FISH FINDERS *(MODIFIED FOR ADEED)*

Overview:

In this investigation, students explore the needs of salmon at each stage of their life cycle, and then go into the field to investigate a local aquatic habitat and its potential as salmon habitat. They observe the physical characteristics of a local area and determine whether they think it is sufficient to sustain salmon.

(**Note:** This is the fourth 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-4.html.)

Objectives:

The student will:

- list the basic needs of salmon for each life cycle stage; and
- observe and evaluate a local body of water to decide if it can support salmon.

Targeted Alaska Content Standards:

This lesson is from a primary grade unit. There are no GLEs for Kindergarten through second grade. Standards addressed at first and second grade levels are listed.

Science

SA Students develop an understanding of the processes and applications of scientific inquiry.

SC Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.

SD Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.

[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.

[2] SD1 Students develop an understanding of Earth's geochemical cycles.

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] 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] SG2.1 The student demonstrates an understanding of the bases of the advancement of scientific knowledge by comparing the results of multiple observations of a single local event. (L)

[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] SG2.1 The student demonstrates an understanding of the bases of the advancement of scientific knowledge by recognizing the need for repeated measurements.

Math

[3] MEA-4 The student demonstrates understanding of measurable attributes by selecting an appropriate unit of English, metric, or non-standard measurement to estimate length, time, weight, or temperature.

[3] MEA-6 The student demonstrates ability to use measurement techniques using pictorial representations [or manipulatives L] in real-world contexts by measuring length to the nearest half-inch.

[4] MEA-4 The student demonstrates understanding of measurable attributes by selecting an appropriate unit of metric measurement to estimate length, weight, or temperature.

[4] MEA-5 The student demonstrates ability to use measurement techniques using pictorial representations [or manipulatives L] in real-world contexts by measuring length to the nearest half-inch [or centimeter L].

[5] MEA-4 The student demonstrates ability to use measurement techniques by measuring temperature or weight using appropriate tools (L).

[5] MEA-8 The student demonstrates ability to use measurement techniques by measuring length to the nearest 1/4 inch or centimeter.

Materials:

- Chart paper/markers, or chalkboard
- Pencils
- Digital camera(s)
- Fine mesh net (one per group)
- Thermometer (one per group)
- Science notebooks
- STUDENT WORKSHEET: "Salmon Needs Chart"
- STUDENT WORKSHEET: "Water Investigation"

Prior Student Knowledge

Students should have practice in using thermometers.

Activity Preparation

1. Find a local aquatic habitat for the field trip. It may be a stream, lake, estuary, or other area that might provide habitat for fish. Visit the site to determine the boundaries of your investigation, and to get ideas for student investigation—what should they notice?
2. Set a date and take care of logistics for the field trip: permission, volunteers, transportation, snacks, water, bathroom facilities.

Activity Procedure:

Engagement: (30-45 minutes)

1. Ask students to recall the freshwater stages of a salmon's life cycle. Write the stages (eggs, alevin, fry, smolt, adult, spawner) as headings on the board, then write "need" after each one and have students list the basic needs for each life cycle stage. You may also provide the blank Salmon Needs Chart for students to complete. They can use the completed chart as a reference on the fieldtrip.
2. Introduce the term "habitat" and remind students that habitat includes food, air, water, and shelter.
3. To help prompt students for responses, you might answer the following questions about each stage:
   - Where does it live (freshwater or saltwater?)
   - Does it have special needs to live here? (gravel, rocks, plants, etc for protection)
   - What dangers are present at this life stage? (predators, human impacts, etc)
   - What does it eat?
   - What is special about it at this stage that allows it to live in the place that it does?
   - Are there any other interesting facts that should be noted at this stage?
4. If students don't mention air as a need, this is a good time to discuss the concept of oxygen in the water. Salmon need water that is rich in oxygen to remain healthy, especially in the life cycle stages that take place in freshwater. Water that moves rapidly across rocks and boulders causes the air to mix with the water. The salmon take in the dissolved oxygen through their gills. Salmon are coldwater fish. They need clean, clear, cold water to survive. They prefer temperatures ranging from 42 -70° F.

(Activity Procedure continues on the following page.)

5. Your completed chart may look similar to this:

Life Stage	Needs	Dangers
Egg	• Freshwater • Gravel to incubate in • No food necessary • Clean, clear, cold water	• Birds, small mammals • Floodwater • Disease • Freezing • Pollution
Alvein	• Freshwater • Gravel to hide in • No food necessary • Clean, clear, cold water	• Birds, bigger fish, aquatic insects • Disease • Pollution
Fry	• Freshwater • Rocks and plants to hide in, under or around • Pools for feeding, resting, and hiding • Insects and plankton • Clean, clear, cold water	• Bigger fish, birds • Pollution
Smolt	• Saltwater • Smaller fish and plankton • Clean, clear, cold water on the way to the ocean	• Bigger fish, marine mammals • Fishing nets or hooks
Adult	• Saltwater • Fish, plankton	• Bigger fish, marine mammals • Fishing nets or hooks
Spawner	• Freshwater • Gravel to lay eggs • No food necessary	• Bears and other mammals • Eagles, gulls • Fishing nets and hooks • Dams • Pollution

6. Pose the question, "Do you think our local water body has what salmon need to survive during any stage of their life?" Ask students to write this focus question and their predictions in their science notebooks.

7. Ask students, "How can we find out if our local water body has what salmon need to survive during any stage of their life?"

Exploration: (30 minutes plus 2-3 hours for field trip)

1. Tell students that they will be investigating a local body of water to decide if it can support salmon.

2. Review the Salmon Needs chart created in the previous activity. Explain to students that they will use the chart to record their findings. They can circle the items that they can see are present, and cross off ones that are not. In the case of predators, allow them to circle the animals they know live in the area. They need not be actually seen during the field experience to know they are a danger to the salmon. The last column is for them to record any additional observations or notes about the water or the area surrounding it.

3. Additionally, you may want to distribute the Water Investigation Worksheet and have students answer these questions:
   Nursery areas for egg, alevin, and fry:
   - Are there places under the banks where young salmon could hide?
   - Is the water cold and moving?
   - Can you see any insects on the bottom of the stream, in the stream, or flying in the air?

   Nursery areas for egg, alevin, and fry:
   - Is the the water clear? Can you see the bottom?
   - Is there gravel (rocks the size of a pea) on the bottom of the stream?
   - Is the water deep enough over the gravel that an adult salmon could swim there?
   - Is the water cold and moving?
   - Would the salmon be able to come up the stream to this place without running out of water, reaching a waterfall they can't jump over, or encountering lots of garbage?
4. If there are several parent volunteers, divide students into working groups for the field trip, and have them investigate different areas of the water body. Or, if there is enough time, the entire class can visit several areas of a water body, or perhaps more than one location. For example, streams can vary from one spot to another, and students may find evidence of salmon habitat in one place and not in another. Also, before going on the field trip, remember to review field trip etiquette with the students.
5. Upon arrival at the field site, give students several minutes to explore their surroundings and notice everything that they can about the site. Have a brief discussion about this particular body of water and how it fits into the bigger local watershed.
6. Circulate among groups as they work on their investigation and assist each group in taking the temperature of the water. A small mesh net can be used to dip into the water to check for evidence of aquatic insects as food for young salmon. Take several digital photos to document student observations.

Explanation: (40 minutes)

1. Upon return to the classroom, have students meet in small groups, paste their data sheets into their science notebooks (if necessary) and share their notes from the fieldtrip.
2. Ask the groups to decide if their evidence leads them to the conclusion that salmon habitat DOES or DOES NOT exist in the study area, and if so, for what life cycle stage of salmon.
3. Give a specific format for a science notebook entry that guides students to make an evidence-based statement, such as:
   Based upon (evidence type 1), _____ (evidence type 2), and (evidence type 3), we conclude that . . ."
4. These statements might be accompanied by a section, "We recommend additional study to answer the following questions . . ."
5. Ask students to reflect and comment on the importance of the study area to salmon and to the watershed as a whole.

Elaboration: (30 minutes)

1. Have each group post their findings and digital photos on the "Rivers to the Sea and Back Again" forum on the Alaska Seas and Rivers website (http://seagrant.uaf.edu/marine-ed/curriculum/forum.html), and look at postings that have been submitted by other students around the state. They can post questions about other students' findings. Alternatively, share findings with a partner school by email.

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.

Tips from Teachers:

1. Expand on the Salmon Needs Chart by having students illustrate the Life Stage, Needs, and Dangers. Divide students into six groups to do this and then share their results. Display their work on a bulletin board outside of the classroom for all to observe, question, and learn from.
2. While investigating factors that are detrimental to habitat, separate them into two categories: things that are in our control (depth, bottom composition), and the things that are outside of our control (temperature, flow rate) so that the students know that some streams are naturally unsuitable for habitat.
3. Teach stewardship by bringing garbage bags to pick up trash around the study area.

Evaluation:

Check science notebooks to assess the students' participation and understanding.

Lesson Credit:

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NAME: _____ STUDENT WORKSHEET

SALMON NEEDS CHART

Salmon Needs at each Life Cycle Stage

Life Stage	Needs	Dangers	Notes and Observations
Egg			
Alevin			
Fry			
Smolt			
Adult			
Spawning Adult			

NAME: _____ STUDENT WORKSHEET

WATER INVESTIGATION

Nursery areas (egg, alevin, fry):	**Yes**	**No**
Are there places under the banks where young salmon could hide?		
Is the water cold and moving?		
Can you see any insects on the bottom of the stream, in the stream, or flying in the air?		
Spawning areas:		
Is the water clear? Can you see the bottom?		
Is there gravel (rocks the size of a pea) on the bottom of the stream?		
Is the water deep enough over the gravel that an adult salmon could swim there?		
Is the water cold and moving?		
Would the salmon be able to come up the stream to this place without running out of water, reaching a waterfall they can't jump over, or encountering lots of garbage?		

Notes and Observations: