COW CREEK BAND
OF UMPQUA TRIBE OF INDIANS

SCIENCE

Lampreys

ESSENTIAL UNDERSTANDINGS

- **Since Time Immemorial**
- **Lifeways**

LEARNING OUTCOMES

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

- **Define "life cycle" and related key terms.**
- **Describe the life cycle stages of the Pacific lamprey.**
- **Describe the importance of Pacific lampreys to the Cow Creek Band of Umpqua Tribe of Indians and other Indigenous people of the Pacific Northwest.**

ESSENTIAL QUESTIONS

- **How are living things related and different in how they experience life, growth, and death?**
- **How are Pacific lampreys related to and different from other fish humans are familiar with?**
- **What role have Pacific lampreys played in the culture of the Cow Creek Band of Umpqua Tribe of Indians?**

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Overview

Lampreys are boneless, jawless fish that have existed for hundreds of millions of years. Several lamprey species are native to the waterways of Oregon and are a traditional food source for the Cow Creek Band of Umpqua Tribe of Indians. Like salmon, which are also an important traditional food source for the Tribe, some lamprey species are anadromous, which means they migrate between freshwater inland rivers and the Pacific Ocean. Traditionally, Cow Creek men collected large numbers of lampreys from the Umpqua River and its tributaries. Both salmon and lamprey were then smoked and dried, serving as stored food to be used during the winter months. Lampreys also yielded oil that could be used as hair grease and medicine. While no longer harvested in large numbers, lampreys continue to be culturally important to the Tribe. In this lesson, students will explore the life cycle of the Pacific lamprey and its importance to the Cow Creek Tribe.

Background for teachers

Lampreys are simple fish that lack jaws and bones. They have round, sucker-like mouths, no scales, and breathing holes instead of gills. They are sometimes called "eels" due to their eel-like body shape but are more closely related to hagfish and sharks.

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

TIME REQUIRED

One hour and 20 minutes

STANDARDS

Oregon science standards

3-LS1-1 – Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Oregon English language arts standards

RI.3.7 – Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

MATERIALS

What will be needed for students to engage in this activity?

- **PowerPoint presentation** (load the slides prior to the lesson to ensure they are displaying properly)
- **Classroom writing surface** (i.e., smartboard, whiteboard, chalkboard, chart paper and markers)
- **Classroom audiovisual technology** to display PowerPoint slides and videos (see next items)
- **"The Pacific lamprey: your ancient neighbor"** video (running time: 1:53) by the Oregon Zoo, available on YouTube at https://youtu.be/ptTqf81SFNY

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Lampreys have existed for 400 to 500 million years, emerging before jawed fish and other vertebrates and surviving several mass-extinction events that killed off many other aquatic species. They have been around for a very long time, but scientists are still learning new things about them.

Several species of lampreys are native to the watersheds of Oregon. They all begin and end their lives in freshwater and move through similar life-cycle stages—egg, larvae (ammocoetes), juvenile (macropthalmia), and adult. The different species can sometimes be hard to distinguish, especially during the larval stage, where they all live burrowed into stream bottoms and filter-feed on algae and detritus. However, as adults, some Oregon lampreys, such as the Pacific and western river lampreys, migrate to saltwater estuaries or the ocean and live as parasites—latching onto other fish and sucking their body fluids—before returning to freshwater to spawn. The western brook lamprey, on the other

hand, lives entirely in freshwater, is non-parasitic, and does not feed as an adult. All adult lampreys usually die shortly after spawning.

The Cow Creek people and other Native Americans living in the Pacific Northwest harvested lamprey for subsistence, ceremonial, and medicinal purposes and continue to catch them today in limited numbers to maintain ties to traditional practices. Willamette Falls in Oregon City is a prime lamprey-harvesting spot used by several tribes.

Given their ecological and cultural importance, and their population declines resulting from dams, pollution, predation by non-native species, and destruction of habitat, lampreys have been the focus of research and conservation efforts by federal, state, and tribal scientists and fish and wildlife officials. For example, the Cow Creek Band of Umpqua Tribe of Indians is working on lamprey conservation in the Umpqua River basin, including developing a database and map of lamprey distribution and working with state and federal agencies to study and protect lamprey habitat and mitigate the effects of dams and other barriers to lamprey migration.

For simplicity, this lesson will focus primarily on the Pacific lamprey, as it is the most well-known and best-studied lamprey species in the state, and information and instructional materials on it are readily available from public sources.

MATERIALS *(Continued)*

What will be needed for students to engage in this activity?

- **"Why Pacific Lamprey Matter to Columbia Basin Tribes"** video (running time: 5:31) from the Columbia River Inter-Tribal Fish Commission (CRITFC), available on YouTube at https://youtu.be/RIsRfSoCvXA. This is an excerpt from a longer (24-minute) documentary, "The Lost Fish," produced by the CRITFC in partnership with Freshwaters Illustrated and the U.S. Fish and Wildlife Service, available on Vimeo at https://vimeo.com/116177956.
  - ***Note:*** *The CCBUTI have traditional and contemporary lifeways and views associated with lampreys that are similar to those of the Columbia Basin Tribes represented in the video, with some differences. For example, in addition to the lamprey harvest methods shown in the video, the Cow Creek people also harvested lamprey using fish traps.*
- **Lamprey vs. Salmon worksheet** (one copy per student)
- **Pacific Lamprey Fortune Teller** (one copy per student group)
- **Pacific Lamprey Life Cycle worksheet** (one copy per student)
- **Cow Creek Lamprey Sighting Reporting Form** (one copy per student group)
- **Lesson Exit Ticket** (one copy per student)
- **Oregon Lamprey Fishing Regulations** (provided as reference material and an optional extension activity)

To prepare for this lesson teachers should:

1. Review all lesson materials.
2. Ensure students will have access to all materials (printed and/or electronic) needed to participate in this lesson (see "Materials" section above).
3. Prepare classroom audiovisual technology to display the PowerPoint slides and videos listed in the "Materials" section.
4. Write the lesson objectives and key vocabulary on a classroom writing surface.

Resources

Brown, V. (2018, February 8). The amazing ancient lamprey. *Columbia Insight.* [Online]. Retrieved from https://columbiainsight.org/the-amazing-ancient-lamprey/

Columbia River Inter-Tribal Fish Commission. (n.d.) *Pacific lamprey: A cultural resource.* Retrieved from https://www.critfc.org/fish-and-watersheds/columbia-river-fish-species/lamprey/

Connolly, S. & Roy, J. (n.d.). *Oregon Zoo's pacific lamprey exhibit showcases the power of collaboration between the Service, tribes, and conservation partners.* United States Fish and Wildlife Service. Retrieved from https://www.fws.gov/pacificlamprey/LampreyExhbitCulturalConnections.cfm

KEY VOCABULARY

Fish biologist – A scientist who studies fish and their habitats.

Lamprey – Boneless, jawless eel- or snake-shaped fish that are considered a traditional food source by Native American tribes in Oregon.

- In Takelma, the traditional language of the CCBUTI, lamprey are called *Xtáan*. Here's a short pronunciation guide:
  - *x-DAHN*
    - *x* – like a cat hiss, made by almost closing your mouth to make a k sound but not all the way. Also sounds like a "heavy h" sound
    - *d* – a regular d sound
    - *ah* – like a in father
    - *ah* – same as above but longer (twice as long)
    - *n* – a regular n sound
    - ALL CAPS syllable means that syllable gets the stress. And in this case, the stressed syllable gets a rising tone, making it sound like a question.

First foods – Traditionally harvested foods that provide sustenance and promote health.

Life cycle – Stages of development animals and plants pass through in their lifetimes.

Larva – An early life stage some animals pass through in their development into adulthood.

Ammocoete (am-o-seat) – Larval stage of lamprey development.

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Lampman, R. (2017). Columbia Basin lamprey identification guide (adults/juvenile). Retrieved from https://www.fws.gov/pacificlamprey/Documents/Identification%20Guides/2017%20Lamprey%20Identification%20Guide%20Final.pdf

Oregon Zoo. (n.d.). *Pacific lamprey.* [Online.] Retrieved from https://www.oregonzoo.org/discover/animals/pacific-lamprey

U.S. Fish & Wildlife Service. (n.d.). *Luna the lamprey.* [Online]. Retrieved from https://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/Luna.html

References

Brostrom, J. K., Wang Luzier, C., & Thompson, K. (2010). *Best management practices to minimize adverse effects to Pacific lamprey. U.S. Fish and Wildlife Service.* Retrieved from https://www.fws.gov/oregonfwo/Documents/Lamprey/Best%20Management%20Practices%20for%20Pacific%20Lamprey%20April%202010%20Version.pdf

Bull, B. (2018, August 24). Tribes and conservation groups study what's leading to low lamprey counts. *Oregon Public Broadcasting.* Retrieved from https://www.opb.org/news/article/low-lamprey-count-oregon-study/

Close, D. A., Fitzpatrick, M. A., & Li, H. W. (2002, July). *The ecological and cultural importance of a species of fish in danger of extinction, Pacific lamprey.* Retrieved from https://ir.library.oregonstate.edu/concern/articles/73666490x?locale=en

KEY VOCABULARY *(Continued)*

Macropthalmia (ma-crop-thal-mi-uh) – The juvenile stage of lamprey development; at this stage some lamprey, including the Pacific lamprey, migrate to the ocean.

Juvenile – A young animal that has not reached adulthood.

Metamorphosis – A series of physical changes some animals go through to develop into adults.

Parasite – A living thing that lives in or on another living thing and gets food and sometimes shelter from it and often causes harm to it.

Species – A group of animals, plants, or other living things that share common characteristics.

Reproduce – To produce another living thing of the same kind.

Coates, K., & Poirier, J. (2017). *Pacific lamprey 2017 regional implementation plan for the Oregon Coast Regional Management Unit South Coast Sub-Region. U.S. Fish and Wildlife Service.* Retrieved from https://www.fws.gov/pacificlamprey/Documents/RIPs/2017/2017.06.19%20SouthCoastRIP.pdf

Confederated Tribes of Umatilla Indians. (2004). *Species of interest: Pacific and Western brook lamprey and freshwater mussel detailed life history, distribution, abundance, and other information.* Northwest Power and Conservation Council. Retrieved from https://www.nwcouncil.org/sites/default/files/AppE_SpeciesofInterest.pdf

Cow Creek Band of Umpqua Tribe of Indians. (2008). *Conference summary: Western Oregon lamprey workshop, February 26-27, 2008, Canyonville, OR.* Retrieved from http://www.cowcreek.com/wordpress/wp-content/uploads/2015/01/western-oregon-lamprey-workshop.pdf

Eastern Oregonian. (2018, June 14). Pacific lamprey swarm Umatilla River in best numbers in years. Retrieved from https://www.eastoregonian.com/sports/outside/pacific-lamprey-swarm-umatilla-river-in-best-numbers-in-years/article_d0353b2f-84ed-55b8-b728-48fb11add776.html

ADAPTATIONS FOR DISTANCE LEARNING

This lesson is primarily structured around group discussion and exploration, but several pieces can be pulled out and used as standalone content and activities for distance- or independent-learning purposes. Following is a suggested sequence. Be sure all students have either print or electronic access to the materials described.

1. Hold an online class meeting to introduce the subject by first having students brainstorm (verbally or in a chat box, whiteboard, or online document) what they already know about lampreys, and then use the PowerPoint slides to provide an overview, mini-teach, or lecture on the lesson content. Alternatively, you can have students brainstorm what they know about lampreys asynchronously and provide written responses (in the comments or whiteboard section of your school's online classroom platform or in an online document you provide a link to) and then review the PowerPoint slides on their own.
2. Provide links so that students can watch the two videos ("The Pacific lamprey: your ancient neighbor" and "Why Pacific Lamprey Matter to Columbia Basin Tribes"), either on their own or together in an online class meeting.
3. Ask students to fill out and submit the "Lamprey vs. Salmon" worksheet (you may need to convert the worksheet to a fillable form or online document or provide some other means of capturing student responses).

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Flatt, C. (2013, July 28). How Pacific lamprey could help nourish streams. *Oregon Public Broadcasting*. Retrieved from https://www.opb.org/news/article/how-pacific-lamprey-could-help-nourish-streams/

Flatt, C. (2018, June 15). Record lamprey return a cultural win for Native tribes. *Oregon Public Broadcasting*. Retrieved from https://www.opb.org/news/article/record-lamprey-umatilla-native-tribes/

Hilty, I. E., Peters, J. H., Benson, E. M., Edwards, M. A., & Miller, L. T. (1980) *Nutritive values of Native foods of Warm Springs Indians* (Revised ed.). Oregon State University Extension Service. Retrieved from https://ir.library.oregonstate.edu/downloads/tm70mv51j

Loew, S. (2018, July 13). Oregon's prehistoric fish making a comeback with Grand Ronde's help. *Salem Statesman Journal*. Retrieved from https://www.statesmanjournal.com/story/tech/science/environment/2018/07/13/oregons-prehistoric-fish-pacific-lamprey-making-comeback/777520002/

Oregon Department of Fish and Wildlife. (n.d.). *Western river lamprey*. Retrieved from https://www.oregonconservationstrategy.org/strategy-species/western-river-lamprey/

Oregonian. (2012, July 18). Pacific lamprey harvested at Willamette Falls (YouTube video). The Oregonian. Retrieved from https://www.youtube.com/watch?v=Sc8VGyY5Hf4

ADAPTATIONS FOR DISTANCE LEARNING
(Continued)

4. Ask students to print out and assemble the "Pacific Lamprey Fortune Teller" and use it to complete the "Pacific Lamprey Life Cycle worksheet." Again, you may need to convert the worksheet to a format students can use to submit responses.

5. Ask students to complete and submit the lesson exit ticket (formatting the ticket as necessary). Alternatively, you can have students write and share a short summary or reflection on what they learned and post it in the comments or whiteboard section of your online classroom platform.

6. As an alternative or extension to step 5, convene another online class meeting to review and summarize the lesson together and answer any remaining questions students have.

U.S. Fish and Wildlife Service. (n.d.). Species fact sheet: Western brook lamprey. Retrieved from https://www.fws.gov/wafwo/species/Fact%20sheets/WesternBrookLamprey_final.pdf

U.S. Fish and Wildlife Service. (n.d.). *Pacific lamprey.* [Fact sheet]. Retrieved from https://www.fws.gov/oregonfwo/species/data/pacificlamprey/documents/012808pl-factsheet.pdf

Considerations for teachers

Assessment

The exit ticket provided with the lesson can be used as a formal or informal summative assessment. You can have students fill it out individually or together with members of their lesson work group.

Practices

Compare and Contrast – Students will view two illustrations (a lamprey and a salmon) and identify similarities and differences between them. Adapt as needed for students with visual impairments.

Group Activities – This lesson assumes that students will work in small groups to learn together, with each student in a group taking on an assigned role. Use your best judgment in assigning students to groups, focusing on which combinations will provide the best opportunity for each student to make a positive and productive contribution to their team.

Learning targets

- I can describe what a life cycle is.
- I can identify the life-cycle stages of the Pacific lamprey.
- I can describe the importance of lampreys to the Cow Creek Band of Umpqua Tribe of Indians.

Options/extensions

- Have students work independently or in groups to complete the "Pacific Lamprey Experience" activity packet (provided in the lesson materials).
- Have the class watch the full "Lost Fish" documentary (Vimeo link is provided in the "Materials" section above section).
- If your school is located in the greater Portland metropolitan area or a reasonable driving distance from it, consider organizing (or having an aide or parent volunteer help organize) a field trip to the Oregon Zoo to have students view the Pacific lamprey exhibit.
- Using information provided on the "Pacific Lamprey: A Cultural Resource" page on the website of the Columbia River Inter-Tribal Fish Commission (see link in the "Resources" section), have students review and write a short report on the efforts of Native American tribes in Oregon and Washington to conserve and protect the Pacific lamprey.
- Provide students with a copy of the lamprey identification guide linked to in the "Resources" section and ask them to write a short report comparing and contrasting three different lamprey species found in Oregon. Questions student could answer using the guide include:
    - Which is the biggest of the three (as adults)? The smallest?
    - What do the three lamprey species have in common? What is different?
    - What are some ways you could tell the three different lamprey species apart?
- Provide students or student groups with a copy of the Oregon lamprey fishing regulations (provided in the lesson materials) and ask them to analyze the rules for who can catch lampreys in Oregon, where they can catch them, and how many they can keep.
- Have students conduct research on lamprey ramps, then think about and sketch their own designs for other devices that could help lampreys get over or around obstacles such as dams.

Appendix

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

- Slides.pptx
- Materials_Lamprey_vs_Salmon_Worksheet.doc
- Materials_USFWS_The_Pacific_Lamprey_Experience.pdf
- Materials_USFWS_Pacific_Lamprey_Fortune_Teller.pdf
- Materials_Pacific_Lamprey_Life_Cycle_worksheet.doc
- Materials_Cow_Creek_Lamprey_Sighting_Reporting_Form.pdf
- Materials_Lesson_Exit_Ticket.doc
- Materials_Oregon_Lamprey_Fishing_Regulations.docx

Activity 1

Activate Student Interest

Time: 15 minutes

Students will engage with materials and a short video to prepare to learn about lampreys.

Step 1

Organize students into groups of three to four using the sorting method of your choice and have them arrange themselves into table groups. Have each table group select group roles such as facilitator, timekeeper, recorder, and reporter.

Step 2

Read the following passage to students, which has been adapted from a 2018 article in the *Columbia Insight* by Valerie Brown (see "Resources" section above for citation and link):

Say:

Picture this: You are an animal that hatches from an egg into a worm-like creature with no eyes. Over the next three to seven years, you live in the mud of a stream, eating algae. Then you change into a male or female fish with no bones, two eyes, a dorsal fin and tail, and a round mouth with teeth made of keratin (the same thing as fingernails). Something inside tells you to swim all the way to the ocean, where you attach your mouth to a bigger fish and suck out its fluids. After a few years of this, something inside again tells you to swim, this time back to where you were born. So, you swim upstream, swimming against currents and rapids by pulling yourself along and up rocks with your mouth until you are back at your home stream or something like it. You never eat again. You build a little nest in the stream gravel, lay or fertilize eggs, and then die. What animal are you?

Activity 1 *(Continued)*

Step 3
Give groups a few minutes to come up with guesses as to what they think the animal is, then ask their group reporters to share out what they came up with.

Step 4
Display the "Meet the Lamprey" slide in the PowerPoint file and note that the animal you just described is a lamprey.

Step 5
Ask students to discuss in their groups the creature they see on the screen. Prompt groups to think about what they *notice* and *wonder* about the creature on the slide and what questions they have about it.

Step 6
After a few minutes, invite groups to share what they discussed with the whole class. If desired, use the classroom writing surface to record what they have noticed, what they wonder about, and any questions they have.

Step 7
Provide a brief introduction to lampreys and this lesson.

Say:
In this lesson we're learning about lampreys. Sometimes people call them "eels" because they have a long, snake-like body like eels do, but they do not have bones or jaws or pairs of fins like eels and other fish. We'll learn some interesting facts about lampreys, explore their entire life cycle, and examine how they are important to the Cow Creek Tribe.

Activity 1 *(Continued)*

Step 8

Play the "The Pacific lamprey: your ancient neighbor" video from the Oregon Zoo on YouTube (see link in "Materials" section).

Step 9

Review the learning targets and key vocabulary for the lesson and ask students if they have any questions before beginning.

Activity 2

Life as a Lamprey

Time: 40 minutes

Students will learn key facts about lampreys and their life cycle from written text and images.

Step 1

Ask students if they know any fish biologists or other people who work with fish for a living.

Say:

Fish biologists know a lot about fish. Sometimes they learn about fish by taking classes at a college or university, but they also learn by watching fish and learning from other people who have studied fish. Traditionally, Native Americans knew a lot about fish, since they depended on fish for food and had closely observed different kinds of fish for thousands of years. They knew which fish migrated and what time of year they would show up, which fish were worth catching, and how many they should catch to feed their tribes while still leaving plenty to make sure there would always be healthy populations. Salmon were a very important fish for Native Americans in the Pacific Northwest, and so were lamprey. Let's put on our fish biologist hats and study the two!

Step 2

Distribute the "Lamprey vs. Salmon" worksheet to students and display the first "Lamprey vs. Salmon" slide, which compares the basics of lamprey and salmon anatomy.

Activity 2 *(Continued)*

Step 3

Ask students to look at the page of the worksheet that does not have labels. Invite groups to discuss what they notice about each of the two fish and take notes on the worksheet. Next, ask them to use the Venn diagram at the bottom of the sheet to compare the similarities and differences between the two fish. Each student should take his or her own notes on a copy of the worksheet, but the group's recorder should take the "official" notes, which the group reporter will share with the rest of the class when called upon.

Step 4

After groups have worked for several minutes, invite each group's reporter to briefly share what their group noticed about the two fish and what they saw as similarities and differences between them.

Step 5

Display the "Lamprey vs. Salmon (Part 2)" slide and ask students to flip their worksheets over to view the lamprey and salmon with their body parts labeled. Give students a moment or two to review the worksheet, then call their attention to features they may or may not have noticed or shared. Next, ask them to add to their Venn diagrams any of the following elements that they might have missed.

- *Lampreys have a suction-cup like mouth instead of jaws and teeth.*
- *Lampreys do not have pairs of fins like other fish.*
- *Lampreys have circular breathing holes instead of gills.*
- *Lampreys do not have scales.*
- *Lampreys do not have bones; similar to sharks, their bodies are given shape by cartilage.*

Activity 2 *(Continued)*

Step 6

Display the "Lamprey vs. Salmon (Part 3)" slide, which shows a jumping salmon with a lamprey attached.

Say:

This is a picture of a salmon with a lamprey attached to it. Some—but not all—lampreys are parasites, which means they attack a host animal and take food or shelter from it. Can you think of any other animals that are parasites?

Step 7

Invite students to popcorn out examples of familiar examples of parasites. Examples may include:

- *Fleas*
- *Lice*
- *Ticks*
- *Leeches*

Say:

Being attacked by a lamprey is not pleasant for a salmon. The lamprey will eventually detach when it is finished feeding. Because salmon are a source of food for some lampreys, they are often found in the same areas. Just like salmon, some types of lampreys are born in rivers and streams, migrate to the ocean as adults, and return to rivers and streams to spawn and die.

Activity 2 *(Continued)*

Step 8

Show the "An Ancient Fish" slide and ask student groups to discuss among themselves what they notice and think the timeline is saying. Ask for a few volunteers to share what their groups think about the timeline. Call attention to the following if students do not identify them and invite them to add any new information to their Venn diagrams.

- *Lampreys have been around for hundreds of millions of years.*
- *They were around before dinosaurs existed, and they have survived to this day while dinosaurs went extinct.*
- *Lampreys are much older than salmon, which showed up only about six million years ago.*

Step 9

Show the "Lamprey Species in Oregon" slide and give student groups a minute to review it.

Say:

There are different species of lamprey that live in Oregon. They are similar in many ways, but different in others. For example, as we just discussed some lampreys migrate from rivers to the ocean and back during their lives, just like salmon, while others do not. Some lampreys are parasites, like the one in the picture we just saw, while others are not. The most well-known species of lamprey in Oregon is the Pacific lamprey, which migrates to the ocean and back and is a parasite. For the rest of this lesson we'll focus on Pacific lampreys.

Activity 2 *(Continued)*

Step 10
Introduce (or review) the concept of life cycles.

Say:
Animals and plants go through changes during their lives. While those changes can take many different forms, we can see some common patterns. For example, all organisms are born, grow up, reproduce, and die.

Step 11
Invite students to popcorn out examples of animal and plant life cycles. Share the following examples, if helpful:

- *Plants sprout from seeds, grow up, make more seeds, and then die. Some plants (like some flowers and vegetables) live only a short time, whereas others (such as trees and bushes) live for many years.*
- *Animals are born, grow up, have babies, and then die. Some animals are born from eggs, others are born live.*

Step 12
Display the "Metamorphosis" slide and introduce (or review) the concept of metamorphosis.

Say:
Some animals—such as humans and other mammals—are born as babies with many of the basic parts they will have and need as adults. They do go through changes—for example human babies have big heads and drink milk and as they grow up their bodies catch up and they start eating solid food—but a baby human has hair, arms, legs, and lungs just like an adult human. Other animals can look very different at different points in their life cycle. For example, they may have different body parts and eat different types of foods. Can you think of any animals that go through metamorphosis?

Activity 2 *(Continued)*

Step 13

Invite students to popcorn out examples of familiar examples of metamorphosis from the animal world. Examples may include:

- *Caterpillars metamorphosing into moths and butterflies.*
- *Tadpoles metamorphosing into frogs.*

Step 14

Display the "Pacific Lamprey Life Cycle" slide and allow students a few minutes to study it. Walk through the lamprey life cycle for students—egg, larva (ammocoete), juvenile (macropthalmia), and adult—stopping to define any unfamiliar words or concepts as needed. Note that lampreys undergo a metamorphosis from the larva to the juvenile stage. It is during this time that they develop their eyes, mouths, and reproductive organs.

Step 15

Distribute one copy of the "Pacific Lamprey Fortune Teller" and one copy of the "Pacific Lamprey Life Cycle" worksheet to each student group. Ask the groups to follow the instructions to create the fortune tellers. Have students use the fortune tellers and worksheets to find and write down interesting facts about each of the four lamprey life stages. Again, students should take notes on their own individual copies of the worksheet, but their group recorder should take the group's "official" notes for sharing out with the whole class.

Step 16

Circulate among the groups to answer any questions and make sure groups are on task.

Activity 2 *(Continued)*

Step 17

When it appears that all groups have recorded at least some information for all four lamprey life stages, reconvene the class and ask the reporters from each group to take turns sharing the interesting facts they discovered.

Step 18

Thank groups for their work and ask for and answer any questions students may have before proceeding. Then, provide a short summary and transition to the next activity.

Say:

Good job! You would all make great fish biologists! Lampreys have been living in Oregon much longer than us humans and are an important part of our river and ocean ecosystems. The first humans to live in Oregon found lampreys to be very useful as a source of food and medicine. We'll now take a look at the importance of lampreys to the Cow Creek people and other Native Americans.

Activity 3

Lampreys and the Cow Creek People

Time: 20 minutes

Students will review materials illustrating the importance of the lamprey to the Indigenous people of the Pacific Northwest and the Cow Creek people specifically.

Step 1

Display the "Lampreys and the Cow Creek Tribe" slide and make the following key points. Refer to the pronunciation guide in the "Key vocabulary" section for guidance on how to pronounce the word for lamprey in Takelma, the CCBUTI traditional language.

Say:

The Cow Creek people lived in the Umpqua River watershed for thousands of years. Lampreys were an important source of food for the Cow Creek people and many other tribes in Oregon. The Cow Creek people called lampreys Xtáan *in their native language, Takelma. The breathing holes of the lamprey reminded them of the holes of a flute, so in stories they told they often described lampreys as good singers.*

Lampreys were and still are "first foods" for the Cow Creek Tribe and other Native Americans. A first food is a food that has been eaten by a group of people for many generations and remains an important part of their diet and cultural practices. Lampreys were a good source of protein, and an oil could be used as a medicine and to keep hair and skin healthy. Humans and other animals ate lamprey, but the fish still managed to thrive. The Cow Creek people only took as many fish as they needed to survive, and they did not waste anything. The Cow Creek Tribe and others still catch lampreys today for food and ceremonial purposes. Willamette Falls in Oregon City is a well-known location where several tribes catch lamprey today.

Activity 3 *(Continued)*

Step 2

Display the "How Lamprey Lost His Bones" slide and read the text on the slide to students or invite one or more strong readers to read it for you.

Say:

This is a story shared with us by the Cow Creek Tribe. Tribe members were good fish biologists. They studied lampreys very closely and noticed many things about them. For example, they noticed that lampreys lacked bones. They also noticed that lampreys and salmon were often found together. This story provides an interpretation of how lampreys came to be.

Step 3

Ask students to think about what they learned about the life cycle of the Pacific lamprey and what natural and human threats they might face at different stages. For example, have students think about what threats there might be to lampreys at the egg stage (such as, being eaten by other animals, being washed out of their nests, having their nests contaminated by pollution). Have students brainstorm a list of threats at each stage and record their ideas on the classroom writing surface, if desired.

Step 4

Share the following information with students and then guide them as they compare this information to the list of threats they created.

Say:

Things changed for lampreys when Europeans and Americans arrived. They took the land from Native Americans and changed it in ways that were sometimes harmful for lampreys. They built dams, diverted water from streams for farms and ranches, and polluted rivers with fertilizers and chemicals. Today, lampreys are not as numerous as they once were, and the Cow Creek Tribe and others have sounded the alarm about how lampreys could disappear entirely from the streams and rivers of Oregon if people don't do more to help them.

Activity 3 *(Continued)*

Step 5

Display the "Looking Out for Lampreys" slide and discuss with students.

Say:

Lampreys remain culturally important for the Cow Creek Tribe and other Native Americans. The Tribe and others are working with federal and state agencies and private landowners to study and protect lampreys through such activities as:

- *Studying, tracking, and counting lamprey in streams and rivers*
- *Restoring damaged lamprey habitat*
- *Designing lamprey ramps and other devices to help lampreys get around obstacles*
- *Working to remove dams and culverts that are no longer useful*

Step 6

Distribute a copy of the "Cow Creek Lamprey Sighting Reporting Form" to each group and have students study it for several minutes. Note that this form was developed by the Cow Creek Tribe to identify where lampreys are living and to track whether their numbers are increasing or decreasing throughout the Umpqua River watershed. Point out that the form asks the person filling it out to identify the species and life stages of the lampreys they find.

Step 7

Provide a few introductory remarks to set up the next video students will watch.

Say:

Next, we're going to watch a video about why the Cow Creek Tribe and other Native Americans in Oregon are concerned about lampreys and what they are doing to help. The people in the video are not members of the Cow Creek Tribe—they are members of tribes that live along the Columbia River in Oregon and

Activity 3 *(Continued)*

Washington—but like the Cow Creek Tribe, lampreys were and are an important part of their cultures. In the video you will see the Columbia Basin tribes harvesting lamprey in waterfalls. The Cow Creek Tribe also harvested lampreys this way, but also used fish traps. Many tribes in Oregon, including the Cow Creek Tribe, are working together to protect lampreys.

Step 8

Play the "Why Pacific Lamprey Matter to Columbia Basin Tribes" video from the Columbia River Inter-Tribal Fish Commission on YouTube (see link in "Materials" section).

Step 9

Ask if students have any questions after viewing the video, and then provide a brief summary for this segment.

Say:

Lampreys are a culturally important food for the Cow Creek Tribe and other tribes in Oregon. Working to protect lampreys is part of the Tribe's commitment to preserving the balance between human and animal life; the lampreys helped the Cow Creek Tribe survive for thousands of years, and now the Tribe is working to help the lampreys survive.

Activity 4

Reflection/Closure

Time: 5 minutes

Students reflect on what they learned in the lesson.

Step 1

Review the learning targets for the lesson.

Step 2

Help students summarize and reflect on what they learned in the lesson using one or more of the following methods:

- Distribute the lesson exit ticket (provided in the folder of lesson materials) to all students and have them fill it out individually.
- Distribute one lesson exit ticket per group and have groups work on filling it out together.
- Hold an informal debrief of what stood out to students in the lesson and why. This can be done by having small-group discussions followed by a whole-class share-out, or as a whole-class discussion.