



SCIENCE

Salmon Homes

ESSENTIAL UNDERSTANDING

- History
- Lifeways

LEARNING OUTCOMES

By the end of the lesson, students will be able to:

- Explain the general stages of the life cycle of Pacific salmon species and the types of habitats necessary to sustain healthy salmon populations
- Describe the role of salmon in the food webs and ecosystems of the Pacific Northwest
- Describe the interrelationship between salmon and Indigenous people in Oregon

ESSENTIAL QUESTIONS

- Why are salmon important to the ecology of the Pacific Coast of North America and the humans who live there?
- In what ways can human activities help or harm the lives and health of salmon throughout their life cycle?

LOGISTICS

- Where does the activity take place?
Classroom (virtual/distance learning option available)
- How are the students organized?
 Whole class Teams: 3 – 4
 Pairs Individually

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Overview

In this lesson, students will examine the role of Pacific salmon in the ecology of the Pacific Northwest. Students will explore the life cycle of the Pacific salmon, the historic and contemporary importance of salmon to human life, and the impacts of humans on salmon populations and habitats, including efforts by the Confederated Tribes of Siletz Indians to restore healthy habitats for salmon. As part of the lesson, students will engage with written, visual, and audiovisual materials that define and illustrate key terms and concepts and work together in groups to expand their understanding of healthy salmon habitats. They will also have an opportunity to play a game, “Salmon Restoration Race,” to reinforce ideas and content introduced in the lesson.

Background for teachers

Salmon is the common name for several species of ray-finned fish in the family Salmonidae that are native to the rivers and streams flowing into both the North Atlantic and Pacific oceans. Salmon are typically—but not always—*anadromous*, which means they hatch in fresh water, migrate to the ocean, then return to fresh water to reproduce.



TIME REQUIRED**2 hours**

For millennia, the various species of salmon indigenous to the Pacific Northwest have served as a keystone species, a living organism that helps sustain an entire ecosystem. There are five species of Pacific salmon native to Oregon. Three—chinook/king, chum/dog, and coho/silver—are common. The other two, pink/humpback and sockeye/red, are seen less often, although kokanee, land-locked sockeye salmon, can be found in some Oregon lakes and rivers where natural or human-created barriers prevent them from migrating to the Pacific Ocean.

Pacific salmon have played an integral role in the nutritional, social, and spiritual lives of Indigenous people in Oregon since time immemorial. Native people consider salmon to be important relatives, and Tribal oral histories speak of salmon so numerous that a person could walk on their backs to cross a river or stream during runs. Many

STANDARDS**Oregon social science standards¹**

5.12 - Describe how technological developments, societal decisions, and personal practices affect sustainability in the United States. (*Geography*)

5.14 - Analyze the distinct way of knowing and living amongst the different American Indian tribes of North America prior to contact in the late 15th and 16th centuries, such as religion, language, and cultural practices and the subsequent impact of that contact. (*Historical Knowledge*)

Oregon science standards

5-ESS3-1 - Obtain and combine information about ways individual communities use science ideas to protect the earth's resources and environment. (*Earth and Human Activity*)

Oregon English language arts standards

RI.5.7 - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (*Reading Informational Text*)

¹ In 2018, the Oregon State Board of Education adopted grade-level social science standards for civics, geography, economics, financial literacy, history, historical thinking, and social science analysis. In February 2021, the board adopted new social science standards integrating ethnic studies into each of the social science domains and removed the co-identified multicultural standards. School districts may implement the 2021 social science standards beginning in March 2021. School districts are not required to implement the new standards until the 2026–27 school year. This lesson uses the 2021 version of the Oregon social science standards.

features of Native lifeways in the Pacific Northwest are rooted in, oriented around, or influenced by the salmon life cycle and ensuring a healthy fishery for generations to come. The predictable and prodigious runs of salmon provided a nutritional foundation that enabled Siletz peoples and many other Tribes in the Pacific Northwest to sustain large populations and develop sophisticated social and economic structures, trade networks, and forms of artistic expression. The past and continuing importance of salmon to the collective experience of Native peoples is reflected in the representation of salmon in the logo and emblem of the Confederated Tribes of Siletz, as well as several other federally recognized Tribes in Oregon.

Indigenous salmon harvest in western Oregon is guided by a set of cultural values that emphasize sustainability and responsibility. For example, Siletz peoples made use of fish weirs, dams, nets, spearing platforms, traps, and other technologies to maximize their salmon catches, and still employ some of these fishing techniques to this day. Some of these structures could be quite large, requiring whole families or villages to build, operate, and maintain. Nonetheless, these practices and technologies remained rooted in a value system that emphasized balance, sustainability, and avoiding waste. This allowed Siletz peoples to create thriving and resilient ecosystems that could support their own societies and other peoples living nearby. With fishing weirs, for example, villages downriver ensured that enough fish passed by

MATERIALS

- **PowerPoint presentation** (available in lesson materials; load the slides prior to the lesson to ensure they are displaying properly)
- **Classroom writing surface** (e.g., blackboard, whiteboard, chalkboard, chart paper and markers)
- **“Life Cycle of the Pacific Salmon”** video from the National Marine Sanctuary Foundation and Pacific Northwest College of Art Animated Arts (running time: 5:37; available from YouTube at <https://www.youtube.com/watch?v=2xG6waimZnl>)
- **“Bandon Marsh National Wildlife Refuge – Marsh Restoration”** video from the U.S. Fish & Wildlife Service (running time: 4:19; available on YouTube at <https://youtu.be/Dgyta4TDaEc>)
- **Guide to Placement of Wood, Boulders and Gravel for Habitat Restoration** from the Oregon Department of Forestry and Oregon Department of Fish & Wildlife (available in the resource files for this lesson as well as online at <https://www.oregon.gov/odf/Documents/workingforests/Wood-placement.pdf>)
- **Salmon Restoration “Snack Mat”** handout, one copy per group of 3–4 students. *Note: The document is sized for printing on 11x17 paper; you may need to adapt or scale down the document for printing if 11x17 paper is not available.*

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to sustain villages upriver and that enough adult salmon made it back to their spawning grounds to reproduce.

In the late 1700s, Europeans and later Euro-Americans began exploring and colonizing the Pacific Coast. They, too, saw the value of the salmon. Unlike the Native peoples, however, they brought a different understanding of the natural world that would decimate salmon runs to a fraction of the abundance maintained by Indigenous people in just a couple of centuries. Euro-Americans saw the land, waterways, and plant and animal populations in Oregon as natural resources rather than honored relatives—assets to be owned and controlled by individuals and developed to become more profitable. Euro-American entrepreneurs and companies established canneries to process salmon for consumption around the world, introducing industrial technologies and a profit-seeking mindset that led to overharvest even as other extractive industries, like early unregulated logging, decimated salmon habitats. As salmon populations plummeted during the 20th century, Siletz peoples suffered alongside their relatives, losing the ability to sustain their communities on the food that they had relied on for thousands of generations.

Recognizing the ecological and cultural value of salmon for human life in Oregon, the Confederated Tribes of Siletz Indians is collaborating with neighboring landowners, other Tribes, and local, state, and federal governments to restore the

MATERIALS *(Continued)*

- **Snacks for the Salmon Restoration “Snack Mat,”** enough for each student group to build a salmon habitat restoration model and enjoy some snacks while they play the Salmon Restoration Race in their group. Suggested snacks (substitute your own alternatives as preferred):
 - Logs - Pretzel sticks, baby carrots/other veggie sticks, cheese sticks
 - Boulders - Large marshmallows; rock-shaped candy; small, wrapped candy (such as Starburst, Mary Janes, Jolly Ranchers); grapes
 - Gravel - Small marshmallows; regular or mini chocolate chips; pebble-shaped candy; button-shaped candy (such as M&Ms or Skittles); raisins or dried cranberries
 - Salmon - Fish-shaped candy; fish-shaped crackers (such as Goldfish)
- **Salmon Restoration Race Game** handout, one copy per group of 3–4 students
- **Supplies for the Salmon Restoration Race Game** (see handout above for supply list)



water and land resources necessary to support healthy habitats for salmon throughout their lifecycle. By maintaining and advancing cultural teachings about responsible fish harvest and ecological stewardship the Tribe works toward a return of thriving populations of Pacific salmon for the benefit of current and future generations.

To prepare for this lesson, teachers should

1. Review all materials for the lesson.
2. Review the steps for the “Salmon Restoration Snack Mat” in Activity 4 and gather the required supplies (see “Materials”). You might consider asking or delegating one or more parent volunteers to bring (or organize other parents to contribute) the suggested snacks for the snack mats. Be sure to follow (and/or ask parent volunteers to follow) any school or district guidelines concerning food allergies, healthy versus unhealthy snacks (e.g., candy), and/or policies regarding pre-packaged versus homemade foods. To increase food safety and reduce food waste, consider using packaged snacks where possible so that students can use the snacks as props in building model salmon habitats and safely eat them after the activity.
3. Review the steps for the “Salmon Restoration Race Game” in Activity 4 and the information on instructions and supplies provided in the game handout and the “Materials” section. It may take a while to explain the rules of

VOCABULARY

- **Alevins** – Newly spawned salmon still carrying the yolks from the eggs they hatched from.
- **Anadromous** – Characteristic of some fish species (including salmon) in which juveniles are raised in fresh water, migrate to salt water, and then return to fresh water as adults to reproduce.
- **Estuary** – A body of water where fresh water and salt water meet.
- **First food** – Traditionally harvested foods that provide sustenance and promote health.
- **Fry** – Young salmon that are capable of feeding themselves.
- **Habitat** – The natural home or environment of an animal, plant, or other organism.
- **Life cycle** – The series of changes in the life of an organism, including reproduction.
- **Keystone species** – An organism that is critical to the survival of other species. Without its keystone species, an ecosystem can change dramatically or even collapse.
- **Redd** – The spawning bed of a salmon in a river or stream.
- **Smoltification** – A process in which young salmon adapt from living in fresh water to living in salt water.
- **Smolts** – Young salmon that have undergone smoltification in preparation for migration to the ocean.
- **Spawning** – Salmon reproductive activity in which female salmon release eggs and males fertilize them with milt (sperm).
- **Zooplankton** – Microscopic animal organisms that provide a food source for larger animals, including young salmon.

the game to students and prep the game cards, which will involve quite a bit of cutting with scissors. Consider prepping the game for students ahead of time by cutting out the game cards yourself or recruiting one or more student or parent volunteers to assist. Alternatively, you might choose to have your students cut the game cards and learn and practice the rules of the game in one class session and then play the actual game in a subsequent class session.

4. Decide if and how you will assess students' individual or group performance in lesson activities (see "Assessment" in the "Considerations for teachers" section).
5. Ensure students have access to all materials (printed and/or electronic) needed to participate in this lesson.
6. Prepare classroom audiovisual technology to display the PowerPoint slides and audiovisual materials to be reviewed together with students in class.
7. Write the lesson objectives and key vocabulary on a classroom writing surface.

ADAPTIONS FOR DISTANCE LEARNING



The lesson is primarily structured around pair-shares and group work, but much of it can be adapted for distance or independent learning. A suggested sequence follows. Be sure all students have either print or electronic access to the materials described.

1. Hold a class meeting online. Using the PowerPoint slides and the steps in Activity 1 ("Warm-up"), have students brainstorm and discuss (verbally or in a chat box, whiteboard, or online document) responses to the provided prompts. Alternatively, you can post the prompts in your school's online classroom platform or an online document and have students respond to them asynchronously.
2. Using a web-conferencing or online meeting platform, the PowerPoint slides, and the steps and talking points in Activity 2 ("Healthy homes for healthy salmon") and Activity 3 ("Salmon and humans in the Pacific Northwest"), provide a virtual lecture and class discussion on Pacific salmon, their life cycle, and the history of human interactions with salmon in Oregon and the Pacific Northwest.
3. Invite students to prepare, play and discuss the Salmon Restoration Race game described in Activity 4 ("Salmon restoration race game") at home with their families or friends.
4. Convene a final online class meeting to review and reflect on the lesson together (see steps in Activity 5, "Reflection") and answer any remaining questions.

References

Lapensée, E. (2016). Indigenous board game design in the gift of food.

Analog Game Studies, 9(2). <https://analoggamestudies.org/2016/03/indigenous-board-game-design-in-the-gift-of-food/>

Oregon Department of Fish and Wildlife. (n.d.). Salmon. <https://myodfw.com/fishing/species/salmon>

Resources

- Confederated Tribes of Siletz Indians website: <https://www.ctsi.nsn.us/>
- Siletz Tribal History/Shared History Lessons for Sixth Grade
 - Siletz Today: Caring for Our Lands
 - Siletz Today: Otter Worlds

Considerations for teachers

Assessment

Many activities in this lesson are built around student discussions in pairs or trios, in small groups, and with the whole class. Teachers can assess student learning by monitoring participation and engagement in these discussions.

Practices

1. *Classroom discussion* – Large-group, whole-class discussion allows students to express their thoughts and hear the thoughts of others. For the instructor, this practice is a good way to take the pulse of the group and see what general themes emerge.
2. *Small-group activities/discussions* – Small-group activities allow students to share and analyze ideas with one, two, or three other people. This

practice can be good for students who do not feel comfortable sharing their ideas with the whole class. The teacher should monitor group discussions to determine the degree to which students understand the concepts.

3. *Gallery walk* – A classroom discussion technique that allows students to actively engage with content and each other. Students work together in small groups to share ideas and respond to meaningful questions, documents, images, problem-solving situations, or texts. Later, they display their brainstorm and work on a computer or tablet screen, a group poster, a co-written paragraph, or a collage. They and their classmates then walk around to review what other groups produced, perhaps providing feedback, praising each other, or both. Alternatively, if classroom space is limited or some students cannot participate in a walking activity, student groups could prepare their poster or artifact as described above and then move the artifacts between tables with an “ambassador” from each group following along to explain the artifact, collect feedback, and answer questions.

Learning targets

- I can explain the general stages of the life cycle of Pacific salmon species and the types of habitats necessary to sustain healthy salmon populations.
- I can describe the role of salmon in the food webs and ecosystems of the Pacific Northwest.
- I can describe the interrelationship between salmon and Indigenous people in Oregon.

Options/extensions

Help or invite students to research the issue of and proposals related to removal of dams on the Columbia, Snake, and other major Oregon rivers to restore habitats and migration routes for Pacific salmon and other fish species. You could have students use the information gathered to hold a mock debate or town hall meeting where students prepare, defend, and debate the pros and cons of dam removal.

Appendix

Materials included in the electronic folder that support this lesson are:

- Salmon Homes_Slides.pptx
- Materials_Guide to Placement of Wood Boulders and Gravel for Habitat Restoration.pdf
- Materials_Salmon Restoration Snack Mat.pdf
- Materials_Salmon Restoration Race Game.pdf

Activity 1

Warm-up

Time: 10 minutes

Students will activate their prior knowledge of ecological concepts and terminology through a thought experiment in which they consider what makes a healthy home for a plant or animal.

Step 1

Review the objectives and key vocabulary for the lesson with students.

Step 2

Write the word “home” on the classroom writing surface.

Step 3

Ask students to work in pairs to discuss what comes to their minds when they see and hear the word “home” and what the word means to them.

Step 4

Ask students to connect their sense of home with what a plant or animal might need in a home and how those needs might change as the plant or animal grows.

Step 5

After a few minutes, invite students to share what they discussed with their partners and record a few responses on the classroom writing surface.

Activity 1 *(Continued)*

Step 6

Prompt students to deepen their understanding of how healthy habitats help plants and animals survive and thrive using the following examples of what an ideal home for a plant or animal might look like:

- Access to essential life-giving substances (e.g., carbon dioxide, sunlight, soil nutrients for plants; oxygen and food for animals)
- Desirable environmental conditions (e.g., temperature, salinity)
- Protection from predators
- A safe place for new plants and animals to establish themselves and grow

Step 7

Take any questions from students before moving on.

Activity 2

Healthy homes for healthy salmon

Time: 20 minutes

Students learn (or review) essential facts about Pacific salmon, their life cycles, and the importance of healthy habitats that help them survive and thrive.

Step 1

Help students connect with their understanding of salmon and their life cycles.

Say:

Let's learn about [or review] the science of salmon. Talk with a neighbor. What do you already know or what do you remember about the life of salmon?

Step 2

Give students a few minutes to share what they know or remember, then display slide 2 ("Salmon essential facts") and review with students.

Say:

Salmon is the common name for several species of ray-finned fish in the family Salmonidae that are native to the rivers and streams flowing into both the North Atlantic and Pacific oceans. Salmon are typically—but not always—anadromous, which means they hatch in fresh water, migrate to the ocean, then return to fresh water to reproduce. That means they depend on many different habitats—or "homes"—throughout their lives. Salmon are often called a keystone species, a living organism that helps sustain an entire ecosystem. Without its keystone species, an ecosystem would be very different or even disappear, as no other species can fill the missing niche. That is, without salmon, many other animals can't find the nutrition that they need to be healthy and thrive in their homes.

Activity 2 (Continued)

Step 3

Display slide 3 (“Salmon in Oregon”) and review with students.

Say:

There are five species of Pacific salmon native to Oregon. Three—chinook (or king), chum (or dog), and coho (or silver)—are common. The other two, pink (or humpback) and sockeye (or red), are seen less often, although kokanee, land-locked sockeye salmon, can be found in some Oregon lakes and rivers where natural or human-created barriers prevent them from migrating to the Pacific Ocean. Many Native languages in western Oregon have distinct names for all of the fish runs. For example, Athabaskan-speaking peoples from southern Oregon/northern California call the spring run of Chinook dan'-dee-ni and the fall run dan'-xvt luu-k'e. [Note: Pronunciation included in slide deck]

Step 4

Prepare students to watch the video on the Pacific salmon life cycle.

Say:

Just like us, salmon go through several stages of development and experience changes to their bodies as they grow into adults. Let's learn the basics of the salmon life cycle and the places where they live as they grow and develop.

Step 5

Display slide 4 (“Salmon life cycle”) video from the National Marine Sanctuary Foundation and Pacific Northwest College of Art Animated Arts (click image on slide 4 or use the link provided in the “Materials” section).

Activity 2 *(Continued)*

Step 6

After the video ends, review key ideas and vocabulary from the video, including:

- The growth and reproduction stages of salmon
 - Redd
 - Alevins
 - Fry
 - Smolts
 - Smoltification
 - Spawning
- Threats to salmon growth and reproduction throughout their life cycle
 - Rising water temperatures
 - Predators (including birds, humans, porpoises, sharks, and seals)
 - Dams
- How salmon contribute to the health and stability of ecosystems throughout their life cycle
 - Providing a source of food for predators, people, and decomposers such as insects and microorganisms (after salmon die)
 - Providing nutrients that fertilize streams and soils when animals that eat salmon leave droppings and when salmon decompose after they die

Step 7

Display slide 5 (“Healthy salmon habitat”) and give students a few moments to study it.

Activity 2 *(Continued)*

Step 7

Display slide 5 (“Healthy salmon habitat”) and give students a few moments to study it.

Step 8

Invite students to work in pairs to jot down some notes about what they see on the slide that might contribute to a healthy habitat for salmon.

Step 9

Display slide 6 (“Unhealthy salmon habitat”) and give student pairs a few more moments to study the slide and jot down some notes on what they see that might contribute to an unhealthy habitat for salmon.

Step 10

Facilitate a large-group discussion with students, inviting volunteer pairs to share what they identified as features of healthy and unhealthy salmon habitats. Confirm their contributions and fill in any gaps by highlighting the following if they do not appear on the students’ lists.

- **Gravel beds** provide important spawning areas for salmon as well as insects and other types of food that young fish eat. In contrast, sediment can smother salmon eggs and insects and plants, increase water temperatures, and clog fish gills.
- **Fallen trees** create pools that protect young salmon from predators, provide rest stops for migrating salmon, and support populations of insects that salmon like to eat.
- A **non-channelized flow** of a river or stream is made up of curves and pools of varying currents that create multiple resting, hiding, and spawning spots for salmon. A **channelized flow** of a river or stream, by contrast,

Activity 2 *(Continued)*

has been straightened to create more straight stretches with stronger currents, meaning that there are fewer places for salmon to rest, hide, find food, and spawn.

- **Native vegetation** shades rivers and streams, keeping water temperatures cool (which salmon prefer), provides hiding spots for young salmon, and hosts insects that salmon like to eat. **Non-native vegetation** and/or **lack of vegetation** can cause water temperatures to rise (which kills fish) and provides limited or no places for salmon to find food or hiding and resting spots.

Step 11

Answer any questions from students before moving on.

Activity 3

Salmon and humans in the Pacific Northwest

Time: 35 minutes

Students learn (or review) essential facts about the importance of salmon to human life in the Pacific Northwest.

Step 1

Connect students' experiences with fishing (or eating fish) to their understanding of the social benefits they may derive from it using the following prompts or others you think of.

- How many of you have ever been fishing?
- Do you go often?
- Do you usually fish in the ocean, lakes, or rivers?
- What kinds of fish do you try to catch?
- Who do you go fishing with?
- What types of feelings do you experience when you are out fishing with family and friends?
- If you do not have experience fishing, does your family eat fish? What kind of fish? Does your family eat fish on a special occasion?

Step 2

Give students time to answer and share their experiences and thoughts. Students who fish (or eat fish) with their families may describe how it's a special time, how it can be exciting to catch a fish, or how they enjoy being part of their family and/or Tribal tradition of fishing.

Activity 3 (Continued)

Step 3

Display slide 7 (“Salmon and humans (Part 1)”) and discuss the images with students. First invite them to interpret what the images represent, and then share the following discussion points to confirm and deepen their understanding.

Say:

Pacific salmon have been important to humans who live in the Pacific Northwest for thousands of years. Indigenous people in Oregon call salmon a “first food,” one of the traditional sources of nutrition that have sustained Native societies since time immemorial, but salmon are seen as more than just a food source. Many Siletz peoples understand salmon to be their relatives and have passed down important knowledge about the best way to ensure that salmon are treated with respect. This includes teachings about how to not waste fish, when to fish, how much to harvest, and the negative consequences of ignoring these teachings.

For example, many Siletz peoples from western Oregon fished with weirs—fences built across a river that channel fish to one opening as they run—making it easier to catch them. Some of these structures could be quite large, requiring whole families or villages to build, operate, and maintain. Nonetheless, these practices and technologies remained rooted in a value system that emphasized balance, sustainability, and avoiding waste. The people building weirs knew that they had a responsibility not just to catch fish but also to let enough fish pass through to feed villages upriver and to be sure that enough fish would survive the journey to spawn.

This way of thinking about salmon helped ensure healthy salmon runs for thousands of years. Many oral histories talk about a time when the salmon runs were so plentiful that people could walk across rivers on the backs of the fish. By creating and sustaining this relationship with fish, Tribal people in the Pacific Northwest

Activity 3 (Continued)

were able to thrive and prosper. The past and continuing importance of salmon to the Native peoples of Oregon is reflected in the representation of salmon in the logos or emblems of several of the nine federally recognized Tribes in the state, including the Confederated Tribes of Siletz Indians.

Step 4

Display slide 8 (“Salmon and humans (Part 2)”) and discuss the images with students. First invite them to interpret what the images represent, and then share the following discussion points to confirm and deepen their understanding.

Say:

In the late 1700s, explorers, fur traders, and settlers began coming to the Pacific Coast. Like the Native peoples, they also saw the value of salmon. However, settlers brought a different understanding of the natural world that ultimately caused harmful impacts to salmon and the Native peoples who depended on them. Settlers came from a society that saw the land, waterways, plants, and animals as “natural resources”—assets to be owned and controlled by individuals and “developed” to become more “productive.” Settlers pushed Native people away from their homes and made it illegal for Indigenous people to fish in the ways that they had for generations. Settlers established canneries to process salmon to be eaten around the world, introducing industrial technologies and a profit-seeking mindset to the salmon fishing that led to overharvest. Other industries decimated the habitats that salmon rely on to spawn and grow by polluting the water, straightening river and stream channels, damming rivers, and removing plants along the riverbank. In just a couple of generations, settlers managed to all but destroy one of the most productive fisheries the world has ever known.

Activity 3 *(Continued)*

Step 5

Display slide 9 (“Salmon and humans (Part 3)”) and discuss with students. Ask if they have any questions or need any of the terms on the slide explained, as well as if they can identify any additional threats to salmon habitat that are not already listed.

Step 6

Select a few of the threats from the list and, using the classroom writing surface, ask students to think about and share aloud examples of how they might cause harm or difficulty for salmon at different stages of their life cycle. Some examples include:

- **Diking and damming:** Prevent fry and smolts from migrating to the ocean and adults from migrating back to spawning grounds.
- **Pollution:** Can kill young and adult salmon, stunt their growth, or prevent them from reproducing healthy new salmon.
- **Invasive species:** Non-native plants can destabilize soil, block light, or reduce water oxygen levels. Non-native animals can spread disease, eat young and adult salmon, or outcompete them for food.
- **Logging:** Destabilizes and erodes soil, causing sedimentation that can bury salmon spawning beds and eggs, increase water temperature, and reduce plant growth.

Step 7

Review the brainstormed list with students. Invite students to discuss with a neighbor how humans could help remove or reduce the threats to salmon. Ask them to share their ideas and add them to the brainstormed list on the classroom writing surface.

Activity 3 *(Continued)*

Step 8

Organize students into groups of three to four using the sorting method of your choice. Have each group select a human-caused threat to salmon from slide 9. Invite them to brainstorm examples of how their chosen threat might cause harm or difficulty for salmon at different stages of their life cycle and to record their ideas on a classroom writing surface, a piece of poster paper, or a personal electronic device. Also invite them to brainstorm and/or research online (if they have access to electronic devices and internet) how humans could help remove or reduce the threat. After sufficient time has passed for students to discuss and record their ideas and findings, invite groups to report out what they discussed and produced. Alternatively, if time permits, have students do a gallery walk, with students moving around the room to review the work of other groups and provide constructive feedback.

Step 9

Display slide 10 (“Humans helping salmon”) and discuss with students. The slide illustrates a few ways in which humans are working to help salmon: removing barriers to salmon migration or providing salmon ways to get around them; raising baby salmon in protected hatcheries to give them a promising start in life; restoring salmon habitats; and preventing and/or cleaning up pollution. Note that the Confederated Tribes of Siletz Indians is leading or contributing to these activities and other strategies to provide healthier homes for salmon and increase their chances for survival throughout their life cycles.

Activity 3 *(Continued)*

Step 10

Display slide 11 (“Salmon habitat restoration activities”). Give students a few moments to study the slide and jot down some notes on what they see on the screen.

Step 11

Facilitate a large-group discussion with students about the activities portrayed on slide 11. Below are suggested talking points; feel free to adapt them or add your own.

- **Removing barriers** refers to demolishing, removing, adjusting, or improving water-control infrastructure that hinders or prevents salmon (and other fish) from moving up or down stream. Barriers include large structures such as dams and smaller structures such as culverts under roadways. For example, many dams have fish ladders that help fish swim up and over or around dams. Ask students if they have ever seen a fish ladder, such as the one at Bonneville Dam.
- **Adding (or removing) soil** can reshape a stream or river channel to improve fish passage and/or restore the waterway to its original (or at least a more natural) shape and flow. Adding soil might add more curves to a channelized river or stream, slowing down the current and creating pools and places where salmon can rest, find food, and spawn. Removing soil might remove fill dirt to restore a flood plain, get rid of polluted soil, or restore a stream or river to its original or a more natural shape.
- **Adding logs** creates pools that protect young salmon from predators, provide rest stops for migrating salmon, and support populations of insects that salmon like to eat.

Activity 3 (Continued)

- **Adding rocks (boulders and gravel)** improves salmon habitat by slowing the stream or river flow to provide rest stops for salmon (boulders) and provide them with nesting material for building their redds for spawning (gravel). Boulders may also be used to anchor logs in place to redirect water flow and/or provide larger eddies and pools where salmon can rest or hide.
- **Adding (or removing) plants** refers to adding grasses, bushes, and trees to provide shade to rivers and streams to keep water temperatures cool, provide hidings spots for young salmon, and host insects for salmon to eat. It may include first removing excessive and/or non-native vegetation to make room for the planting or re-growth of native plant species.

Step 12

Open and display the document “Guide to Placement of Wood, Boulders and Gravel for Habitat Restoration” from the Oregon Department of Forestry and Oregon Department of Fish & Wildlife (see “Materials”) and page through it with students. Pause to let students see, take in, and discuss with an elbow partner the diagrams in the document that illustrate recommended or required ways to add logs, boulders, and gravel to streams and rivers to get the best results from salmon habitat restoration projects.

Step 13

Display slide 12 (“Restoration example”) and share the following key points.

Say:

Recognizing the ecological and cultural value of salmon for human life in Oregon, the Confederated Tribes of Siletz Indians and others are collaborating to restore water and land resources to support healthy habitats for salmon throughout their life cycle. Tribal people are guided by their understanding about the best way to care for fish that have been passed down for thousands of years. But Tribal

Activity 3 (Continued)

people also recognize that today they can't repair salmon habitat alone. The Tribe undertakes its own salmon habitat conservation and restoration activities and partners with other Tribes, public and private organizations, and landowners to restore thriving populations of Pacific salmon and a robust and resilient ecology in the Pacific Northwest for the benefit of current and future generations.

Restoring salmon habitat can be hard work! It means undoing decades of harmful modifications to rivers and streams. Making rivers better homes for salmon again often requires using large construction equipment. Check out this video showing some of the work that the Confederated Tribes of Siletz Indians has been doing in the Coquille River estuary.

Step 14

Play the "Bandon Marsh National Wildlife Refuge – Marsh Restoration" video from the U.S. Fish & Wildlife Service on YouTube (click image on slide 12 or use link provided in the "Materials" section).

Step 15

Answer any questions from students about the video, then provide a few summarizing remarks for this activity.

Say:

Salmon are a culturally important food for the Confederated Tribes of Siletz Indians and other Tribes in Oregon. Working to protect salmon is part of the Tribe's commitment to preserving the balance between human and animal life. The salmon helped the Siletz people survive and thrive for thousands of years, and now the Tribe is working to help the salmon survive and thrive.

Activity 4

Salmon restoration race game

Time: 45 minutes each

Students play an engaging card game to reinforce concepts and vocabulary explored in the lesson.

Step 1

Organize students into groups of three to four using a sorting method of your choice. Have them regroup around one or more tables or desks so they have good-sized group workspaces.

Step 2

Distribute to each student group the handouts and supplies needed for the “Salmon Restoration Snack Mat” and “Salmon Restoration Race Game” activities (see “Materials”). See notes in the “Lesson preparation” section about selecting snacks based on student food allergies, preferences for sugary versus healthy snacks, and school or district guidelines regarding bringing outside food into classrooms.

Step 3

Invite student groups to use the snack mat handout and snacks to build a model of a salmon habitat. They should discuss and decide among themselves where to place snacks that represent logs (e.g., pretzel sticks, baby carrots, cheese sticks), snacks that represent boulders and gravel (e.g., large marshmallows, raisins), etc. Be sure groups have enough snacks so that they can eat some while using others as props in building their model salmon habitats.

Activity 4 (Continued)

Step 4

If time permits, ask each group to share with the class a few notes about how they chose to construct their habitat restoration models. Invite students to continue eating the provided snacks while they get ready to prep and play the Salmon Restoration Race game together.

Step 5

Review instructions for the Salmon Restoration Race game with students. See notes in the “Lesson preparation” section about the time required to prep the game cards ahead of time (it involves a lot of cutting of paper with scissors) and teaching students the rules of the game. Based on the time available, come to agreement with students about the amount of time they have to play the game, the number of rounds they can play, if and how points will be scored and recorded within and among groups, and any modifications the groups wish to make to the gameplay and scoring.

Step 6

Invite the student groups to play the game. Circulate among them to answer any questions, make sure they are playing the game, and ensure all students are participating.

Step 7

Save a few minutes to debrief the game with students, discussing how games can simulate or illustrate scientific concepts and model real-life applications. Invite students to provide feedback on the design of the game, comparing it to other games they have played, identifying variations they would like to try, improvements that need to be made, and new and different games they could create based on it.

Activity 4 *(Continued)*

Step 8

Answer any questions from students before moving on.

Activity 5

Reflection

Time: 45 minutes each

Students reflect on what they learned in the lesson.

Step 1

Restate or point to the learning targets for the lesson and review with students. Ask if they have any questions about what they learned.

Step 2

Ask students to share with their groups what in the lesson stood out or surprised them most. Ask for volunteers to share their responses with the whole group.