



Stream to Plate

Fish to Schools
Classroom Lessons

The Lifecycle of a Salmon

Essential Question:

What is the lifecycle of a salmon?

Objectives:

- a) Students will be able to list the stages of the salmon lifecycle.
- b) Students will be able to identify the challenges salmon face in their life.

Time:

45 minutes

Materials:

- Lifecycle handout (teacher copy)
- Lifecycle stage cards and environment cards (included)
- Chalk or string to use as a boundary

Content Standards:

S.C1, S.C2, S.C3, Geo.B1, Geo.B7, C.B3, C.E2

Teacher Background:

Department of Natural Resources, *Trees to Seas, Journey of the Wild Salmon Lifecycle*: Describes salmon lifecycle, habitat, and predator information.

Salmonoids in the Classroom. Outlines survival rates in each stage of the salmon lifecycle.

Note:

This lesson works best after students have already been introduced to the salmon lifecycle. The following activities reinforce salmon lifecycle, habitat, predator & prey relationships, and human impacts on salmon. See resources listed below under “extensions” for intro lessons or consider reading aloud, “*Salmon Stream*,” by Carol Reed-Jones (Dawn Publications, ISBN hardcover: 1-58469-014-3, paperback: 1-58469-013-5).

Procedure:

1. In small groups, students will have five minutes to put the stages of the salmon lifecycle in order. To make it more challenging, consider the following options:
 - Have the students complete the activity in complete silence.
 - After students have assembled the salmon lifecycle have them match each stage to the appropriate habitat.
 - Once students have the cards in the correct order, have them assemble their cards into a cycle or circle.

Review the salmon lifecycle as a class by pulling in, if appropriate, local connections (forest & river names) to these stages.

2. Reinforce the salmon lifecycle by playing a game based on “rock, paper, scissors.” Students find their opponent based on a similar stage of the life cycle, i.e, egg vs egg or smolt vs smolt. After each match, the winner moves to the next stage of the life cycle and the loser stays at the same stage. Each stage has an action that goes along with it; as listed below. Students must win two out three times before the winner advances to the next stage. Students wander around the room doing their action to find their next opponent at the same stage.

Actions:

- Egg-Low to the ground squatting
- Alevin-Squatting with arms forming a circle around the belly
- Fry-Make a fish face with hands on either side of the mouth
- Smolt-Hands together to make a fish swimming in front of the body
- Adult-Rubbing the tummy
- Spawner-Walk like an old person with a cane

The winner of the spawner to spawner match becomes an egg again, etc.

Stop the game after 5 minutes or after 5 students have made it through the entire cycle and back to egg stage. Have students stand if they made it from egg to alevin. Ask them if in real life salmon die at this stage. Why? **What prevents them from moving on?** Go through each stage asking the same series of questions. End by sharing with students that in real life most salmon don't make it back to their spawning ground. In fact, out of 2,500 eggs only 2-4 will reproduce. They lay thousands of eggs to ensure that a few return to reproduce.

3. Fish face a number of obstacles from stream to ocean back to stream. The **Salmon Lifecycle Game** based on “Red Light, Green Light”, introduces some obstacles salmon face in their lifecycle. In a large space like gym or playground, mark start and finish boundaries using string or chalk (modify for the classroom).

Have students spread across this line. Students will advance or retreat depending on the statement read. In order to ensure students are spaced out across the field, assign statements to certain groups of students (use shirt or eye color, laces on shoes, gender, etc). By not allowing every student to advance down the playing field, you are demonstrating that not all salmon return to spawn. If time allows after each step gained or loss reinforce the statement read.

Note: Predators and fishermen are part of the food web and aren't necessarily a bad thing. This concept will be reinforced in a following lesson.

- Your egg is nestled in the gravel with cool water flowing over you. Move ahead two baby steps.
- Someone picks up the trash around the river. Move ahead 1 step.
- Someone walks through the river and steps on you. Move back 3 steps.
- You're an alevin now! You find a good hiding spot under the shade of a tree. Move ahead 2 steps.
- You get poisoned by water pollution. Move back 1 step.
- Now you're a fry! You find a delicious bug to eat. Move ahead 2 steps.
- A trout eats you. Take 1 step back.
- Fallen trees make the perfect pool in the river for you to hang out in.

Move ahead 1 step.

- Tree roots hold soil in place keeping the river clean and clear, but the trees along the riverbank have been logged. Everyone move back 2 steps.
- Now you're a smolt! You found the perfect hiding spot from predators in eel grass. Move ahead 2 steps.
- You get nibbled on by a kingfisher. Move back 1 step.
- You're an adult now! You munch on some krill. Move ahead 3 steps.
- You get stuck in a gill net. Take 2 steps back.
- It's herring season, food is everywhere! Take a big jump ahead.
- You get hooked by a troller and become someone's dinner! Take two steps back.
- You are small enough to swim through a gillnet. Take 1 step forward.
- The Department of Fish and Game sets regulations on how many fish a fisherman can harvest from the ocean. These rules make sure enough fish return to their natal stream to spawn. Move ahead one step.
- A sea lion gobbles you up. Take a big step back.
- A sport fisherman catches and then releases you. You survive. Take 1 step forward.
- You're a spawner now! You find your natal stream. Move ahead three steps.
- Lots of animals depend on spawning salmon for food. You get eaten by a bear. Move back 2 steps.

- An eagle grabs you and drops you in the forest. You decompose under a tree and give it nutrients as you break down. Move ahead 2 steps.
- Seagulls love to eat salmon as they return to spawn. Move back 1 step.
- You lay your eggs! Take two giant steps forward.
- When you die you fertilize the river and nearby trees. Take one giant step forward.

Discussion:

Go through each salmon stage and habitat as a class and identify the obstacles that salmon face over the course of their lifetime. Ask students what people can do to protect salmon—what is our responsibility?

Evaluation:

To review, have students fill in the salmon lifecycle stages on a blank template or have them draw and label their own salmon lifecycle.

Extensions:

- Take students on a fieldtrip to each stage of the salmon lifecycle: river, estuary, ocean (and forest).
- [Fisheries and Oceans Canada, Salmonoids in the Classroom, Primary](#). This curriculum breaks down each step of the lifecycle and includes engaging, hands-on activities. For a board game on the salmon lifecycle see pages 11-22

and 121-122.

- [American River Salmon Educator Activity Guide](#). The Great Andromous Fish Board Game, pages 43-55 and activities on watersheds, see pages 67-93.
- [University of California, The Incredible Journey](#) (also known as Hook and Ladders). An active game that takes students through the lifecycle of a salmon.
- [Department of Natural Resources, Trees to Seas, Journey of the Wild Salmon, Board Game](#): A board game that follows the salmon lifecycle.
- [Alaska Seas and Rivers Curriculum, A Salmon's Life Journey Lesson](#). A lesson that investigates salmon life cycle stages and their relationship to parts of the watershed.
- [Bonneville Power Administration, Salmon Hexaflexagon](#). An art project that shows the lifecycle of Pacific Salmon.
- [Forest Service, The Salmon Box](#). See pages 41-43 for worksheets that take students through the journey of the salmon lifecycle.

Resources:

[Alaska Department of Fish and Game, Salmon Camera](#). A camera showing the lifecycle of a salmon in real time.

Content Standards:

Science

- C) A student should understand and be able to apply the concepts, models, theories, facts, evidence, systems, and processes of life science.
 - A.1. Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution.
 - A.2. Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms
 - A.3. Students develop an understanding that all organisms are linked to each other and their physical environment through the transfer and transformation of matter and energy.

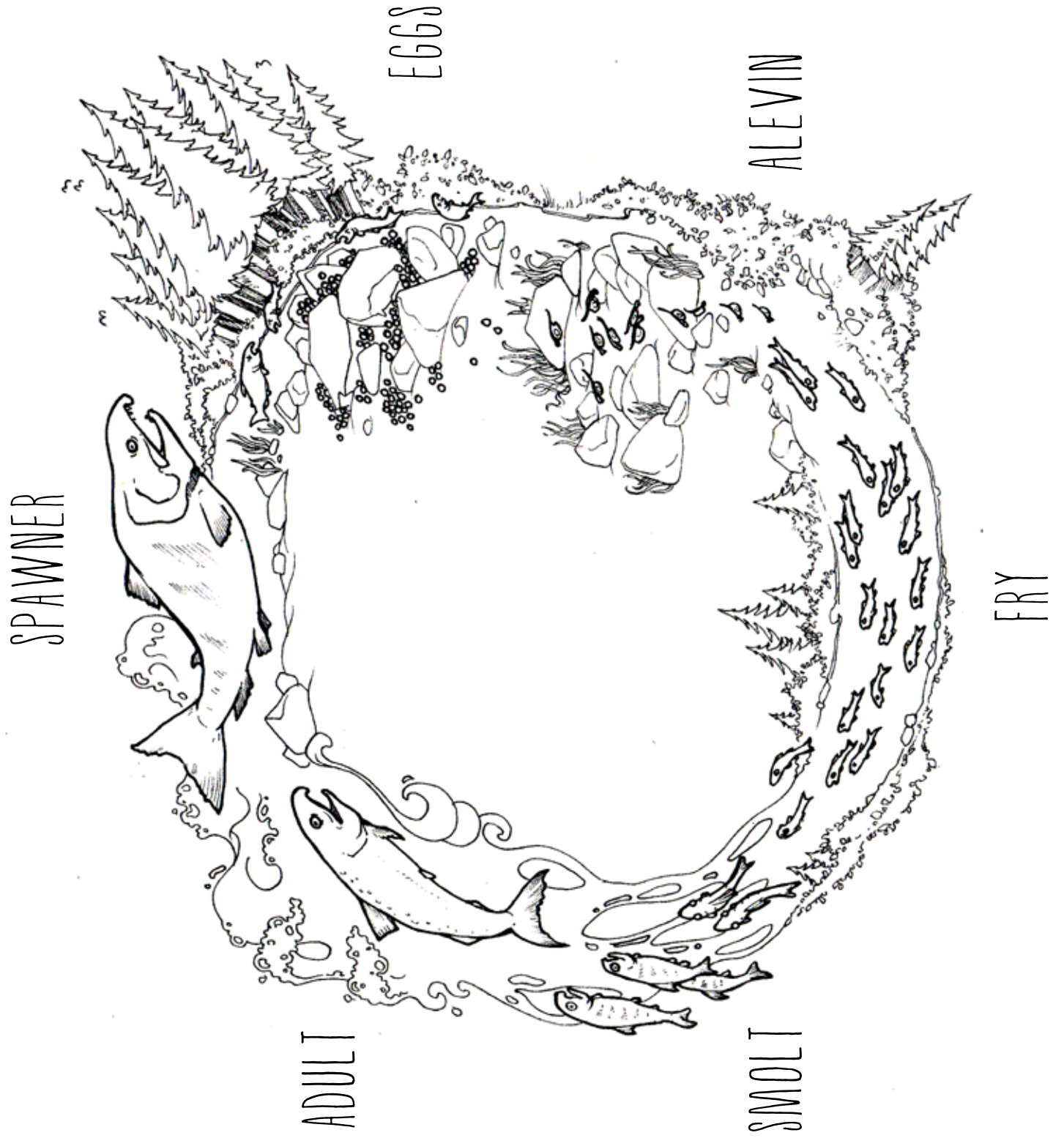
Geography

- B) A student should be able to utilize, analyze, and explain information about the human and physical features of places and regions.
 - B.1. Students know that places have distinctive geographic characteristics.
 - B.7. Students understand that a region is a distinct area defined by one or more cultural or physical features

Cultural

- B) Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life.
 - B.3. Students make appropriate choices regarding the long-term consequences of their actions
- E) Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all the elements in the world around them.
 - E.2. Students understand the ecology and geography of the bioregion they inhabit.

Lifecycle Handout:

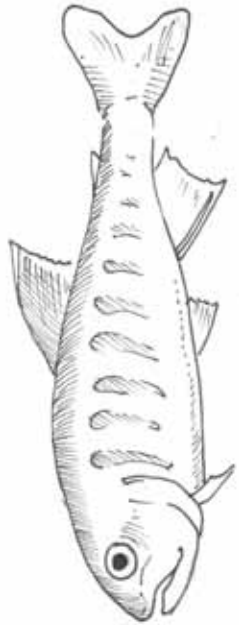


Lifecycle Handout:



Lifecycle Stage and Environment Cards:

SMOLT



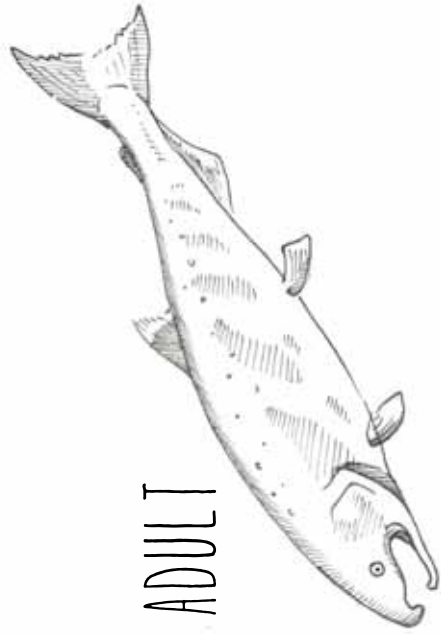
SPAWNER



FRY



ADULT

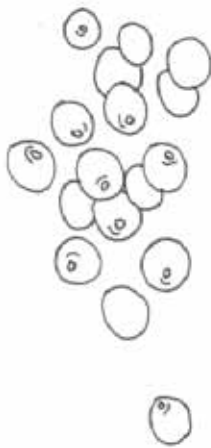


Lifecycle Stage and Environment Cards:

ALEVIN



EGGS



MOUTH OF THE RIVER

OCEAN



Lifecycle Stage and Environment Cards:

LITTLE POOL IN RIVER



GRAVEL BED IN RIVER

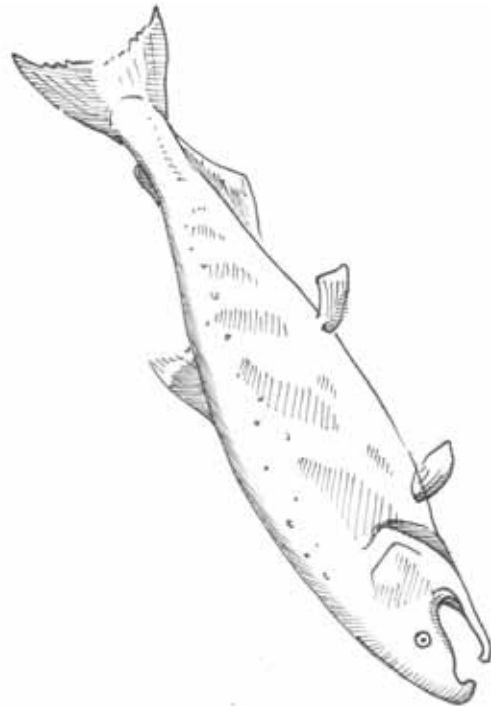
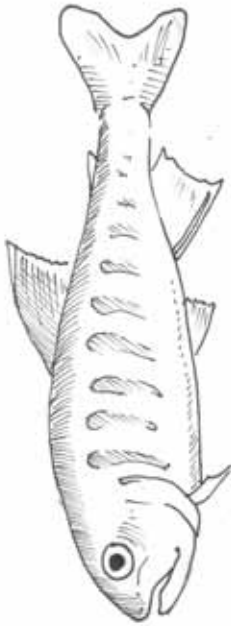


ESTUARY

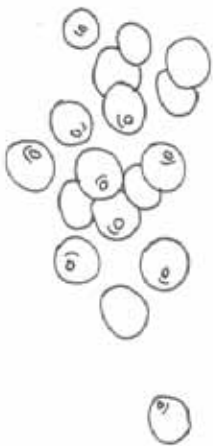


RIVER

Lifecycle Stage and Environment Cards:



Lifecycle Stage and Environment Cards:



Lifecycle Stage and Environment Cards:



Answer Key



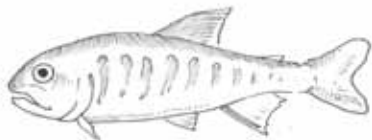
EGGS ——— GRAVEL BED IN RIVER



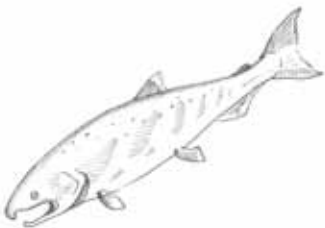
ALEVIN ——— LITTLE POOL IN RIVER



FRY ——— RIVER



SMOLT ——— ESTUARY



ADULT ——— OCEAN



SAPWNER ——— MOUTH OF THE RIVER



Salmon Food Chains, Food Webs, and Ecosystems

Essential Question:

How are salmon part of a food web?

Objectives:

- a) Students will be able to identify salmon predators.
- b) Students will be able to identify salmon prey.
- c) Students will be able to explain what happens to an ecosystem when one part is damaged or removed.

Content Standards:

S.C3, C.E1, C.E2, C.E8, Geo.B.1

Teacher Background:

Salmonoids in the Classroom, Intermediate, Fisheries and Oceans Canada, A list of salmon predators and prey for each stage of the lifecycle, pages 3-4.

Time:

55 minutes

Materials:

- Packet of Food Chain Cards (included)
- Food Web Cards: Cut out the included cards, punch a hole at the top, and loop string through to create a necklace.
- Ball of yarn
- Tape

Procedure:

1. **Food chains** tell us how living things need each other. They tell us how energy is passed from one species to the next. Food chains begin with producers and end with a top predator.

Distribute five pictures to each group. Give students a few minutes to figure out how the cards are connected to each other. Where do the habitats fit in? Wander around to each group to assist with connections.

- tree → mosquito larvae → salmon → brown bear (habitat: forest)
- plankton → krill → salmon → sea lion (habitat: ocean)
- algae → caddis fly larvae → salmon → kingfisher (habitat: estuary)
- plankton → shrimp → salmon → human (habitat: ocean)
- plankton → herring → salmon → eagle (habitat: forest)
- plankton → pteropod → herring → salmon (habitat: ocean)

Tell students that each group has created a salmon food chain. Have students present their food chains to the class and tape each card onto the whiteboard drawing arrows between each card from left to right. In their presentations have students explain a) the food chain succession: mosquito larvae feed on tree leaves, the salmon fry feeds on mosquito larvae, and the brown bear feeds on spawning salmon and b) the habitat

connection: the bear drops the salmon in the forest feeding the trees.

Once all students have presented their food chains, ask students if they can see any other connections. Eagles and kingfisher feed on salmon. A lot of different things feed on plankton. Everything is dependent on the producers. Draw arrows between these additional connections, forming a web. Together these food chains make up a **food web**. The habitats and nonliving elements (like sun, water, etc.) make up an **ecosystem**. Ask students if they can think of anything else they could add to this salmon ecosystem. Draw them in with arrows connecting them to the web.

2. Further demonstrate this concept through **The Salmon Food Web Game**. Have students stand in a circle and pass out food web cards, one to each student: mosquito larvae, salmon, brown bear, tree, pacific ocean, krill, sea lion, estuary, caddis fly larvae, kingfisher, plankton, shrimp, human, herring, eagle, forest, killer whale, sun, squid, eel grass, halibut, pteropod, algae. Students will wear the cards like necklaces with the picture facing out.

Students will begin by introducing their cards to the group. Start the game with a producer or non-living element. That student will hold onto the end of a ball of string and pass it on to someone that either it needs or needs it to survive. This continues until everyone is connected.

At this point ask students what this represents? What does it mean that everyone is connected in the salmon food web? Ask the salmon to wiggle their string up and down. Ask students who felt it to raise their hand. If the salmon is removed from the system many things that depend on it would suffer. Repeat this with a producer—even really small things are critically important to the entire ecosystem. Each “player” has an impact on another.

3. To reinforce this interconnection further, ask students to form a tight circle. Every student will turn to their right and put their hands on their neighbors shoulder. At the count of three, have students slowly sit down on the knees of the person behind them while holding onto the shoulders of the person in front of them. Try this a few times until they are successful. Point out that each depends on the other to stay seated. This is how a food web works, everything is connected. Ask students what they think will happen when one part of the ecosystem is damaged or removed? Read aloud the following scenarios:

- Tree roots act like a sponge and take up extra water and release it over time, keeping rivers from flooding and providing water in dry summers. They also hold in soils keeping sediments from falling into the river, keeping rivers clean and clear. But the trees have been logged next to the riverbank! Ask the “tree” to get out of the circle. What does this demon-

strate? What happens when we log trees next to salmon streams? If the circle doesn’t collapse at this point continue on with another example.

- People depend on salmon for food. People catch fish to eat and share with their families all year long. This has been happening for thousands of years in Southeast Alaska. But fishermen have been taking more fish than they are allowed, fishing where they are not allowed, and fishing after season closures. Ask the “salmon” to get out of the circle.
- The ocean is getting more **acidic** and pH levels are unbalanced. Pteropods require certain acidity levels to build their shells/skeletons. Salmon and many other ocean animals feed on pteropods. A decrease in their numbers could affect the entire food web. Ask the pteropod to get out of the circle. Ask students if they can think of other organisms that build a shell (clams, oysters, mussels, etc.).

Discussion:

Continue with other examples or ask students to return their cards and take a seat. Ask them if there are things humans can do to make sure that we keep the salmon ecosystem in balance. Have students think of an answer and share with a partner. Share a few examples with the class.

Evaluation:

To review have students draw a salmon-on salmon food web. To take it one step further have students group predator-prey relationships according to a) habitat or b) salmon lifecycle.

Resources:

[City of Eugene's Salmon and the Eco-system](#) see pages 45-48 for similar food chain and foodweb activities. And check out their [handout sheets](#) for an example of a salmon food chain.

Content Standards:

Science

- C) A student should understand and be able to apply the concepts, models, theories, facts, evidence, systems, and processes of life science.
- A.3. Students develop an understanding that all organisms are linked to each other and their physical environment through the transfer and transformation of matter and energy.

Culture

- E) Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them.
- E.1. Students recognize and build upon the interrelationships that exist among the spiritual, natural, and human realms in the

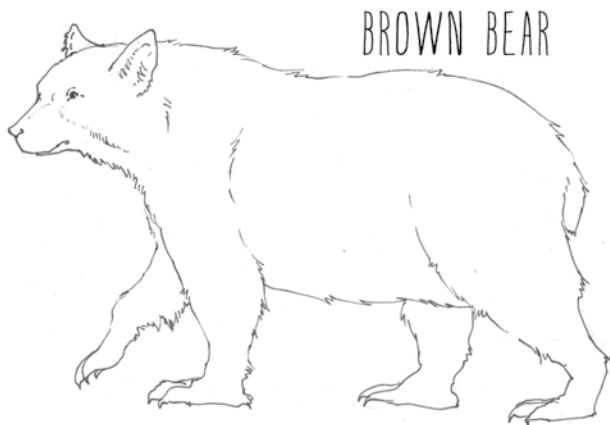
world around them, as reflected in their own cultural traditions and beliefs as well as those of others.

- E.2. Students understand the ecology and geography of the bioregion they inhabit.
- E.8. Students identify and appreciate who they are and their place in the world.

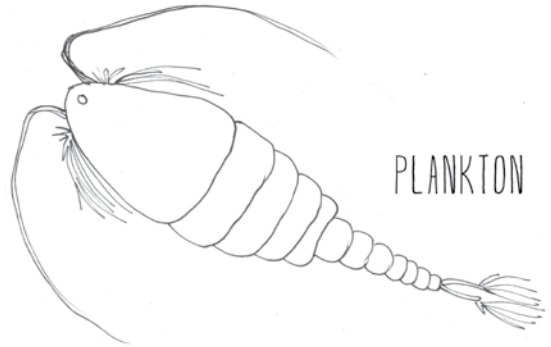
Geography

- B) A student should be able to utilize, analyze, and explain information about the human and physical features of places and regions.
- B.1. Students know that places have distinctive geographic characteristics.

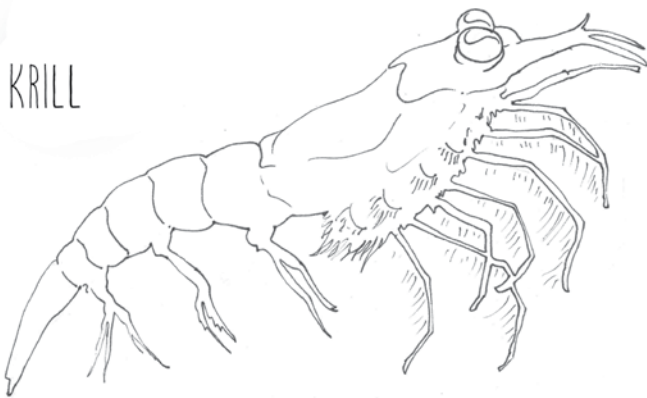
Food Chain Cards Set 1



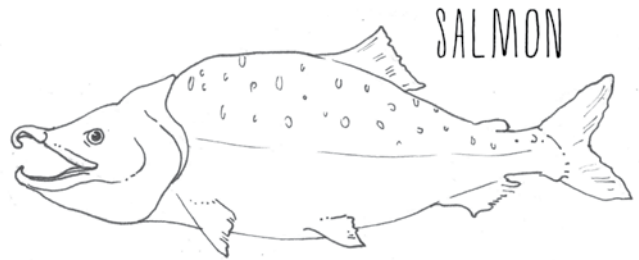
Food Chain Cards Set 2



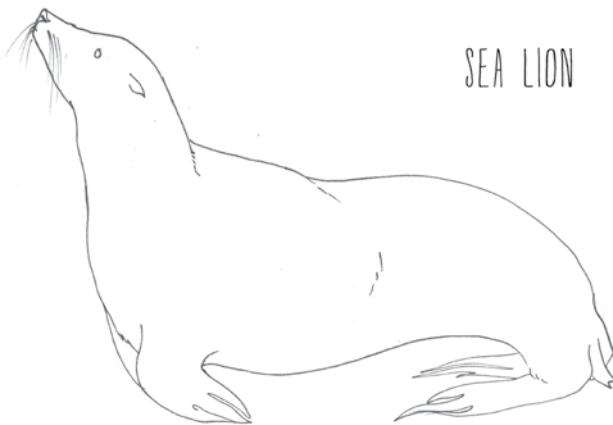
PLANKTON



KRILL



SALMON

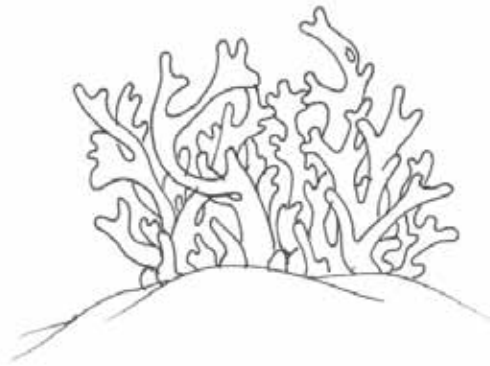


SEA LION

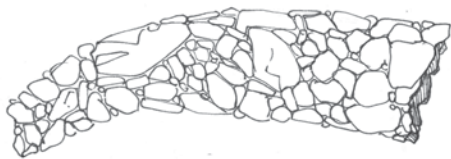


PACIFIC OCEAN

Food Chain Cards
Set 3



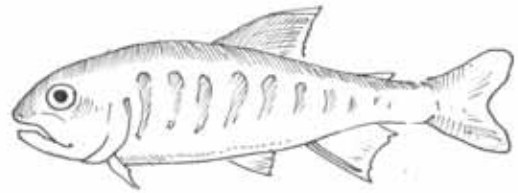
ALGAE



CADDIS FLY LARVAE



SALMON



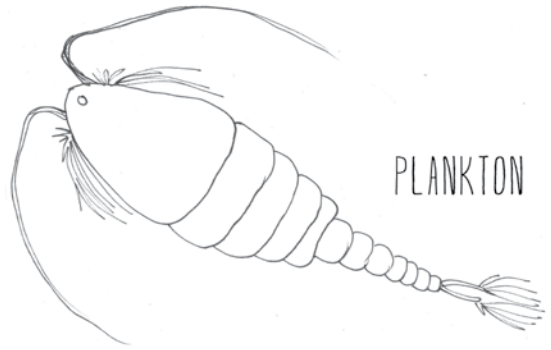
KINGFISHER



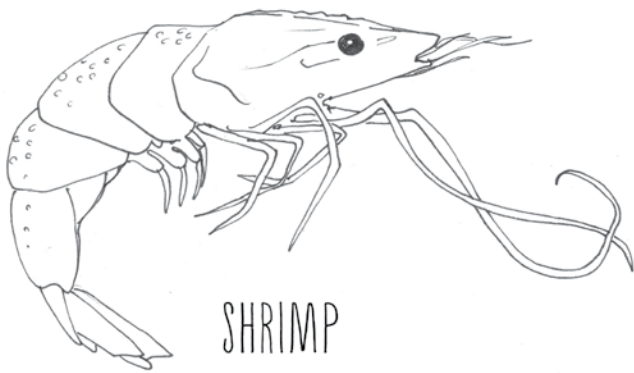
ESTUARY



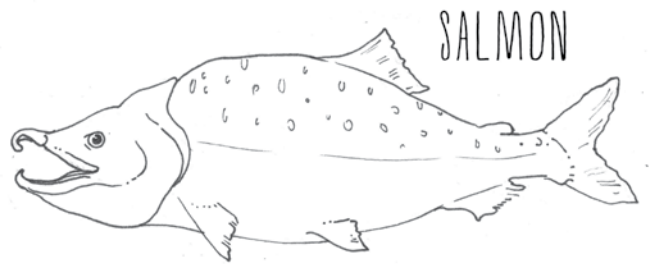
Food Chain Cards Set 4



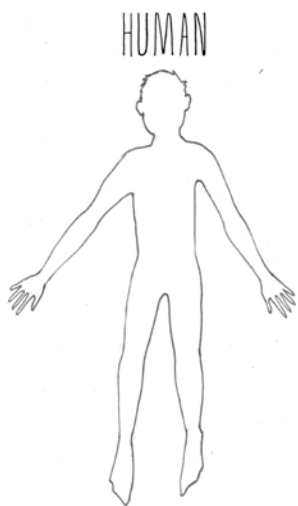
PLANKTON



SHRIMP



SALMON



HUMAN



PACIFIC OCEAN

Food Chain Cards
Set 5



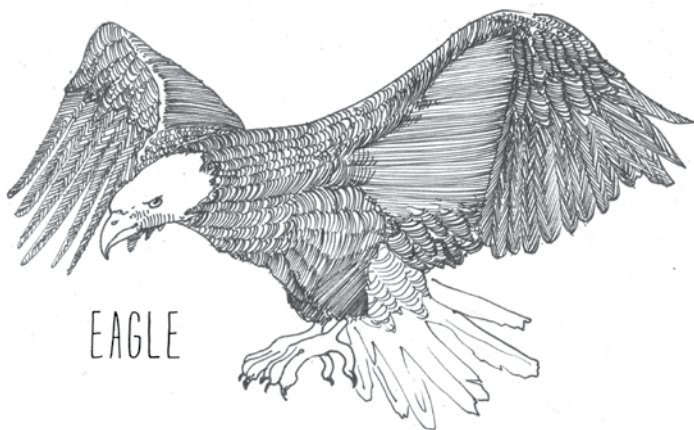
PLANKTON



HERRING



SALMON

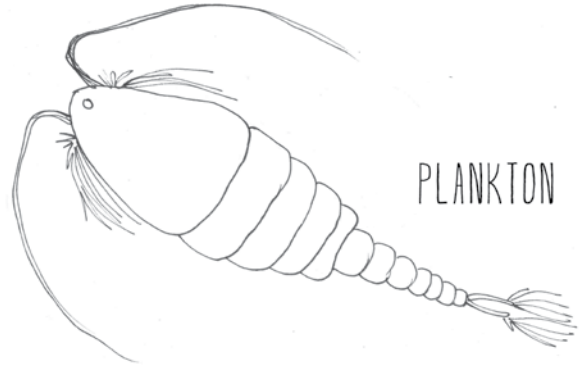


EAGLE

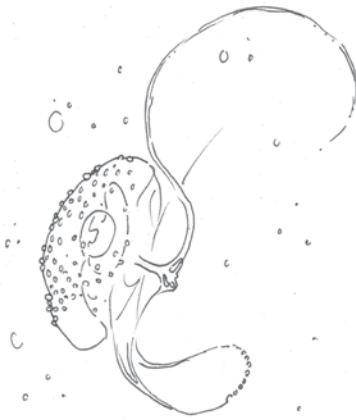


FOREST

Food Chain Cards Set 6



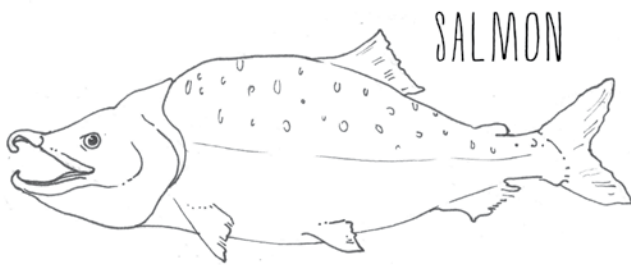
PLANKTON



PTEROPODS



HERRING



SALMON



PACIFIC OCEAN

Food Web Cards



KRILL



ESTUARY



PACIFIC OCEAN



SEA LION

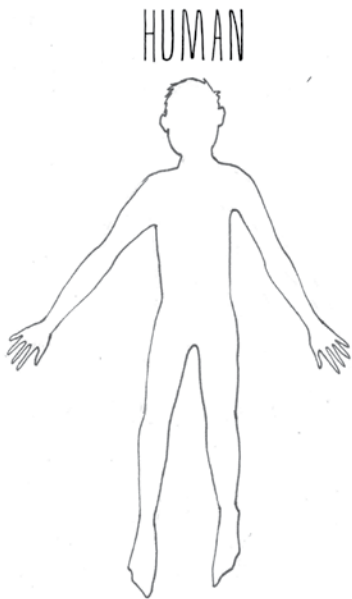
Food Web Cards



EAGLE

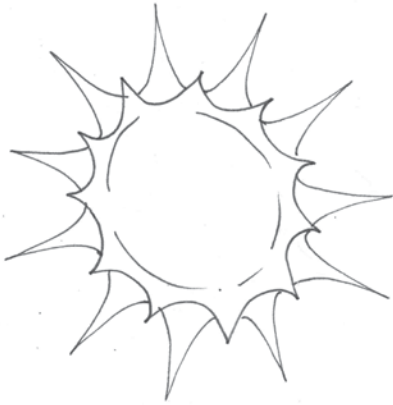


FOREST



HERRING

Food Web Cards



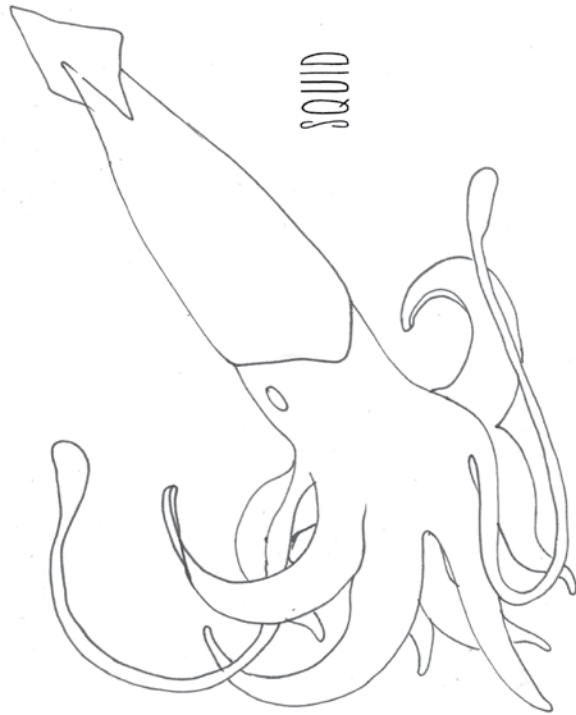
SUN

EEL GRASS



KILLER WHALE

SQUID



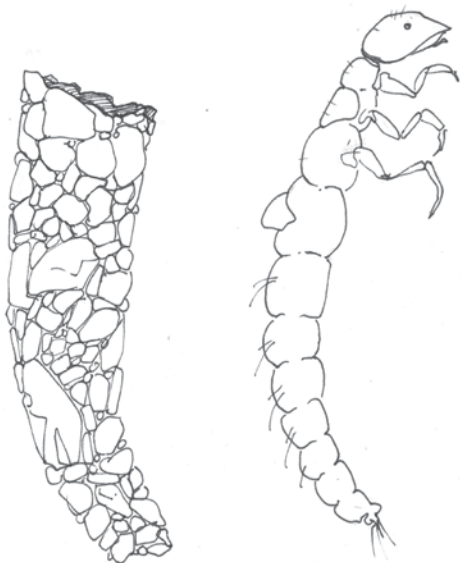
Food Web Cards



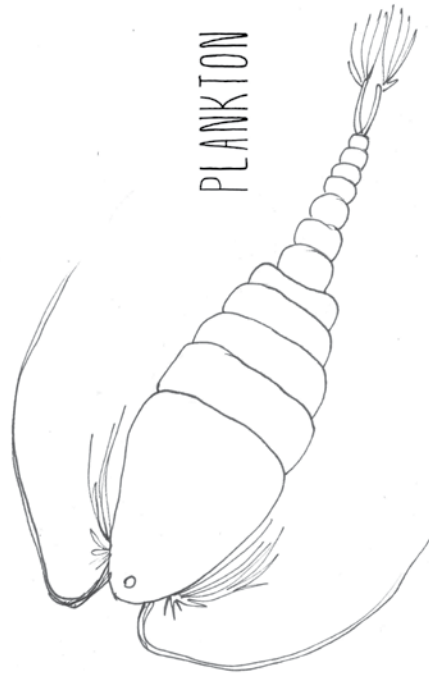
KINGFISHER



SHRIMP



CADDIS FLY LARVAE

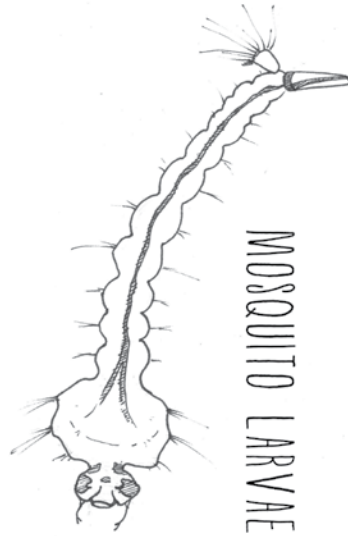


PLANKTON

Food Web Cards



BROWN BEAR



MOSQUITO LARVAE

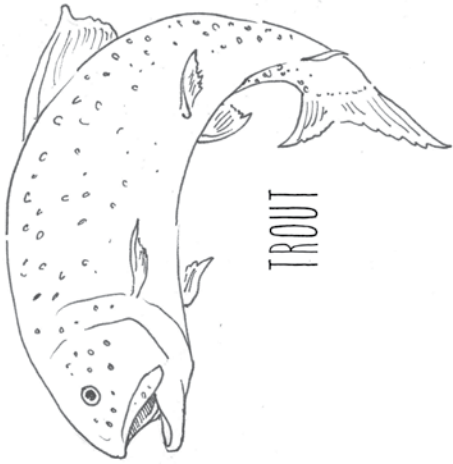


TREE



SALMON

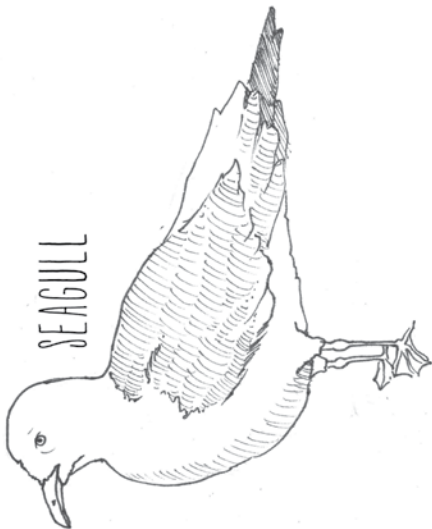
Food Web Cards



TROUT



RIVER

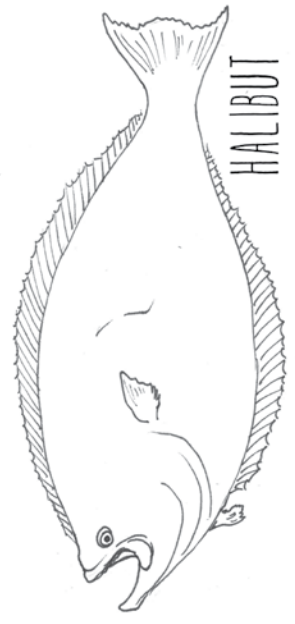
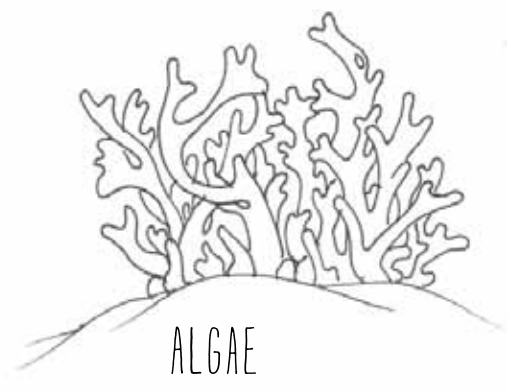


SEAGULL



GREAT BLUE
HERON

Food Web Cards





Local Foods and Economy

Essential Question:

Why eat local salmon?

Objectives:

- a) Students will be able to identify locally available foods.
- b) Students will be able to explain how Southeast jobs are connected to salmon.
- c) Student will be able to identify advantages to eating locally-caught salmon.

Time:

70 minutes

Materials:

- Job Web Cards: Cut out the attached cards, punch a hole at the top, and loop string through to create a necklace. **Cards are included but finding local examples would be ideal.
- Job web worksheet for each student
- Post it notes
- Ball of yarn

Content Standards:

S.A3, S.F1, Geo.E1, Gov.F9, Gov.G4, Gov. G5, H.B1b, H.A6, H.B4, C.A6, C.A7

Teacher Background:

Economic Value of the Alaska Seafood Industry, McDowell Group Report for the Alaska Seafood Marketing Institute outlines the economic value of Alaska's seafood industry.

Procedure:

1. Ask students to close their eyes and imagine they are eating with Alaska Natives before European settlers arrived. What would you be eating? Think about all the foods you could find in the ocean, beaches, and forests. Southeast Alaska examples include: salmon, herring, seaweeds, limpets, seal, beach greens, beach asparagus, goose tongue, berries, spruce tips, deer, and mountain goat.

Have students write down as many foods as they can think of on a post-it note. When they are finished they can stick their answers up on the board. Go over answers and reinforce the habitats they come from. Ask them if these are foods we can still eat today. Define these as “local.”

Ask students if they have ever eaten local foods. Ask students if they had to choose just one local food for survival, what would it be? What did the Native people depend on? Have students consider the following questions: 1) Is the food easy to find? 2) Is there a lot of it? 3) Is it healthy? 4) Is it filling? Go through these questions using one of the local foods they previously suggested as an example.

Give students a minute to think of the answer. When they are ready they can share their answer with a neighbor explaining their reasoning. Then have students share their answer with their table groups. Tell students they have to agree on one food as a group and share their rea-

soning with the class. It is okay if groups have different answers as long as they have strong arguments. This is an opportunity for critical thinking.

If students do not settle on fish/salmon as the most important food, drive the conversation back to salmon. Salmon are abundant, can be easily preserved, high in protein, provide lots of energy, contain healthy oils, and are not too difficult to catch.

2. Tell students they are going to play **“The Sun Shines On” Game**, showing how salmon are connected to our lives and community. Play the game below modeled after “Where the West Wind Blows.” Have students form a circle and ask everyone to remove their shoes and stand directly behind them. Remove one pair from the circle so there is one less pair as there are players.

If the read statement is true for a student they must find a new spot in the circle except for the one adjacent to them. Ask for a student volunteer to begin the game by reading one of the following prompts in the center of the circle. The student in the center will also look for a new spot. Because there is one less spot than students, one will remain in the middle. They will read the next prompt.

The sun shines on everyone who...
... has gone fishing
... has salmon in their freezer at home
... knows a fishermen
... has ever caught a salmon

- ... has canned salmon
- ... has tried fish for school lunch
- ... has seen a salmon carcass in the forest
- ... has seen a bird eat a salmon
- ... is interested in working in the fisheries
- ... likes to eat salmon
- ... has seen a fish jumping in _____River (use local example)
- ... knows someone who works at a seafood processing plant (use local example)

Ask students to take a seat in the circle and put on their shoes.

This game demonstrates the human connection to salmon. They are integrated into the lives of people who live in Southeast Alaska. Ask students how people are connected to salmon. They can use examples from the game: recreation, food source, ecosystem health, aesthetics, jobs, tourism, etc.

- 3.** Point to **one in eight** students and have them stand up. This is the number of people in Alaska that earned at least part of their annual income directly from the seafood industry. These are fishermen, seafood processors, tenders, Fish and Game employees, or hatchery technicians.

Ask students to stand if any of their parents are fishermen, seafood processors, tenders, Fish and Game employees, or hatchery technicians. Compare this percentage as related to the state average.

There are also a number of people who are indirectly related to fisheries. Ask students if they can think of professions that work with fish (charter fishermen, restaurants, grocery stores, fuel pumps, gear stores, repair and maintenance, etc.). Ask students to raise their hands if they know an adult with one of these jobs. Have them keep their hands up if this person is someone in their family.

- 4.** Tell students they are going to play **The Salmon Job Web Game** to demonstrate how local jobs are connected to salmon. Fishermen depend on certain services to be successful and the service providers depend on the fishermen for food and jobs.

We found that using pictures of local businesses really helped students to form connections because they are real places in our community. If you cannot find a parent helper to gather local photos, use the ones included. Photo Credit: Sitka Conservation Society.

Cut out the photos, punch a hole at the top, and loop string through them to create a necklace. Have students stand in a circle and pass out the job web cards representing the following professions: (salmon), troller, seiner, gillnetter, seafood processor, charter fisherman, fuel dock attendant, gear store clerk, boat repairman, Forest Service Ranger, Fish & Game Biologist, grocery store clerk, Chef, teacher, policeman, doctor, li-

brarian, lawyer, accountant, and hatchery technician.

This game is played like the salmon food web in Lesson 2. Student will begin by introducing their cards to the group. Define any professions they may be unfamiliar with. Give students a minute to scan the circle and have them look someone in the eye they depend on. Have them do this again with someone that depends on them. Start the game with the salmon. That student will hold onto the end of a ball of string and pass it on to someone they either depend on or someone that depends on them. This continues until everyone is connected. Help students who are stuck by asking them questions so that they can arrive at their own answer. String may go back to the same person twice but try to prevent this.

Discussion:

Once everyone is connected ask the “salmon” to wiggle their string up and down. Ask students who could feel the tug to raise their hands. Ask the class what that might mean. All of these jobs are connected and they depend on each other to make a healthy economy. When we buy local fish we support local jobs and our community. Ask students if they can think of any other professions they could link into the web.

Evaluation:

Have students complete the salmon “job-web” worksheet, making connections between different professions provided in a word bank.

Content Standards:

Science

- A) A student should understand and be able to apply the processes and applications of scientific inquiry.
- A.3 Students develop an understanding that the culture, local knowledge, history and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.
- F) A student should understand the dynamic relationships among scientific, cultural, social, and personal perspectives.
- F.1 Students develop an understanding of the interrelationships among individuals, cultures, social, science, and technology

Geography

- E) A student should understand and be able to evaluate how humans and physical environments interact.
- E.1. A student should understand how resources have been developed and used.

Government

- F) A student should understand the economies of the United States and

the state and their relationships to the global economy.

- F.9. Students should understand those features of the economy of the state that make it unique, including the importance of natural resources, government ownership and management of resources, Alaska Native regional corporations, the Alaska Permanent Fund Corporation, the Alaska Housing Finance Corporation, and the Alaska Industrial Development and Export Authority.
- G) A student should understand the impact of economic choices and participate effectively in the local, state, national, and global economies.
- G.4. Students make informed choices on economic issues.
- G.5. Students understand how jobs are created and their role in the economy

History

- B) A student should understand historical themes through factual knowledge of time, places, ideas, institutions, cultures, people, and events.
 - B.1.b Students should comprehend the forces of change and continuity that shape human history through the following persistent organizing themes: human communities and their relationships with climate, subsistence base, resources, geography, and technology.

Skills for a Healthy Life

- A) A student should be able to acquire a core knowledge related to well-being.
- A.6. Students use knowledge and skills related to physical fitness, con-

sumer health, independent living, and career choices to contribute to wellbeing.

- B) A student should be able to demonstrate responsibility for the student's well-being.
- B.4. Students develop an awareness of how personal life roles are affected by and contribute to the well-being of families, communities, and cultures.

Cultural:

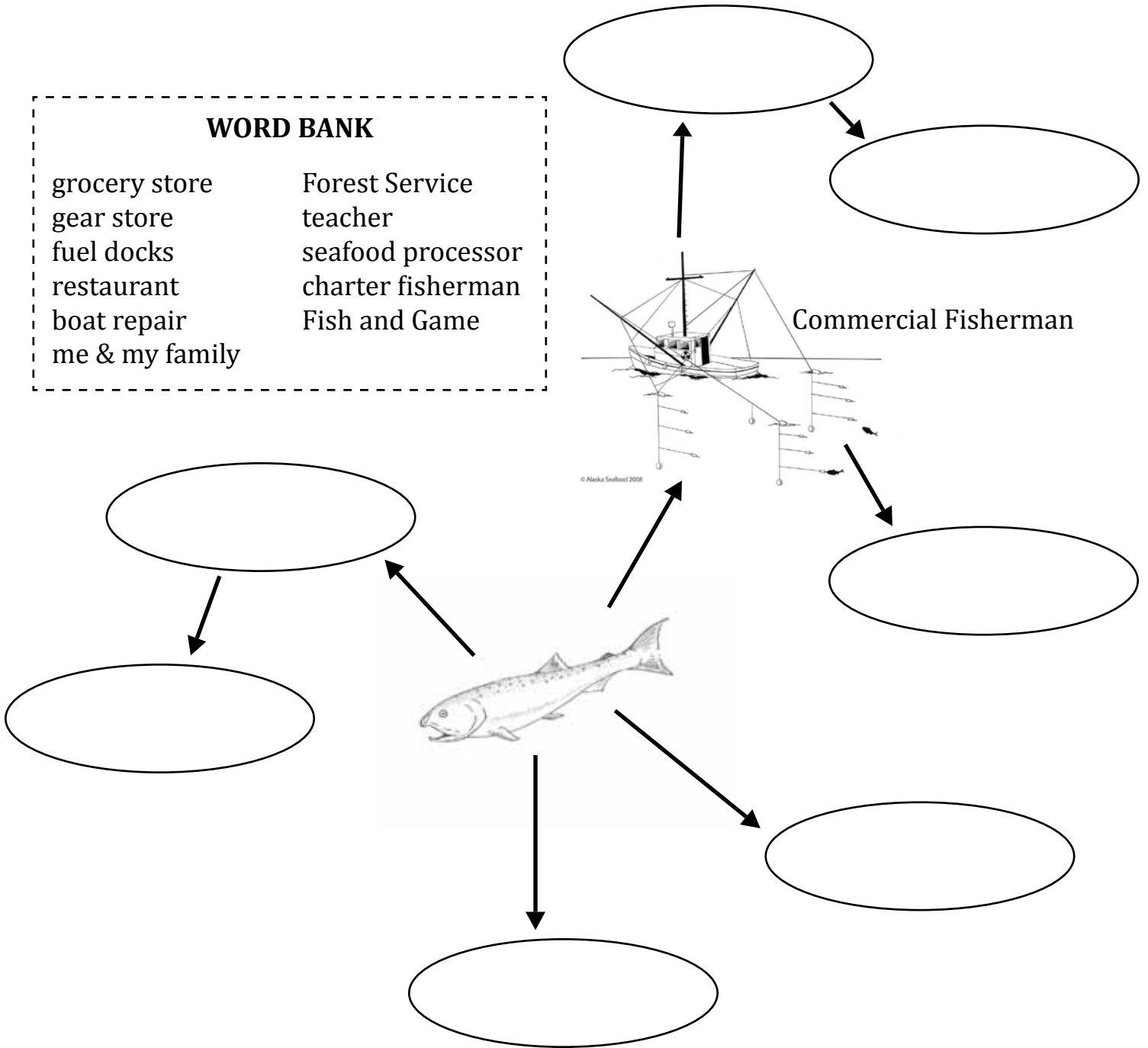
- A) Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community.
- A.6. Students live a life in accordance with the cultural values and traditions of the local community and integrate them into their everyday behavior
- A.7. Students determine the place of their cultural community in the regional, state, national, and international political and economic systems.

Job Web Worksheet

Instructions: Fill in the web by connecting salmon to the different jobs that depend on them. Where do you fit into the web? Make a bubble for you and your parents. Can you grow your web? Add additional boxes and lines if you can think of more connections!

WORD BANK

- | | |
|----------------|-------------------|
| grocery store | Forest Service |
| gear store | teacher |
| fuel docks | seafood processor |
| restaurant | charter fisherman |
| boat repair | Fish and Game |
| me & my family | |



Job Web Cards



Charter Fisherman



Boat Repairman



Forest Service Ranger



Fish and Game Biologist

Job Web Cards



Grocery Store Clerk



Teacher



Gear Shop Clerk



Fuel Dock Attendant

Job Web Cards



Chef



Seiner



Salmon



Doctor

Job Web Cards



Troller



Hatchery Technician



Seafood Processor



Policeman

Job Web Cards

Pay Checks!	4008	402.01	1
loan		500	
Housing			
Costco-Alli		142.37	
Costo-Kate		16	
Sea Mart Grocery breads,			
sizzors		14.98	
Market Cener tuna		4.38	
comb			
Lakeside		7.1	
Sea Mart tea, etc		46.4	
Market Center		5.29	1
Market Center- coffee filters	700		
Market Center ice cream		8	
Shoshauna		14.66	
Eggs		5.46	
Sea Mart- dairy; TP		22.11	1
Costco- bulk		78.25	1
Produce		4.74	
Sea Mart grocery (with			
Sally)		17.24	
Farmers Market Produce			

Accountant



Lawyer



Librarian



Gillnetter

Sustainable Fisheries Management

Essential Question:

How can we fish in a way to ensure there will be fish in the future?

Objectives:

a) Students will identify rules and regulations for a sustainable fishery.

Time:

55 minutes

Materials:

- Bag of kidney beans
- 1 bowl for each group
- 1 small cup for each student
- Straws for each student (can cut them in half)
- Fishing log for each group (included)

Content Standards:

Content Standards:
M.A3, M.E2, S.A3, S.E1, S.E3, S.F1, S.G1,
C.B3, C.B4, Geo.E1, Geo.E4, Geo.E5, Geo.
F2, Geo.F3, Geo.F6, Gov.A1, Gov.C1, Gov.
E7, H.B1b, H.B2, H.D2

Teacher Background:

Alaska Department of Fish and Game protects, maintains, and improves the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle. To (a) manage subsistence, commercial, and personal use fisheries in the interest of the general well being of the people and economy of the state. (b) Division of Habitat is to protect Alaska's valuable fish and wildlife resources and their habitats as Alaska's population and economy continue to expand.

Subsistence Fishing: a customary and traditional type of fishing that is used for personal or family consumption. Usually involves nets, spear, or a longline. Subsistence is given priority over other users.

Sport Fishing: Fishing for recreation, but also used for consumption, usually with a rod and reel. Cannot be sold.

Commercial Fishing: Harvesting fish to be sold.

Article 8 of Alaska’s Constitution states: “The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people.”

Forest Service manages public lands. Controls how lands are designated and how they are used.

Goal: (a) The Forest Service manages public lands in national forests and grasslands. (b) Gifford Pinchot, the first Chief of the Forest Service, summed up the mission of the Forest Service— “to provide the greatest amount of good for the greatest amount of people in the long run.

Notes:

Lesson based on *Alaska Seas and Rivers, Fishing for the Future*.

Procedure:

1. Students will fish in a salmon fishery where subsistence, sport, and commercial fishermen vie for a portion of the catch. Begin the game by revealing very little information, only that students each need to catch two fish to survive the round. At the beginning of every season, new information will be shared. Eventually groups will begin to deplete their fish stocks—use this as an example to talk about sustainable fishing.

Introduce the activity by telling students that they are going fishing. In small groups of four, students will receive: a bowl (ocean) full of 20 kidney beans (salmon), one straw each (fishing pole), one dixie cup each (fishing boat), and one fishing log for the group.

Season 1: Assign groups of four students to local fishing spots. Students will begin as subsistence fishermen. Define subsistence fishing. When the fishery begins students will subsistence “fish” for salmon by sucking a bean from the ocean into their boat using a straw with hands behind their back. They will have 20 seconds, their goal is to catch at least two fish to “survive” the round. Write this goal on the board. After the first round students will record how many fish they caught as a group and how many fish remain. Students who did not catch at least two fish sit out the next season. If a fish didn’t make it into the boat but fell onto the desk, record that as a lost fish on the log. Share results

with the class.

Season 2: Tell students you got some new information. After a lot of scientific research on these “salmon” we have learned that salmon reproduce at a 1:1 rate. So every fish that remains will double (ie. if six fish remain they will receive six more for a total of 12). We have also learned that the ocean cannot hold more than 20 fish (the carrying capacity) because there are not enough resources to support more fish. The most fish their oceans can have is 20.

Collect fish from their Dixie cups (boats) and replenish oceans by adding one fish for every fish that remains in their ocean. For this season, let one of the students hold the straw with their hands—this represents a different user group/newer technology—sport fisherman. Define sport fishing. Remind students again that in order to survive they have to catch two fish. Open the season for 20 seconds. Have students record the number of fish they caught and the number that remain. Share results with class.

Season 3: Collect fish from Dixie Cups and replenish oceans by adding one fish for every one fish that remains in their ocean. Tell students there have been more advances in technology. Give one student a spoon, this represents a commercial fisherman. Define commercial fishing. Ask for some examples of advanced technology they might use (depth finders, hydrolics, deckhands, etc.). Commercial fishermen

can only catch one fish at a time with their spoon. Open the season for 20 seconds. Have students record the number of fish they caught and the number that remain. Share results with class.

2. At this point one of the groups is likely to have overfished. If not, continue another round. Once a group has depleted their ocean gather students together to discuss. Ask students about the game. What happened and why? What happens when we overfish? What happens to people and other predators? What about the foodweb, ecosystem and habitats? Why do we need to make sure we don't overfish?

3. Ask students how they would play the game differently. Have students make up rules for a sustainable fishery (fish stocks are never depleted, maximum harvest but maintain carrying capacity, everyone catches at least two fish, different user groups catch different amounts, etc.). Either create rules as a class or have students formulate rules in their small groups. Record class rules on the board or have small groups write new rules on their fishing logs.

4. **Seasons 4 & 5:** Replenish oceans and play two more rounds. Open the season for 20 seconds using the new rules. Record catch in fishing log. Consider giving “tickets” to students who over fish and do not follow the new rules. Repeat at least once more. Share results with the class.

Discussion:

Ask students if these rounds, with rules, were different than the first three rounds. How do their numbers compare? Are salmon stocks healthier when we have rules?

It is our responsibility to ensure our salmon stocks remain healthy, productive, and sustainable. Ask students who creates fishing rules (Alaska Department of Fish and Game). How do you think they came up with the rules (science, studying fish behaviors, habitat, etc.). How do we know if they are working (observation—just like us they record what happens every year). What are examples of some real life rules (permits, openings, licenses, quotas, etc.)?

What can we do as individuals to ensure sustainable salmon stocks?

Evaluation:

Use the discussion at the end of Seasons 3 & 5 to measure understanding or ask students to define the meaning of a “sustainable fishery.”

Extension:

Add a fishing season and give each group a card with one of the following scenarios.

- The trees next to your natal stream have been logged, remove half of your salmon.
- A road has been built through your natal stream, remove half of your salmon.

- A mine has been built near your natal stream releasing chemicals into the water, remove half of your salmon.
- The ocean is warming and fish are struggling to adapt to changes in temperature, remove half of your salmon.
- You have too much bycatch, remove half of your salmon.
- You have been caught fishing out of season, remove half of your salmon.
- It's a record year for salmon! Add 5 fish to your ocean.

Open the season for another 20 seconds. Have students record the number of fish caught and fish that remain. How did they prepare for this situation? How did they deal with it? Were they able to fish that season? What else must fishermen consider to ensure healthy fishing stocks? Review what other animals depend on salmon.

Content Standards:

Math

- A) A student should understand mathematical facts, concepts, principles, and theories.
 - A.3. Perform basic arithmetic functions, make reasoned estimates, and select and use appropriate methods for tools for computation or estimation including mental arithmetic, paper and pencil, a calculator, and a computer.
- E) A student should be able to apply mathematical concepts and processes to situations within and outside of school.
 - E.2. Students use mathematics in dai-

ly life.

Science

- A) A student should understand and be able to apply the processes and applications of scientific inquiry.
 - A.3 Students develop an understanding that the culture, local knowledge, history and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.
- E) A student should understand the relationship among science, technology, and society.
 - E.1. Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and every day events
 - E.3. Students develop an understanding of how scientific discoveries are technological innovations affect and are affected by our lives and cultures.
- F) A student should understand the dynamic relationships among scientific, cultural, social, and personal perspectives.
 - F.1 Students develop an understanding of the interrelationships among individuals, cultures, social, science, and technology
- G) A student should understand the history and nature of science.
 - G.1. Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building

on prior knowledge.

Culture

- B) Culturally knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life.
 - B.3. Students make appropriate choices regarding the long-term consequences of their actions
 - B.4. Students identify appropriate forms of technology and anticipate the consequences of their use for improving the quality of life in the community.

Geography

- E) A student should understand and be able to evaluate how humans and physical environments interact
 - E.1. Students understand how resources have been developed and used.
 - E.4. Students determine the influence of human perceptions on resource utilization and the environment.
 - E.5. Students analyze the consequences of human modification of the environment and evaluate the changing landscape.
- F) A student should be able to use geography to understand the world be interpreting the past, knowing the present, and preparing for the future.
 - F.2. Students compare, contrast, and predict how places and regions change with time.
 - F.3. Students analyze resource management practices to assess their impact on future environmental

quality.

- F.6. Students utilize geographic knowledge and skills to support interdisciplinary learning and build competencies required of citizens.

Government and Citizenship

- A) A student should know and understand how societies define authority, rights, and responsibilities through a governmental process.
 - A.1. Students understand the necessity and purpose of government.
- C) A student should understand the character of government of the state.
 - C.1. Students understand the various forms of these state's local governments and the agencies and commissions that influence student's lives and property
- E) A student should have the knowledge and skills necessary to participate effectively as an informed and responsible citizen.
 - E.7. Students implement ways of solving problems and resolving conflict.

History

- B) A student should understand historical themes through factual knowledge of time, places, ideas, institutions, cultures, people, and events.
 - B.1.b Students should comprehend the forces of change and continuity that shape human history through the following persistent organizing themes: human communities and their relationships with climate, subsistence base, resources, geography, and technology

- B.2. Students understand the people and the political, geographic, economic, cultural, social, and environmental events that have shaped the history of the state, the United States, and the world.

- D) A student should be able to integrate historical knowledge with historical skill to effectively participate as a citizen and as a lifelong learner.
 - D.2. Students solve problems by using history to identify issues and problems, generate potential solutions, assess the merits of options, act, and evaluate the effectiveness of actions.

Fishing Log:

Names: _____

Fishing Spot: _____

SEASON	Starting #	# Caught	# Lost	# Remaining
1				
2				
3				
4				
5				
6				



Fishing Methods

Essential Question:

How are fish caught?

Objectives:

- a) Students will be able to explain the differences between subsistence, sport, and commercial fisheries.
- b) Students will be able to identify the different fishing vessels in Southeast Alaska.

Time:

60 minutes

Materials:

- “The Tlingit Way, How to Treat Salmon” by Patricia H. Partnow
- Fishing handout with graphic, description, and skit roles (included)
- Blank sheet of paper for each student
- Optional: fishing gear (scraps of seine net, gill net, 2 fishing poles, a halibut hooks)

Content Standards:

C.A5, C.C1, S.A3, S.E3, S.F1, Geo.E1, E.A.6

Teacher Background:

Alaska Department of Fish and Game seeks to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle. To (a) manage subsistence, commercial, and personal use fisheries in the interest of the general well being of the people and economy of the state. (b) Division of Habitat is to protect Alaska’s valuable fish and wildlife resources and their habitats as Alaska’s population and economy continue to expand.

Subsistence Fishing: a customary and traditional type of fishing that is used for personal or family consumption. Subsistence is given priority over other

users. Usually involves nets, spear, or a longline. In the past fish wheels and traps were also commonly used.

Sport Fishing: Fishing for recreation, but also used for consumption, usually with a rod and reel. Cannot be sold.

Commercial Fishing: Harvesting fish to be sold. Methods outlined below.

Gillnetting: Gillnetters set a net wall that hangs up and down in the water. The small openings in the net catch salmon (like sockeye) by their gill covers as they swim through the invisible net. The gillnet hangs between a float line and a weight line. Fish are pulled up on the boat and the net rolls up into a spool.

Purse Seining: Purse seiners stretch a net around a school of fish like pink salmon or herring. A power skiff pulls the net from the fishing boat around a school of salmon. The fishermen will “purse” or close the net and pull it on board using a hydraulic power block.

Trolling: Trollers have large poles that stretch open to the side of their boat with a number of lines and baited hooks. When a salmon (like king or coho) gets caught on a hook, a bell rings on deck and it is pulled up on deck.

Longlining: Longliners catch fish at the bottom of the ocean like halibut and rockfish. A longline stretches across the bottom of the ocean with baited hooks. The line is held in place between two anchors and two flagged buoys.

Procedure:

1. Ask students to close their eyes and imagine they are fishing with the Alaska Natives in your region. How would they catch fish? What tools did they use to catch salmon? Have students share examples and show pictures from “[The Tlingit Way, How to Treat Salmon](#)” that demonstrate each method. If possible, use real examples—see Resources for ideas.

Ask students how each method would have been constructed (hooks of bone, fish traps out of spruce root or cedar bark, etc.). Tell students that some of these methods are still used (dip net and beach seine) to catch fish in the subsistence fishery. These fish are eaten and shared with family, and cannot be sold.

Ask students if they were going to go fishing right now, what they bring with them (a fishing pole with a line, bait or lure, and hook). This is called sport fishing, and anglers either “catch and release” fish for recreation or take fish home to eat. They cannot be sold.

Ask students which type of fishermen can sell fish for money. Ask them for local examples (trolling, seining, gillnetting, longlining). Draw parallels between current technologies/methods with traditional ones.

2. Explain to the class that they are going to be working in small groups to act out the different fisheries. Each student will have a role in the fishery. You can either use the roles in-

cluded or allow them to determine their own.

Begin with an example by calling four student volunteers to demonstrate the traditional fishing method of building a weir across a stream to trap salmon. Two students can be the weir. Explain how the Tlingit would build a weir across the river by driving poles in a row and weave tree branches between them. The two students should spread their arms out and face the class to be the poles and branches. One student can be the salmon, and one can be the Tlingit with a spear. The weir sinks to the floor to show that the tide is rising and the river is flooding over the top of the weir. The salmon can then “swim” over the weir by stepping over the students on the floor. When the tide goes out, the water in the river becomes shallow. The weir can rise up to and spread their arms, linking hands and trapping the salmon from retreating to the safety of the ocean. Now the salmon are trapped in a shallow pool behind the weir and the fisherman can wade into the water and spear the salmon one at a time.

3. Put the students in groups of five and give each group a different fishing handout. Students will begin by reading aloud the description of the fishing method while studying the diagram. They will have 15 minutes to practice their fishing skit. The teacher should circulate to explain difficult words and answer questions. Every student should have a role in the skit. Students are encour-

aged to make sounds (revving up the engine, the ring of a bell when a troller gets a salmon, etc.) and be really descriptive.

4. Have students perform their fisheries. They will begin by introducing each role. The narrator will explain what the different actors are doing. While the fishery is being explained project a diagram of the fishery on the board. If there are two of the same type of fishery (ie. two groups of trollers) they should go one right after the other. After each skit, reinforce the main points to ensure the fishing method has been adequately explained.

After the first demonstration, have students fold a blank piece of paper in quarters. After each skit, students will draw and label the fishery in one of the quarters and write what species of fish they target.

Evaluation:

To review fishing methods assign each fishing method a number on the board (trolling-1, seining-2, gillnetting-3, longlining-4). Ask the following questions, which students will answer by holding up the correct number of hands & fingers. For the last two questions, students will use both hands.

Which fishery targets a school of salmon? (seiner-2)

Which commercial fishing method targets halibut and rockfish? (longlining-4)

Which type of commercial fishery catches salmon with a hook? (trolling-1)

Which fisheries catch salmon using a net? (seiner-2 and gillnetter-3)

Which fisheries catch fish with hooks? (troller-1 and longliner-4)

End by projecting photos of a [gillnetter](#), [troller](#), [longliner](#), & [seiner](#). Have students identify the boats by showing you the correct number of fingers, as listed on the board.

Extension:

A) If available, show students real fishing equipment to reinforce each method. If possible have students school up and “seine” them. Catch “fish” in gillnets by having them get their hand stuck in the net. Have someone troll by holding out two fishing poles while walking slowly.

B) Invite a local fisherman into the classroom to share stories, show gear, and answer questions.

C) Take a fieldtrip to the local harbor.

Resources:

The [Hands-on Loan Program](#) through Alaska State Museums will loan out materials across the state to k-12 classrooms. You can find many examples of traditional fishing gear.

Images of fishing boats provided by the Alaska Seafood Marketing Institute (ASMI).

Content Standards:

Cultural

A) Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community.

A.5. Students reflect through their own actions the critical role that the local heritage language plays in fostering a sense of who they are and how they understand the world around them

C) Culturally knowledgeable students are able to actively participate in various cultural environments.

C.1. Students perform subsistence activities in ways that are appropriate to local cultural traditions.

Science


A) A student should understand and be able to apply the processes and applications of scientific inquiry.

A.3. Develop and understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.

E) A student should understand the relationships among science, technology, and society.

E3. Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

F) A student should understand the dynamic relationships among scientific, cultural, social and personal



perspectives

- F.1. Students develop an understanding of the interrelationships among individuals cultures, societies, science, and technology.

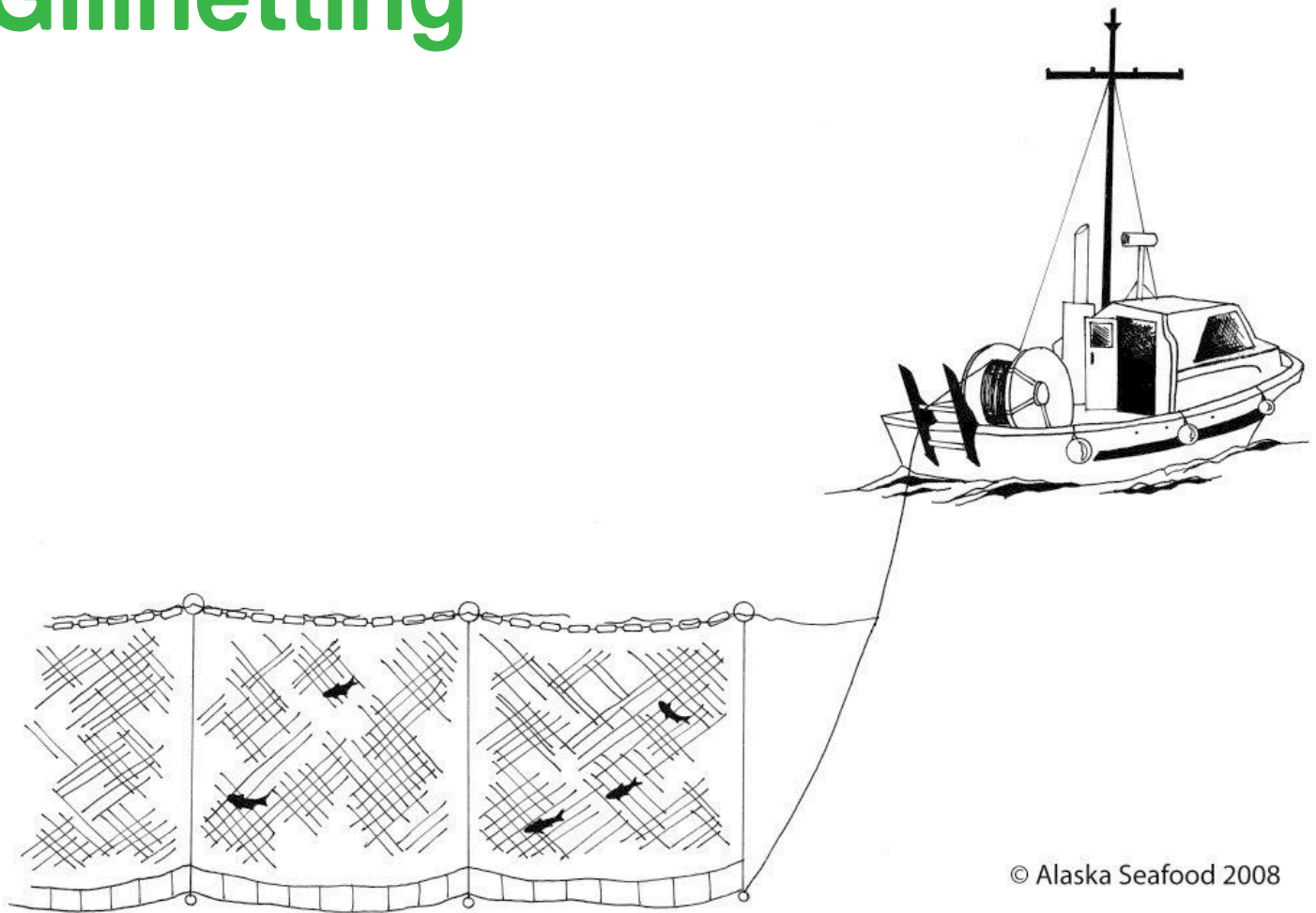
Geography

- B) A student should be able to utilize, analyze, and explain information about the human and physical features of places and regions.
- B.4. Students discuss how and why groups and individuals identify with places.
- E) A student should understand and be able to evaluate how humans and physical environments interact
- E.1. Students understand how resources have been developed and used.

English

- A) A student should be able to speak and write well for a variety of purposes and audiences.
- A.6. Students when appropriate use visual techniques to communicate ideas; these techniques may include role playing, body language, mime sign language, graphics, Braille, art and dance.

Gillnetting



© Alaska Seafood 2008

Gillnetters set a **net** wall that hangs up and down in the water. The small openings in the net catch salmon, usually **sockeye**, by their gill covers as they swim through the invisible net. The gillnet hangs between a float line and a weight line. Fish are pulled up on the boat and the net rolls up into a **spool**.

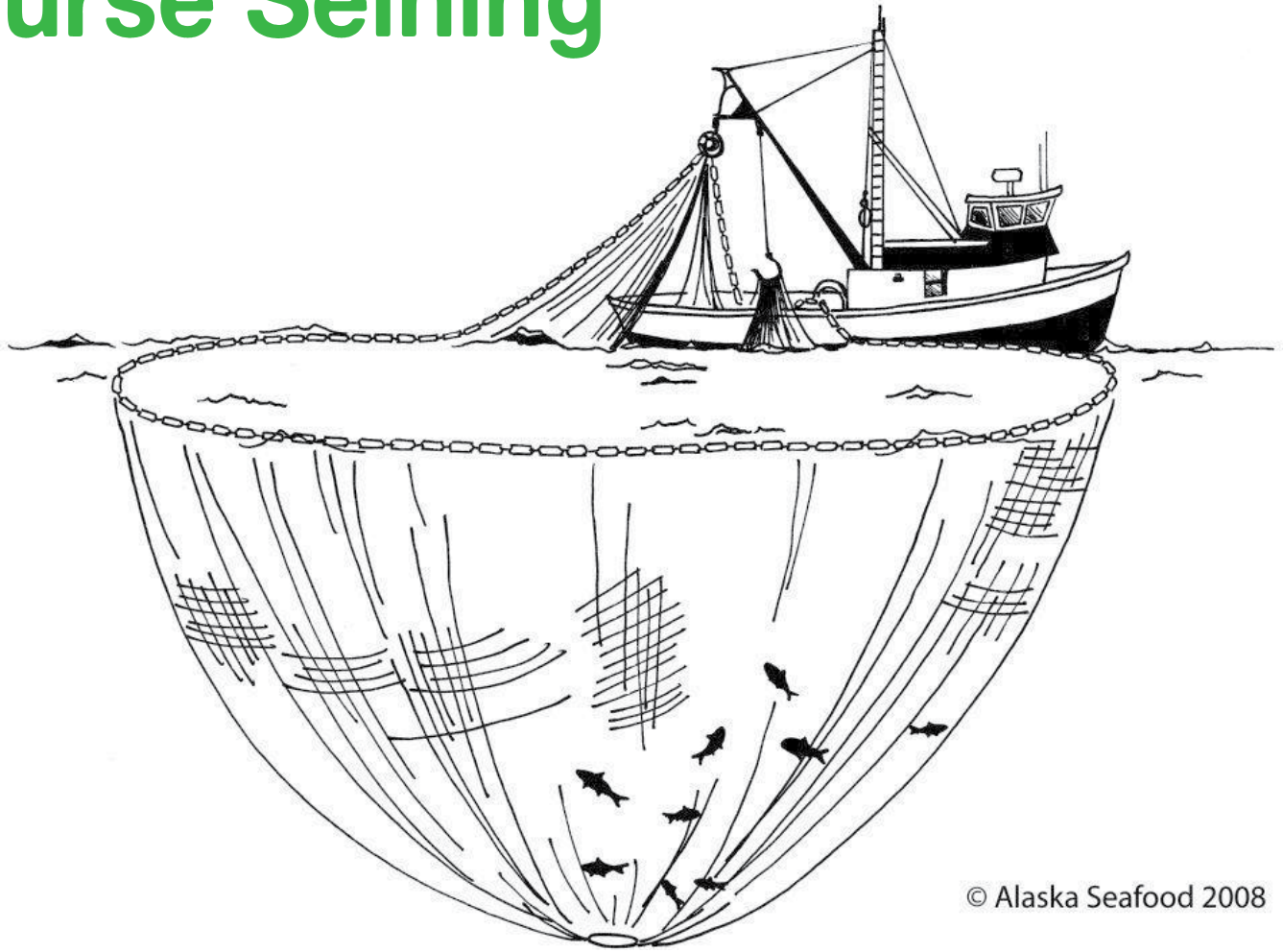
Questions to answer in your skit:

- What type of gear do you use?
- What type of fish do you catch?
- How are fish caught?
- How can someone identify your boat?

Roles:

- 2 nets
- 1 - 2 sockeye salmon
- 1 narrator

Purse Seining



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Purse seiners stretch a net around a school of fish like **pink salmon or herring**. A **power skiff** pulls the net from the fishing boat around a school of salmon. The fishermen will “purse” or close the net and pull it on board using a **hydraulic power block**.

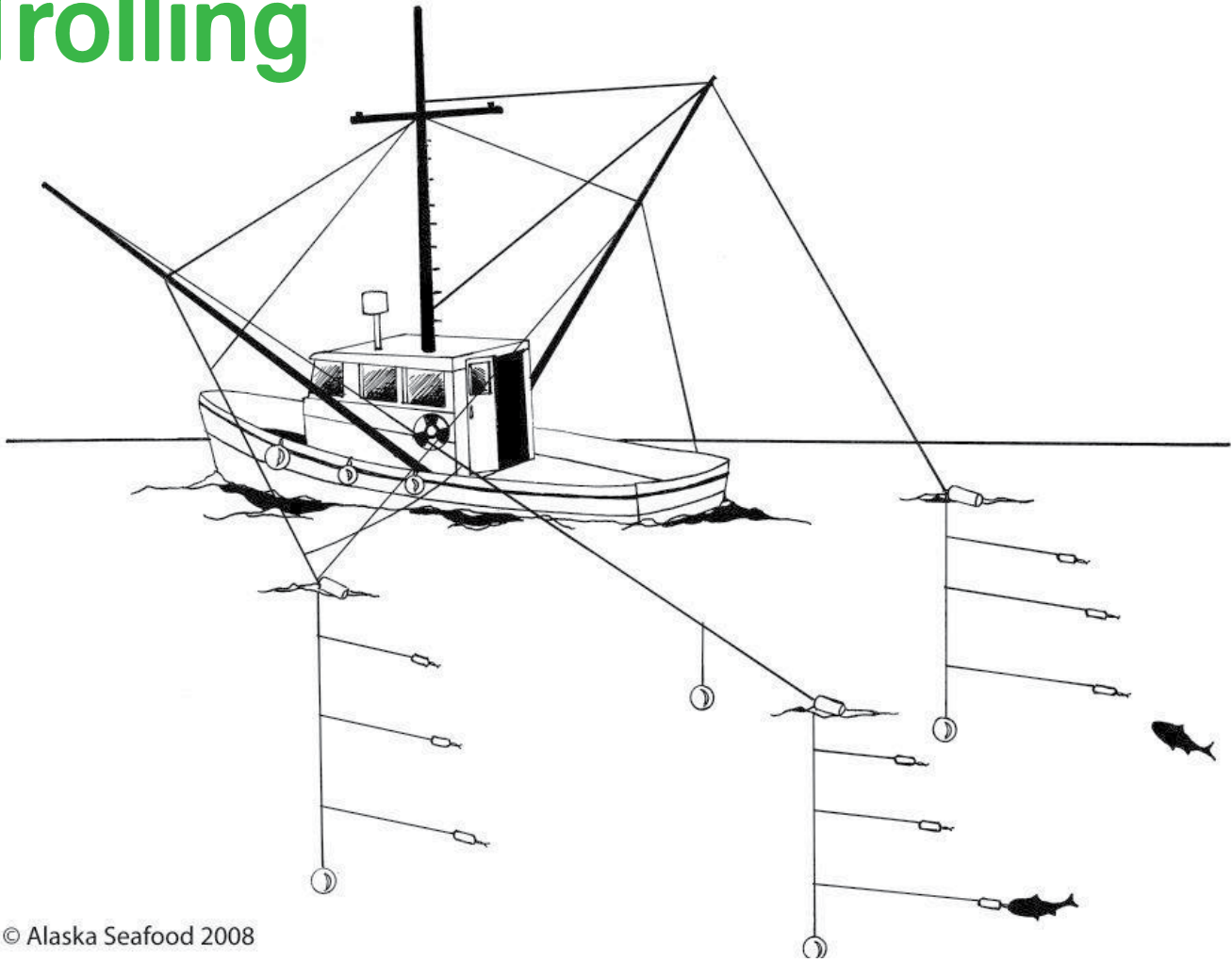
Questions to answer in your skit:

- What type of gear do you use?
- What type of fish do you catch?
- How are fish caught?
- How can someone identify your boat?

Roles:

- 1 boat
- 1 skiff
- 1 – 2 pink salmon
- 1 narrator

Trolling



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Trollers have **two large poles** that stretch open to the side of their boat with a number of lines **and baited hooks**. When a salmon, like **king or coho**, gets caught on a hook, a bell rings on deck and it is pulled up on deck.

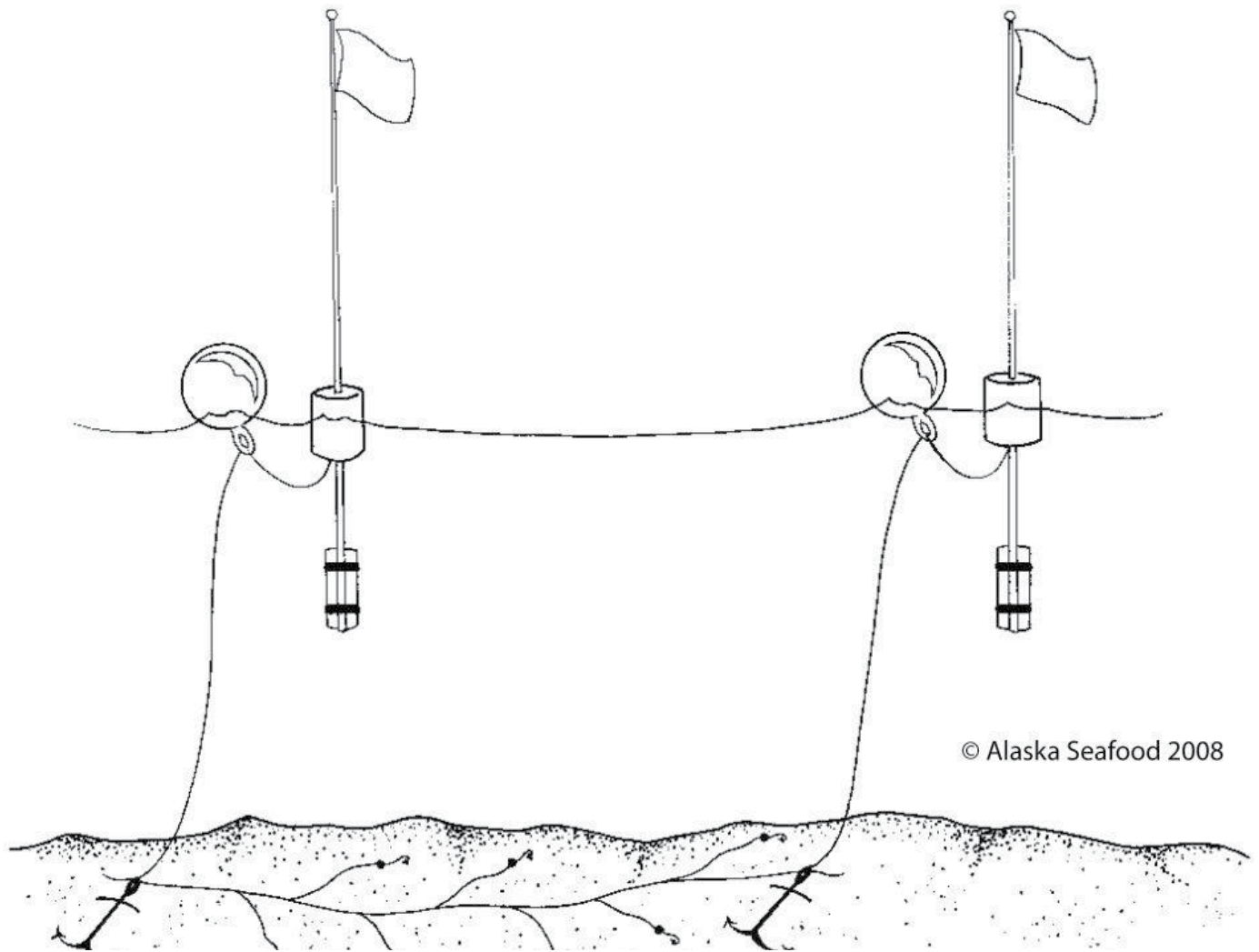
Questions to answer in your skit:

- What type of gear do you use?
- What type of fish do you catch?
- How are fish caught?
- How can someone identify your boat?

Roles:

- 1 boat
- 1-2 lines with hooks
- 1 salmon
- 1 narrator

Longlining



Longliners catch fish **at the bottom of the ocean** like **halibut and rockfish**. A **longline** stretches across the bottom of the ocean with **baited hooks**. The line is held in place between **two anchors and two flagged buoys**.

Questions to answer in your skit:

- What type of gear do you use?
- What type of fish do you catch?
- How are fish caught?
- How can someone identify your boat?
- Where do those fish live in the ocean?

Roles:

- 2 flagged buoys with anchors
- 1 longline
- 1 rockfish
- 1 narrator

Salmon Processing & Preservation

Essential Question:

How are salmon processed and preserved?

Objectives:

- a) Students will be able to identify the steps to clean a fish.
- b) Students will be able to explain how to prepare smoked salmon.

Time:

This lesson is divided into two parts. The first part covers processing and preservation techniques and includes an activity on brining salmon. The second part covers smoking salmon on campus which requires periodic observation of the fish. Part 1 will take about 55 minutes and Part 2 will take an additional 45 minutes spread across the school day to load the smoker, add wood chips throughout the day, remove from smoker, and package.

Materials:

- Whole salmon for fillet demo
- Fillet knife
- Butcher paper or trash bags to cover table
- 2 salmon fillets per class cut into 1" strips (1 per student)
- 1 large bowl for each class (glass or plastic only) & mixing spoon
- 4 sets of white sugar, brown sugar, salt, water, and recipe (included)
- 4 Quart jars or bowls marked with 2 cup line
- 4 Measuring cups
- Oil spray
- 1 large tupperware (if smoking off site)
- Smoker (like Big Chief) with racks
- Wood chips
- Vacuum sealer and bags
- Pictures of traditional smokehouses (optional)

Content Standards:

C.C1, S.A3, S.G3, Geo.B4, Geo.E1, H.B1b

Teacher Background:

University of Alaska, Cooperative Extension Service Publication: [Smoking Salmon at Home](#).

Procedure:

Part 1

1. Review the salmon lifecycle. Ask students to close their eyes and imagine they are a salmon egg nestled into gravel at the bottom of a river. Cold clean water is running over them. Then they become an alevin. Now they're feeding off of their yolk sac finding little pools to hang out in. Then they eat up all of their yolk sac and go looking for food—caddis fly & mosquito larvae. Then they become big enough to swim out in the open ocean where they fill their tummies full of plankton, krill, and herring. And then... they're caught! (Or use the visualization on page 4 of the [Salmon Protection and Watershed Network](#) curriculum.)

Have students open their eyes. To review fishing methods, ask them what may have caught them in a big net (seiner), or by their gills in an invisible net (gillnetter), or by a hook (troller).

Once students have named the different fishing methods, tell them how each fisherman handles the fish. Gillnetters pluck the fish out of the nets and keep them in a cold storage tank, as do seiners. Trollers bleed and gut every fish and either

pack them with ice or freeze them right on board.

2. Ask students to close their eyes again and lead them through a visualization where they are sport fishing for salmon. Catching the fish is just the first step. Ask students to gather around a table covered in butcher paper. Demonstrate the following steps to clean a salmon (consider getting a salmon donated from local hatchery):

- Fish are stunned.
- Fish are bled by cutting the gills.*
- Fish are gutted. Cut open the belly and remove the internal organs.*
- Scrape the kidney off the backbone with a spoon.*

*Use as an extension to talk about the anatomy of salmon.

3. Tell students that people process fish differently—one method is no better than another. For example some may:

A) Remove the Head (many fish are sold this way, called h/g fish)

B) Fillet the fish. Let students know there are many ways to fillet a fish.

Demonstrate how to fillet a fish. Ask students where this happens on a commercial scale (seafood processor/cannery).

4. Lay out all parts of the fish. Ask students which parts they can eat. Almost everything is edible: the skin, eggs, heart, fillet, etc. We often discard a large amount of what is edible, but Native people would use everything, nothing was wasted. Meat off

the backbone could be scraped off into patties, the skeleton added to a pot of boiling water for soup stock. The eggs and some organs are edible and are rich in healthy omega-3 oils. Ask students to point to their favorite parts of the fish (probably fillets). Tell students that most consumers agree and purchase salmon fillets. Seafood processors generally sell fish fillets while the rest is ground up and returned back to the ocean or made into other products (fertilizers, dog food, etc.)

Ask students if they have ever seen a salmon carcass in the forest. What might have left the carcass in the forest (bears/birds)? Tell them that bears often eat the **eggs, skin, and brain**, which contain the highest concentration of calories and omega 3s (fat). The remaining carcass returns nutrients back into the forest soil.

5. Now tell students to imagine they went fishing and caught 20 sockeye salmon. Ask students what they're going to do with all of those fish. Remind them of the "rule" that you are only supposed to catch as much fish as you can eat. If you can only keep fish fresh in the refrigerator for a couple of days, what can you do? Why would someone want to catch so many fish?

By preserving foods, you can harvest foods in season when they are most abundant and save them for later (like the winter). Ask students for examples.

a) **Freezing**: Freezing inhibits bacte-

ria growth.

b) **Canning**: High heat kills off bacteria.

c) **Smoking**: Today smoking fish is mostly done for flavor and is not a standalone preservation method. In order to fully preserve smoked salmon it must be canned or frozen.

Ask students which method was used by their Native people. Why were the other methods not viable?

6. Tell students that they are going to make **smoked salmon**. In small groups they will begin by making a brine out of water, salt, white sugar, and brown sugar. When students are finished they will combine their brine with the other groups in a large bowl.
7. After the brine is combined in the large bowl, have students line up to drop a strip of salmon (pre-cut) into the brine. The fish will marinate for 10 minutes, set a timer. If you are only going to complete Part I, take this 10 minutes to teach students the remainder of the smoking process: salmon will sit over night to form a **pellicle**, a tough shiny coating that seals in moisture. They will then be loaded into a smoker. Salmon will take about 6 hours and 3 pans of wood chips. The salmon strips must reach an **internal temperature of 160** in order to kill off all of the bacteria. Once the fish is done smoking, it can be vacuum packed and frozen or canned. If time allows show students pictures of traditional smoke houses in your community.

When the 10 minute timer goes off have students remove a piece of the brined salmon and place it in a tupperware to smoke off-site. If your school does not allow you to process the fish on school grounds or you do not have the time/resources, ask a parent volunteer to complete off-site. Reserve smoked salmon for the following cooking lesson.

Part 2

8. Have students remove salmon strips from the brine onto the smoker racks (spray racks with oil to reduce sticking). Put butcher paper or newspaper under the racks so the oil from the salmon does not stain your table. The salmon strips will sit overnight in your cool classroom to form a pellicle. If your classroom is kept warm, use a fan.
9. The next morning, have students load racks into the smoker and add wood chips to the smoke pan. Check on the smoker periodically throughout the day to replenish wood chips and check the internal temperature of the fish. To ensure even cooking, move racks around (top to bottom, etc.). Once fish have reached an internal temperature of 160 degrees, remove from smoker. If it does not reach an internal temperature of 160 degrees, finish off in an oven at 300 degrees. Allow smoked salmon to cool and reserve for cooking lesson.

Evaluation:

Students will write a recipe for smoked salmon by listing the ingredients at the top and writing out the directions using the words, “first, then, next, etc.”

Extension:

- a) Take a field trip to a commercial seafood processor if you have one in your community. Or ask a seafood processor to make a presentation about what they do.
- b) Teach salmon anatomy while gutting the fish. Check out these great lessons and resources:

[Salmonoids in the Classroom: Primary, Fisheries and Oceans Canada](#) Background information on salmon anatomy and, internal and external anatomy diagrams, and lesson plans on individual parts of the salmon. Pages 25-35.

[Salmonoids in the Classroom: Intermediate, Fisheries and Oceans Canada](#) Detailed lesson on a salmon dissection. Pages 69-81.

[The Salmon Box, US Forest Service, Cordova Ranger District](#) Background information on salmon anatomy and adaptations with lesson plan on a classroom dissection. Pages 9-18

[Alaska Department of Fish and Game: Salmon Dissection](#) with directions and pictures.

Think Quest Online Salmon Dissection: Online salmon dissection.

c) Integrate **cultural knowledge** and Tlingit language into this lesson:

Resources:

Smoked Salmon Brine Recipe

2 quarts water
1 cup salt
½ cup white sugar
½ cup brown sugar

For 4 groups

2 cups water
¼ cup salt
1 TB white sugar
1 TB brown sugar

Measure water. Add salt, sugar, and brown sugar. Mix until salt and sugars dissolve. Brine strips of salmon for 10 minutes.

Content Standards:

Cultural

- C) Culturally knowledgeable students are able to actively participate in various cultural environments.
- C.1. Students perform subsistence activities in ways that are appropriate to local cultural traditions.

Science

- A) A student should understand and be able to apply the processes and applications of scientific inquiry.
- A.3 Students develop an understanding that the culture, local knowledge, history and interaction

with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.

- G) A student should understand the history and nature of science.
- G.3. Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmations.

Geography

- B) A student should be able to utilize, analyze, and explain information about the human and physical features of places and regions.
- B.4. Students discuss how and why groups and individuals identify with places.
- E) A student should understand and be able to evaluate how humans and physical environments interact
- E.1. Students understand how resources have been developed and used.

History

- B) A student should understand historical themes through factual knowledge of time, places, ideas, institutions, cultures, people, and events.
- B.1.b Students should comprehend the forces of change and continuity that shape human history through the following persistent organizing themes: human communities and their relationships with climate, subsistence base, resources, geography, and technology

Cooking Lesson

Essential Question:

How can I prepare salmon?

Objectives:

- a) Students will be able to follow a recipe.
- b) Students will be able to prepare a salmon dish.
- c) Students will be able to list at least two health benefits of salmon.

Time:

55 minutes (with all materials prepped ahead of time).

Materials:

For salmon wrap:

- smoked salmon, cream cheese, yogurt, green onions, parsley, salt
- whole wheat tortilla, carrot strips, red pepper strips, spinach
- clean cooking surface (cutting board, parchment paper, large plate)
- sets of each: mixing bowls, mixing spoon, bowls for ingredients
- cutting board & sharp knife

- small tasting cup/napkin for each student

For cooking demonstration:

- 1" cubes of raw salmon, skin & bones removed (1-2 #s for a class of 20)
- Soy sauce, brown sugar, sesame oil, fresh garlic, fresh ginger, sesame seeds
- Hot plate, nonstick pan, tongs or spatula
- Mixing bowl, whisk, knife
- Optional: garlic press & grater for ginger

Content Standards:

While this lesson may not meet specific benchmarks, it was the most significant lesson in terms of getting students to try local seafood and veggies. As a culmination to the unit and through active participation, students feel compelled to try what they make—the start of a life-long habit to eat healthy and think critically about where their food comes

from. Extensions could stem from this lesson that focus on math, language arts, culture, geography, etc.

Notes:

This lesson write-up reflects what we have done in Sitka for the last three years. We invited local chef, Colette Nelson of [Ludvigs Bistro](#), to design a couple of recipes for third graders. Chef Colette did a demonstration on salmon wraps that students then assembled in small groups at their desks. She also did a cooking demonstration using raw fish, cooking show style. Recipes are included at the end of this lesson.

If a guest chef is not available, invite a parent or community volunteer. If neither option is available to you, have students participate in the full process by peeling carrots, slicing red peppers, etc. Adjust time accordingly.

Ingredients for the salmon wrap will need to be prepared in advance unless time permits for students to grate carrots and slice bell peppers. Salmon will need to marinate for cooking demonstration as well—recipe included below.

Teacher Background:

Wild Alaskan [salmon](#) is rich in nutrients: [Protein](#), [Vitamin D](#), and [Omega 3 Fatty Acids](#). USDA “[My Plate](#)” is a popular baseline for health and nutrition requirements.

Procedure:

1. Begin the lesson by asking students if they like to eat fish. Ask them to raise their hands if they think they eat fish at least once a month, once a week, twice a week. Tell them that the [USDA recommends](#) we eat seafood twice a week. Ask students if they’ve heard before that fish is good for them. Ask students if they know why. Make a list of their ideas. Go over each.

- [Protein](#): Building block of every cell in our body. Gives us energy and maintains our working, healthy bodies.
- [Vitamin D](#): Important for the absorption of calcium in bone growth.
- [Omega 3 Fatty Acids](#): Salmon has natural concentrations of omega 3s that help with:
 - Brain development, helps brain cells work more efficiently (head)
 - Facilitate learning (head)
 - Reduce risk of heart disease and cancers (heart)
 - Helps with [Concentration](#)/Behavior/Mood (happy)

In order to reinforce health benefits, have students repeat that salmon is good for your “head, heart, and makes you happy” while pointing to your head, heart, and smile.

Ask students to raise their hands if they have ever cooked seafood before. Tell them that today they are going to learn how to prepare salmon using simple recipes that they

can take home and make with their families.

2. Gather students around a large table for a demonstration on smoked salmon wraps. Point out that this recipe includes the colors of the rainbow and that eating a variety of colors provides our bodies with different nutrients.

Go over each ingredient by name. Mix up a batch of salmon spread for the class (recipe below), and show students how to assemble a salmon wrap. Students will begin by spreading the smoked salmon spread over their tortilla. Down the center, students will add a layer of carrot ribbons, red pepper strips, and spinach leaves. Show students how to roll up tortillas like a burrito and cut them into 1" slices.

3. After students have washed their hands, they will assemble a salmon wrap in small groups. Distribute the student roles below. When finished an adult helper will collect the wraps and cut them into 1" pieces to sample.

Each group will need: $\frac{1}{4}$ cup of smoked salmon spread, carrot ribbons, red pepper strips, spinach, 1 tortilla, and a clean cooking surface (parchment paper, cutting board, plate).

Student Roles:

Student A: spread salmon dip all over tortilla*

Student B: add carrot ribbons down the center*

Student C: add red pepper strips down the center*

Student D: add spinach leaves down the center*

Student E: Roll up tortilla

*Amounts will vary on the size of the tortilla

4. Once students have completed their salmon wraps, ask them to join you at the large table for a cooking show demonstration. Students will learn how to prepare raw salmon by following a recipe. Have student volunteers measure ingredients for a marinade and then cook already marinated salmon on a hot pan for students to sample. While fish are cooking, take the opportunity to review the nutritional benefits of fish.
5. Tell students that as a chef, you have to try everything you eat. Encourage students to try what they have prepared. Encourage positive reactions. Eat and enjoy!

Recipes:

Smoked Salmon Spread

Ingredients:

8 oz cream cheese
¾ cup Greek yogurt
¼ cup flaked smoked salmon
1 TB green onion
1 TB fresh lemon juice
1 TB fresh parsley
Salt & pepper

Mix together and use as a dip or spread.

Sesame Salmon Bites

Ingredients:

1 pound Alaskan coho, skinned, de-boned and cut into 1" cubes.

Marinade:

¼ cup soy sauce
¼ cup water
3 TB cup sesame oil
2 cloves fresh garlic, minced or pushed through a garlic press
1/2 inch of fresh ginger, minced or grated
2 teaspoons brown sugar
Sesame seeds for garnish

Mix all ingredients together in a bowl. Make sure there are no clumps of brown sugar. Add the salmon cubes and marinate in refrigerator for 10 min. Panfry on medium-high heat for a few minutes on each side. After flipping sprinkle sesame seeds for garnish.

Recipes courtesy of Chef Colette Nelson of [Ludvigs Bistro](#).

Credits:

Principal Author: Tracy Gagnon, Community Sustainability Organizer, Sitka Conservation Society

Design: Adam Andis, Nunatak Design

Illustrator: Bayla Laks

Lesson Development Team:

Stacey Wayne, Educational Consultant

Rebecca Himshoot, Science Specialist, Keet Gooshi Heen Elementary School

Chris Bryner, 3rd Grade Teacher, Keet Gooshi Heen Elementary School

Ann Walter, Keet Gooshi Heen Elementary Retired Teacher

Marian Allen, University of Alaska Southeast Professor and SCS Board Member

Jasmine Shaw, University of Alaska Fairbanks Extension Agent Assistant

Courtney Bobsin, Living with the Land Jesuit Volunteer, 2012-2013

Mary Wood, Living with the Land Jesuit Volunteer, 2013-2014

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Sitka Conservation Society

www.sitkawild.org

(907) 747-7509

PO Box 6533

Sitka, Alaska 99835