated for future use.

A salmon storyboard writing activity also may be begun at this time. Such a writing activity may accompany culminating activity for Investigation 5. See Curricular Connections: (<http://seagrant.uaf.edu/marine-ed/curriculum/grade-3/investigation-3.html#connections>) for additional information.

You may choose to invite a fish biologist or Alaska Department of Fish and Game or U.S. Fish and Wildlife Service education specialist to the classroom to speak to the students about salmon the salmon life cycle. If there are no local agency personnel, local commercial or sport fishermen, as well as elders may be equally qualified to help.

Essential Questions:

1. How are we connected to wetlands, rivers and the sea?
2. What is the salmon's life journey through the wetlands, rivers and the sea?
3. Where does our local water come from and where does it go?

Enduring Understandings:

1. Watersheds, rivers, wetland and the one big ocean of the world are an interconnected system.
2. Salmon depend on the rivers and the ocean during parts of their life cycle.
3. Science is a way to help us study the many connections in our world.

Extension Ideas:

1. Add a chart titled, "How does a fish compare to a human?" Students can complete the chart, showing how fish compare to humans regarding their different systems, i.e., respiratory, digestive, reproductive, nervous, circulatory, etc.
2. Find out about obtaining a permit to incubate salmon fry in your school and release them into a nearby stream. Classroom Salmon Egg Incubation Program (<http://www.sf.adfg.state.ak.us/region2/ie/SICHome.cfm>).
3. Learn both names for the five types of Pacific salmon.
4. Dissect a salmon.

Tips from Teachers:

1. Before the lesson, do a quick review of the definition of watershed, drawing and labeling the interconnected system.
2. Review vocabulary with a quick game of matching terms to definitions (on index cards) to assess student understanding.
3. During the Engagement session, use the "think/pair/share" strategy to generate a list of questions to explore. Record these questions in the science notebooks.
4. Review the new vocabulary before the life cycle cards to help students learn a little bit about the stages.
5. If you would like to introduce more information about estuaries, "Salmon in the Estuary" by Kenn Oberrecht: <http://www.oregon.gov/DSL/SSNERR/docs/EFS/EFS30salmon.pdf> provides a good explanation.

Curricular Connections:

Writing: Students may extend their understanding of the investigation through a writing activity (salmon storyboard) that tells the story of a salmon's life journey from the salmon's point of view. Evidence of the proper life stages taking place in the proper parts of the watershed should be apparent. The story can be used later to accompany the watershed model activity in Investigation 5.

Evaluation:

Assess students' posters and/or oral presentations for understanding of the salmon life cycle and its relationship to a watershed. The following suggested criteria could be incorporated into a rubric for scoring the presentations. If possible, help students develop the rubric themselves before beginning work on their posters.

- Evidence of the proper life stages
- Life stages take place in proper order
- Life stages take place in appropriate parts of the watershed
- At least one additional characteristic or trait of each salmon life cycle stage is given
- An explanation of the watershed placement connection is given (For example, "Fry have parr marks (characteristic) and live in the stream (placement). The parr marks help them blend into the rocky stream bottom to avoid predators (connection)."

Ask students to reflect in their science notebooks by summarizing their understandings, drawing the salmon life cycle, or reflecting on what they thought they knew prior to the investigation.

Lesson Credit:

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