

SCIENCE

Salmon and the River

ESSENTIAL UNDERSTANDINGS

- Since Time Immemorial
- History
- Lifeways

LEARNING OUTCOMES

- Students can show understanding of why salmon are essential to the traditional lifeways of Native Americans in Oregon.
- Students can identify the life cycle of salmon in the Pacific Northwest and the impact dams have on this life cycle.
- Students can identify important contributions that tribes are making to salmon restoration efforts in Oregon.

ESSENTIAL QUESTIONS

- Why are salmon important to Native American tribes in Oregon?
- How have hydroelectric dams and their use of natural resources (i.e., water) affected the environment (i.e., salmon)?
- What are some tribes doing to help restore salmon habitat?

[Continued on next page](#)

Overview

Native American tribes in Oregon have relied on salmon for thousands of years. Salmon is considered a first food—a food resource that Indigenous people have depended on since time immemorial. This lesson includes four activities to support student learning about this traditional resource. In the first activity students will learn why salmon are essential to the traditional lifeways of Native Americans in Oregon. In the second activity students will evaluate the life cycle of salmon, specifically the importance of salmon returning to their home stream to spawn. In the third activity students will examine the impact of dams on the life cycle of salmon. Finally, students will work in small groups to identify strategies being used to restore the salmon population in Oregon.

Background for teachers

National Park Service: Salmon Life Cycle
<https://www.nps.gov/olymp/learn/nature/the-salmon-on-life-cycle.htm>

Oregon Department of Fish and Wildlife: Oregon Salmon
<https://www.dfw.state.or.us/species/fish/index.asp#Salmon>

Northwest Power and Conservation Council: Indian Fishing
<https://www.nwcouncil.org/reports/columbia-river-history/indianfishing>

Columbia River Inter-Tribal Fish Commission: Tribal Salmon Culture
<https://www.critfc.org/salmon-culture/tribal-salmon-culture/>



LOGISTICS

- Where does the activity take place?
Classroom
- How are the students organized?
 - Whole class Teams: 2 – 4
 - Pairs Individually

TIME REQUIRED

Three to four hours of class time

Background for teachers (continued)

Indian Country Today news story <https://newsmaven.io/indiancountrytoday/archive/eat-insanely-fresh-native-salmon-four-tribes-open-fishery-on-columbia-river-D8H4NW1sIUykN1Y1wrGp3g/>

Warm Springs Fishery <https://warmsprings-nsn.gov/program/fisheries-department/>

Oregon Public Broadcasting: First Salmon Ceremony <https://www.pbs.org/video/oregon-field-guide-first-salmon-ceremony/>

Oregon Public Broadcasting: Tribal Fishing Tradition Runs Deep <https://www.opb.org/news/article/at-lyle-falls-tribal-fishermen-carry-on-a-longstanding-tradition/>

STANDARDS

Oregon Science Standards

4-ESS3-1 – Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

4-ESS3-2 – Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Oregon English Language Arts Standards

4.RI.2 – Determine the main idea of a text and explain how it is supported by key details; summarize the text.

4.RI.7 – Interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears.

4.W.2 – Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

4.SL.1 – Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

4.SL.5 – Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.



Considerations for teachers

Assessment

Students should be assessed both formatively and summatively. The formative assessment will be teacher observation of student participation in small-group and class discussion and critical analyses. The summative assessment will be student written responses to summative questions about their learning.

Practices

- PowerPoint: You will need a projector to support instruction on salmon and Native American tribes in Oregon.
- The teacher must have knowledge of the life cycle of salmon and the types of salmon in the Pacific Northwest.
- The teacher must have knowledge of the natural environment of Oregon.
- The teacher must be prepared to activate engagement strategies, such as think-pair-share and group discussion.
- The teacher must be prepared to manage small-group work. Students will work in groups of four or five to complete a center activity. As the instructor, you can determine whether to preassign groups or allow self-selection.

MATERIALS

What materials are needed for students to engage in this activity?

- Salmon People Slide Deck
- SalmonandNativeAmericanTribesinOregon (one copy per student)
- Worksheet:SalmonandNativeAmericanTribes in Oregon (one copy per student)
- PacificSalmon Life Cycle Hexaflexagon (one copy per student)
- Salmon Restoration: Three Column Chart (one copy per student)
- Wy*Kan*Ush*PumSalmonActivityBookavailable at: https://www.critfc.org/wp-content/uploads/2012/11/activity_book.pdf(one copy per student)

VOCABULARY

Dam – A barrier constructed to hold back water and raise its level, forming a reservoir used to generate electricity or as a water supply.

Habitat – The natural home or environment of an animal, plant, or other organism.

Hydroelectric – Relating to the generation of electricity using flowing water (typically from a reservoir held behind a dam or other barrier) to drive a turbine that powers a generator.

Life cycle – The series of changes in the life of an organism, including reproduction.

Restoration – The act of returning something to a former owner, place, or condition.



Learning targets

- I can understand why salmon are essential to the traditional lifeways of Native Americans in Oregon.
- I can identify the life cycle of salmon in the Pacific Northwest.
- I can discuss the impact of dams on the life cycle of salmon.
- I can identify important contributions that tribes are making to salmon restoration efforts in Oregon.

Options/extensions

- Activity 1: The Cultural Importance of Salmon can be supplemented with watching the following video:
 - PBS: Oregon Field Guide: First Salmon Ceremony (6:02 minutes) - <https://www.pbs.org/video/oregon-field-guide-first-salmon-ceremony/>
 - After watching the video, complete the open mind diagram and reflection questions.
- Activity 1: The Cultural Importance of Salmon *can also* be supplemented with:
 - Sea Lions vs. Salmon (from the Oregon Science Teachers Association) <https://www.oregonscience.org/Oregon-Phenomena#EastMetro>
- Activity 2: The Salmon Life Cycle can be supplemented with the Pacific Salmon Life Cycle Hexaflexagon.
- Activity 3: The Impact of Dams on Salmon can be supplemented with the following videos on dams and fish ladders:
 - Columbia Snake River Fish Passage: https://youtu.be/m21CpGu_hPc (8:23 minutes)
 - ScienceMan Digital Lesson – Biology – Fish Ladders <https://youtu.be/sabk7Khq0kQ> (2:24 minutes)
- Activity 4: Tribal Salmon Restoration Efforts can be supplemented with the following videos on tribal restoration processes and partnerships:
 - Columbia River Inter-Tribal Fish Commission <https://youtu.be/LXmRsu-lzXo> (5:12 minutes)
 - Jesse Beers, Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians <https://youtu.be/gSwWEdlhiBg> (3:15 minutes)
 - Stearns Dam Removal, Crooked River, Prineville, Oregon: 100-year history and removal <https://youtu.be/wfYOml2-hzM> (17:58 minutes)



Reflection/closure

Review learning targets and discuss with students what they believe they have learned. Use an exit ticket to assess student responses to the following essential questions:

- Why are salmon important to Native American tribes in Oregon?
- How have hydroelectric dams and their use of natural resources (i.e., water) affected the environment (i.e., salmon)?
- What are some tribes doing to restore salmon habitat?

Activity 1

The Cultural Importance of Salmon

Time: 45 minutes

Say:

Today we're going to learn about the significance of salmon to the lifeways and traditions of Native Americans in Oregon. The relationship of the tribes to salmon goes back thousands of years. I'd like to hear about any experiences you might have with salmon or with fishing. First, we are going to watch this video titled, "Tribal Fishing Tradition Runs Deep" (<https://www.opb.org/news/article/at-lyle-falls-tribal-fishermen-carry-on-a-longstanding-tradition/>).

Step 1:

To connect students' observations of the video and experiences with fishing (or eating fish) to their understanding of the social benefits they may derive from it, consider asking the following questions:

- How many of you have ever been fishing?
- How does the kind of fishing you do differ or look the same as the fishing in the video?
- 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?

Activity 1 (Continued)

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 tradition of fishing. There are many families in Oregon for whom fishing is a way of life. If you have students for whom that is true, build on that experience by connecting it to the importance of fishing in many tribal cultures in Oregon. For many tribes, salmon are not only a food source, but also a part of the social, cultural, and spiritual fabric of their lives.

Step 3:

Pass out the Salmon and Native American Tribes in Oregon handout and prepare students for the reading.

Say:

*We're going to read about salmon and the Native American tribes in Oregon. When we're finished, we'll focus on the main details of what we read. I'll give you a worksheet you can use to take notes about important ideas. Pay attention to the **bolded** words in each paragraph. If you have questions about what we read, don't hesitate to ask.*

Step 4:

Read through the handout in whatever manner works best for the reading levels of your students. You may choose to have students read to each other in pairs or small groups, ask volunteers to read out loud to the whole class, or read the text aloud yourself.

Step 5:

After students read, pass out the Salmon and Native American Tribes in Oregon worksheet. Have students work in groups to reread the text and take notes about key details related to each of the five main ideas. Encourage students to cite facts from the text, but also allow them to make inferences.

Activity 1 (Continued)

Step 6:

Monitor students as they work to ensure they are understanding what they read. If students do not infer some of the following ideas, be sure to point them out explicitly:

- As part of their life cycle, salmon return to certain Oregon rivers at specific times every year.
- All Native American tribes in Oregon have some connection to salmon.
- Salmon are important to tribes not only as a food but also for social, cultural, and spiritual reasons, including tribal beliefs about creation.
- Tribes have always practiced a form of resource management by allowing enough fish to pass to keep the life cycle going.
- Salmon were at the center of a vast trade network of Native people throughout the Pacific Northwest and contributed to tribal wealth.
- Many tribes in Oregon and across the Pacific Northwest depended on salmon for their livelihood.

Step 7:

After students complete the worksheet, project the Salmon People Slide Deck and review with students.

Slides	Directions
1	<p>Say:</p> <p><i>This slide deck offers quotes and other information about the importance of salmon to Native Americans in Oregon. All tribes in Oregon have some connection to salmon.</i></p>
2	<p>Ask:</p> <p>Which tribes have a reference to salmon fishing in their tribal seal (logo)? Which ones do not? (see slide notes for answers)</p>



Activity 1 (Continued)

Slides	Directions
3 – 16	<p>As time allows, read the quote or passage on each slide. Ask students what they think it means or what it represents about the cultural importance of salmon to the tribes. Discuss with students what meaning is conveyed by the thoughts of the tribe or tribal member that is represented. Examples include:</p> <ul style="list-style-type: none">• Tribes are working hard to restore salmon runs in their ancestral lands.• Tribes are fighting to regain access to their fishing grounds.• Tribes are fighting to regain access to their fishing grounds.• Some tribal members still work as professional fishers.• The salmon is an important part of life for food, religion, and culture. <p>If time does not permit your class to reflect on all the quotes, select quotes from tribes that are nearest to where you live.</p> <p>Note: This is a sample of quotes drawn from a variety of online resources. If the tribe nearest you is not represented in the slide deck, consider asking their tribal education office for a quote about the role that salmon played in their culture.</p>

Activity 1 (Continued)

Optional Activities

Optional Activity #1

Grade 4: Science Standards

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Directions:

Watch the PBS: Oregon Field Guide: First Salmon Ceremony video (6:02):

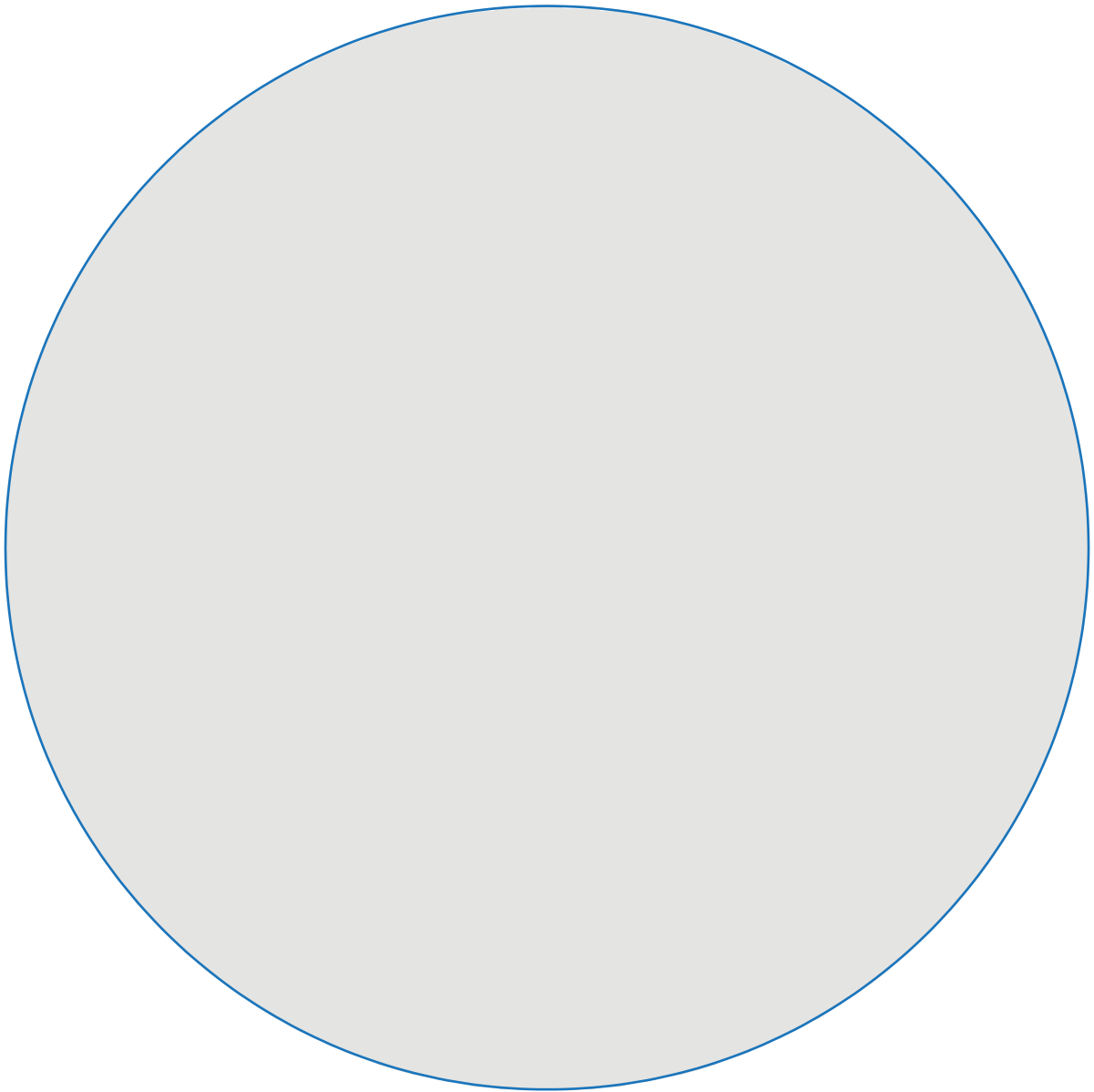
<https://www.pbs.org/video/oregon-field-guide-first-salmon-ceremony/>

- Create a drawing and/or take notes on the **open mind diagram** as you are listening and watching the video.
- What do you notice or wonder about the life of Salmon as it moves from the ocean to the rivers?
- What is unique about the life of the Salmon?
- What challenges do the Salmon have?

Activity 1 (Continued)

Optional Activities continued

Open mind diagram



Activity 1 (Continued)

Optional Activities continued

Reflection Questions:

Students can write thoughts, questions, reflections and responses to each prompt below, then discuss with a partner or group. Once complete, ask for volunteers to share out answers to the whole class.

1. What was the significance of Agnes Pilgrim, Confederated Tribes of Siletz Indians Takelma Elder, bringing back the First Salmon Ceremony?
2. From your point of view, were her efforts important to salmon and the environment?
3. What sounds and images from the environment stood out to you the most in the video?
4. How did removing the dams in the video help the salmon habitat and population?
5. What can you do to ensure habitat restoration efforts keep occurring and salmon are in existence for future generations?

Optional Activity #2

Sea Lions vs. Salmon (By the Oregon Science Teachers Association - May 2019 - Developed by Natalie Wolf, Elementary School Teacher)

<https://www.oregonscience.org/Oregon-Phenomena#EastMetro>

Activity 2

The Salmon Life Cycle

Time: 45 minutes

Say:

We've spent some time learning about why salmon are important to Native Americans in Oregon. Now let's learn about the science of the salmon life cycle. Let's review what you already know. Talk with a neighbor. What do you already know or what do you remember from what we've already read about the life of salmon?

Step 1:

Give students a few minutes to share what they know or remember. They have already read that the fish are anadromous, for example.

Step 2:

Pass out the Wy*Kan*Ush*Pum Salmon Activity Book. And project slide 17 in the Salmon People Slide Deck.

Say:

Great! I heard a lot of good thinking. In the activity book that I just passed out, please turn to page 1. There are a few different types of salmon that are common to Oregon. This page has three: Chinook, Coho, and Sockeye. On my screen, I have five types of salmon. Ask your neighbor: What other two are on the slide? [Listen for students to answer Chum and Pink.] You're correct! Chum and Pink are the other two types of salmon common to Oregon. However, Sockeye and Pink are not found in Oregon rivers as much as they used to be before the dams were built.

Activity 2 (Continued)

Step 3:

Project slide 18 in the Salmon People Slide Deck. This slide will match the student activity book pages 2-3. Explain each step in the life cycle of salmon and the key terms in a way that students can understand. Be sure students understand the following key terms:

- Alevins
- Fry
- Smolts
- Adult salmon
- Redd
- Spawning

Step 4:

Have students turn to page 8 in their Wy*Kan*Ush*Pum Salmon Activity Book. Using a pencil (in case they need to change their answers), have them complete the activity, matching the appropriate terms with the correct picture and then numbering the order in which the cycle occurs. This activity can be done individually, in pairs, or in small groups.

Step 5:

Click through the slides in the presentation, sharing the explanations for the images provided below.

Optional Activity

Have students create the Pacific Salmon Life Cycle Hexaflexagon. This activity requires students to pay attention to detail. The hexaflexagon is a dynamic paper-based project that upon completion flexes in four different directions to show different aspects of the salmon life cycle. It is a unique toy-like creation that students can take home to show their families.

Activity 3

The Impact of Dams on Salmon

Time: 30 minutes

Step 1:

Ask student to turn to page 4 in the Wy*Kan*Ush*Pum Salmon Activity Book.

Say:

*Take a moment to tell your neighbor where salmon are born. [Give students time to say they go upriver to spawn.] That's right, they are born in small streams and creeks far inland. Female salmon create nests, called a redd, in shallow gravel beds in the stream. Let's take some time to think about how the river system works. Let's now read aloud the text in your Wy*Kan*Ush*Pum Salmon Activity Book together.*

Step 2:

Teacher can lead a read aloud, asking for volunteers to read from the following paragraph:

Most of the Pacific Northwest is part of the Columbia River Basin. All the water that falls here eventually flows into the Columbia River and out into the Pacific Ocean. The basin includes parts of Wyoming, Utah, Nevada, Idaho, Washington, Oregon, and British Columbia. Some water travels over 1,000 miles! Rain that falls in Yellowstone National Park in Wyoming can eventually flow into the Pacific Ocean, going through four states to get there. Below is an outline of the Columbia River Basin. Help guide the raindrops from Yellowstone to the Pacific Ocean.

Say:

Now take a couple minutes to complete the maze to see how many states water flows through to get to the Columbia River and then to the ocean. After you complete the maze, circle the names of all the states and countries that are part of the Columbia River Basin.

Activity 3 (Continued)

Step 3:

When students are finished, ask them what states and countries they circled. In the directions or on the map, they should have circled: Wyoming, Utah, Nevada, Idaho, Washington, Oregon, and Canada (or British Columbia).

Step 4:

Project slide 20 in the Salmon People Slide Deck and explain to students how the small rivers and streams where salmon make their redds (nests) are located in many areas of the Columbia River Basin. Point to various examples of the smaller rivers and streams (e.g., Deschutes, John Day, and Yakima rivers).

Say:

What do you think would happen to the salmon if something blocked the river or stream where they were born? Talk with a partner about your thoughts.

Step 5:

Listen to students discuss. Students should recall from the salmon life cycle activity that the salmon must go back to the exact stream where they were born (their home stream). If they cannot get to their home stream, they will not be able to reproduce.

Say:

Good thinking, class. I heard many of you say that the salmon would not be able to spawn and have baby salmon because they couldn't get to their home stream. How would that affect the salmon population over time? [Give students time to think and talk as they realize that there would be less salmon if streams get blocked.]

Activity 3 (Continued)

Step 6:

Project slide 23 in the Salmon People Slide Deck and explain that the symbols are dams, all of which block the water in one way or another. Advance to slide 24 and explain that people put dams in rivers for two main reasons: to create hydroelectricity or to create a reservoir that holds extra water for irrigation of crops and for human use. As time allows, briefly explain the process of creating hydroelectricity. Advance to slide 25.

Say:

When people put a dam on a river, they should consider how it affects the environment, including fish. Salmon can pass many of the dams in Columbia River Basin, but they can't pass others. The picture on the left is the John Day Dam. Fish can get past it. The picture on the right is the Grand Coulee Dam. Fish can't get past it. That means that all the home streams north of the Grand Coulee Dam no longer have any salmon.

[Advance to slide 26.] The people who make a dam have to be creative to help fish get past. They do that by making something called a fish ladder. Fish are able to swim up a fish ladder just like they could swim up small waterfalls and rapids.

[Advance to slide 27.] Before dams were put into the Columbia River Basin, salmon could get to all their home streams in the areas shown in yellow. Rivers and streams in the grey area were naturally blocked by tall waterfalls that salmon wouldn't have been able to pass on their own.

[Advance to slide 28.] The little black marks on this picture are all man-made dams in the rivers. All the orange color shows streams and rivers that have become blocked off to salmon because the dams do not have fish ladders. They can't get to their home streams in these areas, which means they can't spawn new fish. The yellow areas are what are now accessible after all the dams were made. Talk with a neighbor about your thoughts. What do you think this has done to the salmon population in the years since the dams were built?

Activity 3 (Continued)

Step 7:

Have students discuss their thoughts on the impact of dams on the salmon population. Students may create a pro and con list, a venn diagram or another planning organizer. Walk around and monitor student discussions to listen for understanding. Provide corrective feedback as necessary. Be sure students understand that the dams have dramatically reduced the salmon population over the years because they cannot access their home streams to build their redds (nests). This means significantly fewer alevins and frys, which means fewer fish in general.

Step 8:

Wrap up by summarizing how dams have dramatically affected salmon populations and how this has affected the tribes and their ability to maintain their traditional practices related to salmon fishing.

Activity 4

Centers: Tribal Salmon Restoration Efforts

Time: 90 minutes

Setting Up Research Centers

Create physical research centers by grouping student desks or by using large tables.

1. Make sure students can see the whiteboard/projector for whole-class instruction.
2. Label the centers: (1) Stream Access, (2) Fish Hatcheries, (3) Stream Restoration.

Note: For large class sizes you will need to create two or three physical research centers per topic.

3. Distribute copies of reading material and/or set up computer access to the appropriate center:
 1. Stream access
 - Read: “A Swimming Chance for Fish on the Crooked River”
 - Read: “Crooked River - Native Fish Society”
 2. Fish Hatcheries
 - Watch: “Oregon Officials Restore Vanishing Salmon Species”
<https://youtu.be/PYC9gNWsriw> (1:58 minutes)
 3. Stream restoration
 - Watch: “Salmon Habitat Restoration in Coos Bay”
<https://youtu.be/Te4PTSHdx5Y> (1:22 minutes)

Activity 4 (Continued)

Step 1:

Project slide 28 in the Salmon People Slide Deck.

Say:

*We've learned that dams have caused salmon to lose access to their spawning grounds. That has significantly reduced the number of fish in Oregon rivers in the past 100 years. The tribes in Oregon are actively working to restore the salmon runs to higher levels like they were long ago. The tribes often partner with each other, scientists, government agencies, and other organizations to reach their common goals. There are three big ways in which tribes and other organizations are restoring the salmon population and their natural habitat: 1) restoring **access** to their spawning streams, 2) managing **fish hatcheries**, 3) and restoring **stream habitat**. In this next activity you will visit three different centers where you will have the opportunity to learn more about salmon restoration.*

Step 2:

Pass out the Salmon Restoration: Three Column Chart.

Step 3:

Organize students into DIFFERENT groups of four or five. Assign the following group roles by distributing Cooperative Group Role Cards from Read-WriteThink and review each role with the whole class.

Leader: Makes sure that every voice is heard and that group members are focused on the learning task.

Timekeeper: Encourages the group to stay on task.

Presenter: Presents the group's finished work to the class.

Monitor: May briefly leave the group to get supplies or to request help from the teacher.

Activity 4 (Continued)

Step 4:

Explain to students that they will have the opportunity to learn more about tribes' salmon restoration efforts by visiting different centers around the classroom. Further explain that at each center there is either a set of reading materials or a video for students to review and take notes. Tell students that they will visit each center for about 20 minutes.

Explain to students that the expectations for each center are the same:

- Be considerate of those around them: Use quiet voices as much as possible
- Allow everyone an opportunity to share ideas: Take turns
- This is a group effort: Work as a team

Step 5:

Share the Three Column Chart-Sample Answer Key on an overhead projector and model for students how to complete the center work.

Stream Access	Fish Hatcheries	Stream Restoration
Create fish passage		
Install fish ladder at Opal Springs		
Dam on the lower Crooked River		
Removal of the Stearns Dam		
Creation of fish diversion streams		

Step 6:

Provide students with 20 minutes to complete their first center. Remind students that when they are doing research they should put the information in their own words. If they copy directly, the information should be in quotation marks.



Activity 4 (Continued)

Step 7:

Continue moving students through each research center. If groups are having difficulty, you can continue to work as a class and scaffold the conversation about what is important to write down.

Step 8:

Once students have completed each center, gather the whole class together and report out findings/answer questions.