 UNIT 7

**MIGRATION**

Teacher Guide

**Earth Sciences**: Natural Resources, Human Impacts on Earth Systems

**Life Sciences**: Growth and development of organisms, Ecosystem dynamics

Grade Level: 5

Explore Chapter: 7 EPIC JOURNEYS

Time Required: 12 50-minute sessions plus Salmon Stream Survey









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**Background for the Teacher**

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Wildlife migrations cause an exchange of nutrients between the land and the sea, and from sea to sea, connecting us to all of the coastlines in the world. Migration may be a few hundred meters to get to a pond to breed and lay eggs (if you’re an amphibian), or, more than double the length of the globe each year ([44,000 miles/71,000Km](https://www.nationalgeographic.com/news/2010/1/100111-worlds-longest-migration-arctic-tern-bird/)) if you’re an Arctic tern. Reasons to migrate range from food source-hopping to safe breeding-zone seeking and even finding the just-right temperature, like many human “snowbirds.” Just how do they navigate so far? Some animals seem to use the magnetic fields in the Earth. Others use olfactory cues, seafloor topography (bathymetry), currents, sun and moon position, river flow, and even celestial navigation.

Scientists and others still have many mysteries to explore around migration, but we do know that our whole planet is in constant motion with thousands of migratory pathways and billions of individual creatures on the move, following cues detected with chemo-, photo-, magneto-, electro-, and temperature-sensing organs and proteins, and perhaps in other ways we have yet to discover.

Figure 1| Dozens of shorebird species, like this yellowlegs sandpiper, flock to the sandflats of the Salish Sea to feast on invertebrates and nutrient-rich biofilm (diatoms and detritus) at low tide. Image by Steve Havert, Salish Sea In Focus

In this unit, students will map their choice of a migratory sea animals’ migration routes. Next, they will unite to investigate the migration patterns and habitat needs of the iconic Pacific salmon. If you’ve implemented the entire curriculum, after introducing the phenomenon of the Southern Resident killer whale population, you followed water in the water cycle from ocean to cloud to rivers flowing through the watershed.

This journey brought us to the estuary, formed by ancient geological and glaciation events. Then into the depths and out to sea. Here we follow the cycle all the way back into the heights of the watershed as the salmon return to their natal streams to spawn, inextricably connecting the land and sea in an interdependent exchange of nutrients and supply of food to wildlife and people. The gift of the salmon goes back thousands of years to the retreat of the Cordilleron Ice Sheet at the end of the Vashon Glaciation.



Figure 2| General Pacific salmon lifecycle. Time spent in the ocean, river, or even lakes, varies by species and even by stocks within species. Illustration by King Co. Dept of Natural Resources and Parks.

The five species of Pacific salmon - Chinook (king), coho (silver), pink (humpy), chum (dog), and sockeye (reds), plus the steelhead (anadromous rainbow trout) and sea-run cutthroat - each begin life in a stream or

lake. They spend varying times in freshwater before swimming out to the estuary, where they feed and grow on the abundant food there. Next they travel through the Salish Sea, hugging island shores and resting and feeding in essential pocket estuaries, before they are strong enough for their long swim up into Alaskan waters before returning all the way back to their natal stream to spawn. Every river mile, saltmarsh channel, seagrass meadow, bull kelp forest, and open ocean waterway of their journey needs to have clean, cold, clear, complex, and connected, food-rich waters to sustain this massive journey. At journey’s end, the worn and battered females will dig a depression, called a *redd*, in the gravel and cobble and deposit their eggs, with competing males ready to fertilize them by delivering sperm-rich milt into the water to penetrate the eggs before their membranes toughen and block them out. Hungry predators, such as American dippers, river otters, other fish, diving ducks, and more, await this oil- and protein-rich egg banquet.

Soon after spawning, their epic journey complete, both male and female parents will fade and die, their bodies feeding bears, bald eagles, otters, mink, insects, and even salmon fry and the great trees of the Pacific NW forests. Salmon parents sacrifice everything to bring forth the next generation.

After the young salmon hatch, they stay nestled in their redds, growing stronger by absorbing nourishment from their yolk sacs. Even before this is gone, they will begin to swim up into the water column and go after tiny invertebrates. With the yolk sac absorbed, they are now fry and will feed on aquatic macroinvertebrates as long as they are in the stream. These insect larvae, snails, and worms can serve as water quality indicators because some are tolerant of pollution and some are sensitive to it and won’t be found in polluted water. Collecting these can tell us whether the stream has abundant food and is clean enough for salmon.

Figure 3| A bald eagle digests its salmon feast in a branch above the Skagit River, one of few rivers bearing runs of all 5 species of Pacific salmon and steelhead. Image by Bob Friel, Salish Sea Wild.

Time spent in the river as fry varies by species from several months (chum) to over a year (coho and some Chinook). Sockeye salmon usually migrate to a lake and live there for up to two years. Similarly, time spent in the ocean varies from one to five years.

Watch [this Salish Sea Wild episode](https://www.youtube.com/watch?v=0tM9TRtqi3U&t=2s) by SeaDoc Society to observe intimate details of a coho salmon’s journey up the Skagit River to spawn.

**Ways the geosphere, biosphere hydrosphere, and/or atmosphere interact**

The perfect interaction of water quality and flow (hydrology), sediment (geology), and living things (biology) have supported Pacific salmon in the Salish Sea since the glaciers last receded and freed the inland waters for migration over 10,000 years. Their migration has sustained Coast Salish peoples since they first inhabited these shores, interrupted only when the people neglected to show them good care. Their populations have steeply declined since the advent of intensive fishing, logging, land development, pollution, and changes of ocean conditions that have occurred since settlers arrived. Now, newcomers are working with tribes and First Nations to apply Western and Indigenous science to recover this treasured resource. And kids can help. This unit synthesizes student understanding of salmon habitat needs, scientific investigation skills, value of Indigenous knowledge, and science communication to assess the health of salmon habitat near your school. There is rich opportunity for a visit to a local salmon stream for a habitat assessment and/or a hatchery visit to investigate their role in salmon recovery.

**Consider raising salmon in your school!**
Watching baby salmon wriggling out of their eggs, grow into swimming, feeding fry, and ensuring a healthy aquarium habitat all the while enriches this study of salmon greatly. There is no better phenomenon to motivate finding a suitable salmon stream than having babies who need a home. Make it a project! Work with a community partner to conduct stream surveys. Assess whether or not the stream would make an appropriate home for your salmon to be released then take a field trip to free the fry – achieving your research and Salish Sea Heroes projects all in one. Students can release individuals and wish them well on their journey. Parents/guardians, community members, Superintendents, and the local papers can join in on the event.
Divide salmon stream survey components between Explore Teams, classrooms, grades, or even schools, depending on who is involved in the project in your district.

Sources

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Further Learning and Classroom Resources

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Miller, Debbie S., John H. Eiler, and Jon Van Zyle, 2014. **A King Salmon Journey**. *University of Alaska Fairbanks Press.* Fairbanks, Alaska.

Reed-Jones, Carol. 2001. **Salmon Stream**. *Dawn Publications.* Nevada City, CA.

**Salmon in the Schools – Seattle**. Guidance, support, lessons, and resources for raising salmon in your school. Website last accessed Feb 10, 2023 at <https://sisseattle.org/>

Skagit Fisheries Enhancement Group. **Wild Salmon Trunk and other Teacher Resources.** Contact through website at <https://www.skagitfisheries.org/teacher-resources/> , via phone at 360-336-0172, or via email at sfeg@skagitfisheries.org

Suzuki, David, Sarah Ellis, and Sheena Lott. 2006. **Salmon Forest.** *Douglas & McIntyre Publishing Company.* Vancouver, BC.

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Turner, Bob. 2022. **Sockeye Salmon Run** *Uploads from Bob Turner*. Accessed online via YouTube at <https://www.youtube.com/watch?v=st2EFuA0wh8&list=UUHKOSD9xmRx21yS0OX_158Q&index=4>

**Unit Overview**

How can we gather and communicate evidence about how the geosphere, biosphere, and hydrosphere interact?

**Anchoring Phenomenon:** Baby coho salmon hatching out of their eggs in a school aquarium in need of a home stream.

**Research Challenge:** How can we determine whether a local stream has the appropriate interaction of geology, hydrology, and biology to support coho salmon?

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| **Lesson 1 -** 3 daysWhat drives animals to migrate? | **Lesson 2 – 4** daysWhat do salmon need for a healthy habitat? | **Lesson 3 – 5** daysHow can we gather and communicate evidence that a local stream will provide healthy habitat for salmon? |
| Session 1What do we wonder about the baby salmon hatching in a school aquarium?Session 2What causes birds to migrate along the Pacific Flyway? What are the effects of taking this epic journey? Session 3What patterns do we notice in other animals’ migrations? | Session 1How can we compare and contrast different species of Pacific Salmon?Session 2What do salmon need and need to overcome in each phase of their lifecycle?Session 3How have humans impacted salmon habitat before and since settlers arrived?Session 4How do Coast Salish communities take care of salmon? | Session 1How can we develop a research question that will guide what we survey at the stream?Session 2How will we measure the stream’s habitat components and organize our data?Session 3How do we use Science and technology to conduct our stream survey – field trip (actual or virtual) day!Session 4How can we analyze our data using graphs and diagrams?Session 5How can we use Western and Indigenous science ideas to protect and improve our local watershed for salmon? |
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|   **UNIT 7: MIGRATION STORYLINE**Students will figure out how to identify safe spawning habitat for a culturally- and ecologically-essential fish, Pacific salmon. They will first wonder at salmon eggs hatching in an aquarium and develop an essential question related to finding them a safe home stream. Learning the cultural and ecological importance of salmon to Salish Sea people and the whole food web will build a sense of urgency for their goal. Next, to figure out an answer to their essential question, students will work in Explore Teams to gather clues about animal migration in general, including an active bird migration model game and a migration mapping activity. From here they will focus in on salmon needs along their migration routes, specifically. They will find out what species of salmon migrate through the Salish Sea and compare and contrast the lifecycles of two of those species. With this lifecycle knowledge, they will become salmon and experience challenges and obstacles in an active, salmon lifecycle model. Students will discover human impacts on salmon habitat while comparing an important salmon river on maps from the 1800s vs. today and by reading and summarizing a scientific article on a mysterious toxin in urban streams.Indigenous knowledge will be elevated while viewing and reflecting on the Through Salmon Eyes video and words from Nisqually treaty rights activist, Billy Frank Jr. Next, they will model a dream (or nightmare!) salmon stream.With this background, teams will develop a research question to guide them in measuring stream health indicators at one or more sites in a local creek or compare more than one creek. Evidence will include Western science data and, if possible, Indigenous science in the form of knowledge shared about the creek by local tribal knowledge holders.Finally, they will make evidence-based recommendations for a safe release site and for improvements to the stream. They will keep these recommendations for Unit 8, Salish Sea Heroes, when it comes time to select and conduct an environmental improvement project with support from a community partner. For this reason, keep journals from each unit you choose to implement until after Unit 8, the culminating unit, is complete. |  **TERMS FOR THE TEACHER**A picture containing text, sign  Description automatically generated**Assessment**- a chance to measure overall growth through a pre- and post-assessment for each unit. **A picture containing object, mirror  Description automatically generated****Background research**- includes the Explore the Salish Sea book, articles, videos, games, songs, and expert guests.Shape  Description automatically generated with low confidence**Essential question** – The overarching question that drives the background research, games, activities, and authentic inquiry for each unit.Checkbox Checked with solid fill**Formative Assessment** – opportunity to check for student understanding and misconceptions.**Games-** games are used to introduce and reinforce concepts through play. Instructions are included.**Diagram  Description automatically generatedMind Map** – Draw a model with the problem in the center circle and clues to solving it connected to it, grouped by related ideas. **Shape  Description automatically generated with low confidenceModel** – A physical, mathematical, or conceptual representation of an object, process, or event**Text  Description automatically generated****Team Read** – The equitable division of a large piece of literature among teammates, each getting summarized individually, and then synthesized into one summary. This allows each student to feel that they have contributed an important piece of background research, while accommodating individual reading levels. A picture containing sign, dark  Description automatically generated**Team Talk** –Each student shares ideas with their Explore Team for 1 uninterrupted minute to ensure equitable sharing and give a voice to students who may not speak out in a full-class discussion. The Science Communicator reports a summary to the class. This symbol is also used when students communicate their science with the class or greater community.**A picture containing text, sign, dark  Description automatically generated**A picture containing icon  Description automatically generated**Tribal Knowledge** - Work with your district’s Tribal or First Nations Liaison, if you have one, to invite a cultural outreach or natural resources employee from a local tribe or First Nation to meet with your class and share *what they deem appropriate* about the topic.**Wonder** – a phenomenon, problem, or discrepant event that sparks curiosity in students and initiates exploration*Icons in this curriculum are from "https://www.flaticon.com/ free-icons/chemistry" title="chemistry icons">Chemistry icons created by Freepik - Flaticon</a>* |

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| **LEARNING TARGETS LESSON 1:*** Analyze a living model of shorebird migration for challenges and benefits
* Use a map scale to calculate the distance of a migration route.
* Identify patterns in migration across a variety of animals, including that the Salish Sea is a destination or rest stop for many migratory species

 **TEACHING WITH THE 5 E’s FOR A COHERENT STORYLINE – LESSON**ENGAGE activity: Students wonder about baby coho salmon hatching out of eggs in an aquarium and in need of a home stream**Practice**: Asking questionsEXPLORE activity: Students become shorebirds and model challenges and benefits of migration along the Pacific Flyway.**Practice:** Developing and using models. EXPLAIN activity: Students explain the benefits versus challenges of shorebird migration and what makes the epic journey worthwhile.**Practice**: Evaluating and Communicating InformationEXTEND activities: Students measure the migration route of one animal species on a map and use scale to calculate actual distance.**Practice**: Using Mathematics and Computational ThinkingEVALUATE activity: Students create a class graph including all of their species migrations to compare distances then discuss patterns across species.**Practices**: Analyzing and Interpreting Data, Communicating and Evaluating Information | **NGSS PERFORMANCE EXPECTATIONS**Three Dimensions of NGSSblue=Practice orange=DCI green= Crosscutting ConceptGRADE 5[5-LS2-1](https://www.nextgenscience.org/dci-arrangement/5-ls2-ecosystems-interactions-energy-and-dynamics)Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.* [5-ESS3-1](https://www.nextgenscience.org/pe/5-ess3-1-earth-and-human-activity) Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

**BRITISH COLUMBIA SCIENCE CURRICULUM****If using this content for grades 4 or 6-8:*** [MS-ESS2-1](https://www.nextgenscience.org/pe/ms-ess2-1-earths-systems) Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.
* [MS-LS2-1](https://www.nextgenscience.org/pe/ms-ls2-1-ecosystems-interactions-energy-and-dynamics) “Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

[MS-LS2-4](https://www.nextgenscience.org/pe/ms-ls2-4-ecosystems-interactions-energy-and-dynamics) Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populationsCollect and analyze evidence to explain the safety level of the stream for salmon. |

**TEACHER PREP LESSON 1**

* Review unit plan, student journal, and slideshow together. Revise these as desired and appropriate for your community and ecosystem.
* Print student journals on 8.5 x 14” paper, booklet fold, in-color if possible. If you choose to print so each journal page is on a full sheet of 8.5 x 11” paper, change settings in the Word document. It is automatically set to print in booklet fold on 8.5 x 14” paper as is.
* Connect with a community partner who can support a forage fish spawning survey in Lesson 3. Plan ahead for a field trip to conduct the survey.
* Invite a visit by an indigenous knowledge holder from the tribe or First Nation upon whose territory your school resides. This might also be your community partner for the forage fish survey. See suggestions for developing partnerships with local tribes and First Nations in [A Note About Indigenous Knowledge here](https://ucdavis.box.com/s/sbuff9hbyz3gq3fcwn58au1nwfq4jq1w).
* Review unit vocabulary (see student journal pp.5-6) and consider ways you will weave the use of these words naturally through the lessons. Students will return to define them opportunistically as they become familiar through use.
* Print, cut, fold, and place [Pearls of Wisdom](https://ucdavis.box.com/s/yv7wjrqconqjprrzh87nw3dr63kx1cqi) into a shell or other container for students to draw from, if you choose to include this practice of inspiration.
* Decide on Explore Teams composition. It works best to have mixed ability groups, where students may contribute their individual strengths to the team and support one another where needed. If you haven’t already, label spots at each table with Explore Team titles (see student journal p.5). When switching roles, students can rotate seats within their own team or find their new role in their new team.
* Print Migration [pre-assessment](https://ucdavis.box.com/s/yzqomszv8rui19rscrmap9fdgnivblci) or prepare to administer electronically.

Session 1

* Take/find photos of a nearby stream or river for **slide 9** (coho wonder activity) if you are not able to visit a stream. This should be the stream you will target for your salmon stream survey, if you are able to do one with a community partner. Replace **slide 9** photos with photos of your local stream. Note: if your stream or river is available, show the [ArcGIS Fish view images of it on this website,](https://www.arcgis.com/apps/MapTour/index.html?appid=eedbd8d9bffc4a45acb8345056ef6c9c) also listed in Online Resources for Lesson 2 below.

**Salmon in the Classroom** (optional) Connect with the nearest hatchery or salmon enhancement program to set up your classroom, library, or hallway for raising salmon from eggs to fry (aquarium, gravel, chilling unit, water quality test kit, net, source of chlorine-free water). This is typically done from mid-January to just before spring break, ~10-12 weeks.

**My Way or the Pacific Flyway Game**

Print and cut the game cards, set up the play area, mark boundaries and staging areas.

**Map Your Migration**

Familiarize yourself with an online mapping tool, such as Google Earth, Map Hub [www.maphub.net](http://www.maphub.net) or Esri.com (free to all schools!), enough to measure a pathway with a measuring tool. Prepare a spreadsheet, such as a Google Sheet and have it ready to enter data to graph distance traveled by each animal.

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| **MATERIALS LESSON 1** Session 1 ENGAGE* Internet connection
* Audio-visuals equip for slideshow/videos
* Printed student journals
* Task Force slideshow
* Mind Map for adding clues, building schema

Session 2 EXPLORE and EXPLAINMy Way or the Pacific Flyway game* Large outdoor space
* 6 cones or other boundary markers for the play field
* 3 large hula hoops or rope
* 3 pennies or flags to identify predators: one peregrine falcon, one merlin falcon, one bald eagle
* The Incredible Journey Game Cards (10 Northern, 10 Southern, 14 Staging Area), print and cut
* A printed, cut-out of each of the birds in the list (optional) for students to pin or tape to shirts

Session 3 ELABORATE and EVALUATE Map your Migration activity:* Internet access for Explore Teams
* Mapping tool, such as Google Earth, MapHub, or Esri or printed maps for each animal
* one 12-inch piece of string per pair of students
* one ruler per pair of students
 | **WEBLINKS LESSON 1***Student journal*[https://pacificeductioninstitute.sharepoint.com/:w:/s/Program/ET\_OOatLi25LkpajUNuBsLsBx29M9E0KYdFQDYulqs5Mug?e=yTWt8j](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/ET_OOatLi25LkpajUNuBsLsBx29M9E0KYdFQDYulqs5Mug?e=yTWt8j) *Slideshow*[https://pacificeductioninstitute.sharepoint.com/:p:/s/Program/EXOWPEr-DL9Jj67u52wmrE0BdSjJlIxfmmcTWSscvKAoJg?e=SJvjpA](https://pacificeductioninstitute.sharepoint.com/%3Ap%3A/s/Program/EXOWPEr-DL9Jj67u52wmrE0BdSjJlIxfmmcTWSscvKAoJg?e=SJvjpA) *Pre-assessment*[https://pacificeductioninstitute.sharepoint.com/:w:/s/Program/ERVnSfV5xNxDh70fCUg8bFIBJGkWFkq6YvnUqHye\_CXR4A?e=eE4KOa](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/ERVnSfV5xNxDh70fCUg8bFIBJGkWFkq6YvnUqHye_CXR4A?e=eE4KOa) *Pre-assessment key*[https://pacificeductioninstitute.sharepoint.com/:w:/s/Program/ETIbAL-4ZNFHqsfNw4mBm\_EBnFfuET8nbM0j1FW017SLxA?e=stUOkZ](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/ETIbAL-4ZNFHqsfNw4mBm_EBnFfuET8nbM0j1FW017SLxA?e=stUOkZ) *Pearls of Wisdom*[https://pacificeductioninstitute.sharepoint.com/:w:/s/Program/Edk\_J84PpalCus5QP4N-zdgB9hW2fRCelCU6NiwZW5oxrw?e=F6n5V5](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/Edk_J84PpalCus5QP4N-zdgB9hW2fRCelCU6NiwZW5oxrw?e=F6n5V5) *Wonder**1. Coho hatching video*[<https://www.youtube.com/watch?v=dnX4ZKvYTHs>](https://www.youtube.com/watch?v=dnX4ZKvYTHs) *2. Baby coho hatching in an aquarium need a home stream!* *Developing an Essential Question*<https://www.scholastic.com/teachers/articles/teaching-content/essential-questions/>*Voices of the Pacific Flyway video* by the Commission for Environmental Cooperation in collaboration with the Cornell Lab of Ornithology<https://www.youtube.com/watch?v=3_CqIJbZx4I> *My Way or the Pacific Flyway Game*[https://pacificeductioninstitute.sharepoint.com/:b:/s/Program/Eaxq6nCTs8xEnqF6-AZcbMsBnRP8a42cd\_weiywqV2xe9w?e=UGSfkk](https://pacificeductioninstitute.sharepoint.com/%3Ab%3A/s/Program/Eaxq6nCTs8xEnqF6-AZcbMsBnRP8a42cd_weiywqV2xe9w?e=UGSfkk)  |

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| TIME | **TEACHER GUIDE: LESSON 1 WHAT DRIVES ANIMALS TO MIGRATE?** |
| Session 11 min2 min15 min17 min5 min5 min5 min | **ENGAGE**1. Provide ‘Pearls of Wisdom’ (inspirational quotes) in a large shell.
2. Distribute student journals. A picture containing text, sign  Description automatically generatedDirect students to form **Explore Teams** using the guide on **slide 4** and **journal p2** and rotating roles from the previous unit. Have them sign their stewardship pledge, **journal p3**, now or just before your field trip to keep the promises fresh in mind.
3. Administer the [Migration pre-assessment](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/ERVnSfV5xNxDh70fCUg8bFIBJGkWFkq6YvnUqHye_CXR4A?e=GdcN9I), **slide 5** (This is a separate, printed hand-out or digital quiz).
4. A picture containing text, different, same, several  Description automatically generated have students read ***Explore the Salish* *Sea* Ch.7** *Epic Journeys*, **slide 6** (book image) then free-write on **journal p4**.
5. Direct them to highlight or circle unfamiliar vocab words on **journal p5** and add any more they are unsure of from the chapter. They should define these as they are learned naturally, through repeated exposure and use throughout the unit. Return to this page opportunistically as you go.
6. A picture containing text, sign, dark  Description automatically generated**Wonder**: Show salmon eggs hatching video clip, **slide 7**, then show coho video clip, **slide 8.**  Guide students to then share what they **saw** and **thought** with each other in a ***Team Talk*** about the phenomenon. Then ask them to write what they **wondered** on **journal p6**, Ask Science Communicators to share out with the whole class what their team wondered. Show **slide 9** and have Explore Teams consider whether their local stream is safe for salmon.
7. Shape  Description automatically generated with low confidenceGuide the formation of an [Essential Question](https://www.scholastic.com/teachers/articles/teaching-content/essential-questions/) as a class, **slide 10**, using what students wondered about the struggling coho and considering salmon facts shared by the class so far. Have students write their question on **journal p6**. Something related to: “Is our stream safe for coho salmon?” But allow students freedom in question formation.
 |
| Session 22 min18 min30 min | **EXPLORE** A close up of a logo  Description automatically generated1. Remind the class of their essential question and ask if they need to conduct some background research, **slide 11.** Show **slide 12** and ask students to share what they know about migrating wildlife, why animals migrate, and why the Salish Sea would be an important rest stop or “staging area.”
2. **A picture containing man  Description automatically generated**Show [Voices of the Pacific Flyway video.](https://www.youtube.com/watch?v=3_CqIJbZx4I) Prompt a ***Team Talk*** on the importance of cross-boundary/culture/management organization cooperation in ensuring the health of migratory wildlife. Why do states, countries, and sovereign indigenous nations need to cooperate to help migratory species? Ask Science Communicators to share out with the whole class.

**EXPLAIN**1. Play the game, [My Way or the Pacific Flyway](https://pacificeductioninstitute.sharepoint.com/%3Ab%3A/s/Program/Eaxq6nCTs8xEnqF6-AZcbMsBnRP8a42cd_weiywqV2xe9w?e=rKQEOq), **slide 13**, **journal p7**.Include time for reflection at the end – what were the challenges and benefits of migration?
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| Session 3\*35 min15 min**Total****2 hrs.** |  **ELABORATE**1. Guide *Map Your Migration activity*, **slide 14**, **journal p8** Each Explore Team should choose a different migratory animal, answer questions with books, articles, or a web-based search using listed websites or others you trust. They will then measure the distance travelled on its migratory path. This may be done with a mapping tool online (Google Earth) or by printing maps for each animal and providing string with which to lay along the path, measure the distance on the map, and use math to convert the distance to miles or km. This is a good chance to connect scale on the map with scale used in building their watershed models in Unit 2 Stormwater and/or ROVs in Unit 5 Ocean Tech.

A picture containing sign, dark  Description automatically generated**EVALUATE**1. Create a class graph (a bar graph works well) on paper or in Google Sheets, Excel, or another graphing program with Species on one axis and Migration distance on the other. Have Science Communicators report to the class while Lab Techs add the distance travelled to the class graph.
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| **LEARNING TARGETS LESSON 2*** Identify patterns in the habitat needs during each salmon lifecycle stage.
* Understand that there are 5 species of salmon plus steelhead and sea-run cutthroat trout, and each species varies in its migration pattern.
* Consider changes to salmon habitat and how they may have affected salmon
* Know that salmon sustain life for Coast Salish peoples, are respected for their sacrifice, and honored with a First Salmon Ceremony.

**TEACHING WITH THE 5 E’s FOR A COHERENT STORYLINE – LESSON 2**ENGAGE activity: Observe a video of coho gasping in an urban stream. **Practice**: Asking Questions and Defining ProblemsEXPLORE activities: Create a Salmon High Five to identify each of the Pacific salmon types. Compare and contrast Chinook vs. chum lifecycles, Draw a habitat that meets the needs of each phase of a salmon’s lifecycle. Model a salmon lifecycle in an obstacle course.**Practice:** Obtaining information (and art!), Constructing explanations, Developing and Using Models EXPLAIN activity: Students compare and contrast the Duwamish River from an aerial photo from the 1800s vs. today, including measuring the total river miles of each.**Practice**: Communicating and Evaluating Information, Using mathematics and computational thinking: ELABORATE activity: Learn from Coast Salish knowledge about salmon, how to take care of their habitat, and, if possible, the history of the local stream. **Practice**: Asking Questions and Defining Problems, Obtaining InformationEVALUATE activity: Identify patterns in the changes in salmon habitat over time.**Practice**: Constructing Explanations | **NGSS PERFORMANCE EXPECTATIONS**blue=Practice orange=DCI green=Crosscutting Concept**BRITISH COLUMBIA SCIENCE CURRICULUM**Grade 5 Content –**If using this content for grades 4 or 6-8:*** [MS-LS2-1](https://www.nextgenscience.org/pe/ms-ls2-1-ecosystems-interactions-energy-and-dynamics). “Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.”
* [MS-LS2-4](https://www.nextgenscience.org/pe/ms-ls2-4-ecosystems-interactions-energy-and-dynamics) Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
* [MS-ESS3-3](https://www.nextgenscience.org/pe/ms-ess3-3-earth-and-human-activity) Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

BC Science Curriculum Contentst fit the experience your class will have. |

**TEACHER PREP LESSON 2**

Session 1

**Team Talk**

Provide two sticky note pads of different colors for each Explore Team and one large poster paper for the class, entitled “anadromous fish habitat needs.” Divide the poster paper into two sides, one column entitled “Know”, the other “Need to Know.” Explore Teams will post their sticky notes to this poster.

**Know Your Salmon ID and Salmon Lifecycle activities**

Print one Chinook lifecycle sheet (p1 of pdf)

and one pink salmon lifecycle sheet (p2 of pdf) for each Explore Team. Half of each Team will get Chinook, the other half will get pink. Print and cut out one lifecycle stage card set for each student. Half get Chinook sets; the other half get pink salmon sets. Cut, fold, and glue each sheet so the life stage is on one side and the adult salmon image is on the other to keep the Chinook lifecycle cards separate from the pink salmon. Cut into individual cards. Bind sets with paperclips or small envelopes.

**Hooks and Ladders game**

Print [instructions](https://ucdavis.box.com/s/i48fw2y15ihcncwluwmpy7olh20ewf8w) and gather materials for Hooks and Ladders Game. Allow 15 minutes for set-up.

Recruit a few parent/guardian volunteers for game day to be predators, dam tur- bines, or fishermen (or even kid wranglers).

Students may also take on these roles.

**First Salmon Ceremony Culture Connection** Work with your school or district tribal or First Nations liaison to invite a visit by an outreach person with a local tribe or band to share about the importance of salmon in their lives in what- ever way the Tribe or Band feels appropriate. Thinking ahead-arrange for the Traditional Knowledge-gathering team to learn from the knowledge-sharer about the salmon stream you will survey in Lesson 3.

Prepare a gift with your students to offer as thanks to honor their visit.

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| **MATERIALS LESSON 2****Know Your Salmon activities** for each Team**:** * Colored pencils or markers for Salmon High Five art
* Photos or poster of the 7 species of Pacific salmon
* Dichotomous key (in student journals)

**Salmon Lifecycle activity:*** Lifecycle poster, available online or at your nearest hatchery or salmon enhancement organization.
* Printed and cut out cards with salmon life cycle stages and species names.
* Salmon lifecycle poster

**Option Duwamish River Miles activity:*** Duwamish River Habitat maps
* Yarn
* Scissors
* Rulers

**Team Read:*** Team Read template
* poster paper
* one different colored marker for each group member
* Team Read article: Coho mortality, Seattle Times

**Cultural Connection Salmon Story** * Invitation to a tribal or First Nations speaker to share about salmon and their people or the Through Salmon Eyes video.
* Gifts to thank the guest speaker

 ADDITIONAL RESOURCES FOR ELA TIME:***Salmon Stream***, Carol Reed-Jones and Michael S. Maydak***A King Salmon Journey***, Debbie S. Miller and John Heinrich Eiler | **WEBLINKS LESSON 2***Salmon High 5 Art Activity video*<https://www.youtube.com/watch?v=a3FaOXBUDGo> *Salmon species ID activity cards*[https://pacificeductioninstitute.sharepoint.com/:p:/s/Program/Ebd4Mnw4zMtIkKoNkV5p8OYBBrZ3X4kI8b9hLBpyfElN-w?e=bLjsp4](https://pacificeductioninstitute.sharepoint.com/%3Ap%3A/s/Program/Ebd4Mnw4zMtIkKoNkV5p8OYBBrZ3X4kI8b9hLBpyfElN-w?e=bLjsp4) *Hooks and Ladders Game Instructions* [https://pacificeductioninstitute.sharepoint.com/:w:/s/Program/EVja1jLhF8dEtksB9lMc9bcBU8IcGkGGfu3FqjMkS10SOg?e=yInkfk](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/EVja1jLhF8dEtksB9lMc9bcBU8IcGkGGfu3FqjMkS10SOg?e=yInkfk) *Through Salmon Eyes video* (NW Indian Fisheries Commission/Since Time Immemorial curriculum)<https://vimeo.com/3584149> *Salmon Challenges Game,* Native Knowledge 360, Smithsonian Natl Museum of the American Indian<https://americanindian.si.edu/nk360/pnw-history-culture/pnw1-salmon/> *Duwamish River maps*[https://pacificeductioninstitute.sharepoint.com/:b:/s/Program/EWhirXiIPHJFnQUmzyTZGzkBO6mryxUaLXXL8tFAXIxb3Q?e=VzSeMB](https://pacificeductioninstitute.sharepoint.com/%3Ab%3A/s/Program/EWhirXiIPHJFnQUmzyTZGzkBO6mryxUaLXXL8tFAXIxb3Q?e=VzSeMB) *Coho dying before spawning in urban streams*[<https://www.youtube.com/watch?v=Nfnn4CMSysY&feature=youtu.be>](https://www.youtube.com/watch?v=Nfnn4CMSysY&feature=youtu.be) *Student Research Resources*[https://pacificeductioninstitute.sharepoint.com/:f:/s/Program/Es4BrqVVyARIt\_f\_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=ChWmq5](https://pacificeductioninstitute.sharepoint.com/%3Af%3A/s/Program/Es4BrqVVyARIt_f_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=ChWmq5) *Survive the Sound, Long Live the Kings*<https://www.survivethesound.org/home> *Extra video: I Am Salmon*<https://www.youtube.com/watch?v=gFswGt7o_08&list=PLu8nNzPLSc7QPiLfvNQsTbT-L_eq0cXjO&index=12>  |

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| TIME | **TEACHER GUIDE LESSON 2, WHAT MAKES A HEALTHY SALMON HABITAT?** |
| Session 15 min5 min20 min20 min | **ENGAGE**1. Narrow the research focus to migrating fish, “Now that we have explored a few different migrating animals, let’s talk about ones that actually travel from the sea to the mountains – anadromous fish, **slide 15.** See if anyone can tell the salmon apart in **slide 16**. Ask Explore Teams to hold a ***Team Talk*** to share their own connections to the anadromous fish that share the watersheds.
2. Refer back to the Essential Question, **journal p6**, and ask what clues they need to gather next. They will likely want to learn about what salmon need for a safe habitat. Let them know that not all salmon are currently getting what they need and there is a mystery in Longfellow Creek. Show the video in **slide 17.** Have students think, pair, share about what this makes them wonder. Afterward, ask who thinks we have enough salmon clues to figure this out. No? Then let’s do some art and play some games to gather more!
3. Let students explore the Know the Salmon High Five, **journal p9**, practice, and test one another for fun. Provide colored pencils or markers and have students follow [the video](https://www.youtube.com/watch?v=a3FaOXBUDGo) instruction to create their own salmon high five art, **slide 18,** **journal p10**.
4. Guide the *Salmon ID* activity, **journal p11, slide 19**. Divide each Team in half. Assign half of each Team to Chinook and the other half to pink (don’t reveal which is which). Distribute lifecycle cards to each student. Challenge students to identify their mystery salmon using the dichotomous key, **journal p11**, and the [lifecycle cards](https://pacificeductioninstitute.sharepoint.com/%3Ap%3A/s/Program/Ebd4Mnw4zMtIkKoNkV5p8OYBBrZ3X4kI8b9hLBpyfElN-w?e=GNypKJ). Show **slide 19** or refer to a classroom poster to review then have students glue or tape their lifecycle stage cards in order of events on **journal p12 or 13**. Finally, have teams rejoin and share the differences and similarities between the two species’ lifecycles. Ask them what these differences mean for habitat needs.
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|  Session 215 min35 min | **EXPLORE**1. Show **slide 20** (salmon habitats). Have students sketch and label what each habitat on a salmon’s migration should include in Have to Have a Habitat-Salmon Style on **journal p14**. Make sure they include river, tidal marsh, open ocean, and eelgrass meadow, one for each stage. Doing this on larger art paper or as part of your Salish Sea mural is also great.
2. **A picture containing man  Description automatically generated**Show **slides 21-22**, explain how to play the [Hooks and Ladders](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/EVja1jLhF8dEtksB9lMc9bcBU8IcGkGGfu3FqjMkS10SOg?e=ZmuvCr) obstacle course game. Modify if necessary. For students not able to run the physically-active game, include them in a less-active role and use the [Online game alternative.](https://americanindian.si.edu/nk360/pnw-history-culture/pnw1-salmon/index.html) Hold a class discussion to share triumphs and challenges. Invite them to journal about the experience under NOTES, **journal p15.**
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|  Session 320 min30 min | **EXPLORE Continued**1. Show **slide 23** (Duwamish Valley images) and ask Chief Scientists to lead a Team Talk to share what students notice without any teacher input. Assign the River Miles activity, **journal p16**. Invite teams to hold another Team Talk to discuss what they noticed in their comparison and how that might impact salmon habitat.
2. Announce that you dug up a source of clues about the coho mystery in Longfellow Creek. Have Lab Techs pick up copies of the [coho article](https://pacificeductioninstitute.sharepoint.com/%3Ab%3A/s/Program/EYX22un90RJPriUTA8A5vCQBDvKIOaarsHpcAwARXaOONQ?e=rbvMNG), conduct a Team Read, **slide 24**, then invite Science Communicators to share their team’s summaries of what is happening to coho in urban streams. Add clues to the class mind map
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| Session 440 min 10 min | **ELABORATE**1. **A picture containing knife  Description automatically generated**Include your Coast Salish Liaisons and work with your district’s tribal or first nations liaison to invite a local tribe or First Nation speaker to share the meaning of salmon to their people and what they do to help salmon habitat, **slides 25 and 26.** Inform students that Coast Salish peoples help recover salmon and \*had to take the state government to court to enforce their right to fish for salmon. \*Since Time Immemorial curriculum (STI)connection – Boldt Decision.
2. If hosting a tribal guest is not an option, please share a Coast Salish salmon story, such as [Through Salmon Eyes](https://vimeo.com/3584149) by the NW Indian Fisheries Commission, shared in the STI curriculum. This story is shared with permission from the NWIFC. If you use a different story, make sure you have its tribe’s permission to share it, as many stories are sacred and private. Have students share their reflections on the salmon story on **journal p 17**.

**EVALUATE**1. Ask students to consider what was learned from the Coast Salish visitor and/or Salmon Eyes video, the River Miles activity, and the coho in urban streams. Conduct a Team Talk to discuss connections between all of these. What do the changes in the salmon habitat have in common? How have humans shaped the ecosystem?

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| **LEARNING TARGETS LESSON 3 SALMON STREAM SURVEY:*** Understand that the process of science includes the explorations, observations, and discoveries scientists use to solve a problem or mystery.
* Know that student environmental data can be used to determine the health of local streams and salmon populations.
* Understand that science-based recommendations can result in actions that improve ecosystems for wildlife and people

  **TEACHING WITH THE 5 E’s FOR A COHERENT STORYLINE – LESSON 2**ENGAGE activity: Develop a research question to drive the stream survey**Practice**: Asking questionsEXPLORE activities: Conduct a survey of a local stream for water quality, spawning habitat, riparian vegetation, macroinvertebrates, and structural complexity.**Practice:** Planning and Carrying Out Investigations, EXPLAIN activity: Analyze stream survey data through graphs and diagrams.**Practice**: Analyzing and Interpreting Data EXTEND activities: Consider a claim, evidence, reasoning, implications, and applications of the survey results.**Practice**: Using Mathetmatics and Computational Thinking, Constructing Explanations and Designing Solutions EVALUATE activity: Support a claim about the survey results with evidence from survey data and Indigenous knowledge and determine the implications and applications of this new information in the environment in a Get CERIAs Forum **Practice**: Engaging in Argument from Evidence, Communicating and Evaluating Information | **NGSS PERFORMANCE EXPECTATIONS**blue=Practice orange=DCI green=Crosscutting Concept* [5-ESS3-1](https://www.nextgenscience.org/pe/5-ess3-1-earth-and-human-activity) Obtain and combine information about ways individual communities use science ideas to protect the earth’s resources and environment.
* [3-5-ETS1-2](https://www.nextgenscience.org/pe/3-5-ets1-2-engineering-design)Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

 Middle School* [MS-LS2-1](https://www.nextgenscience.org/pe/ms-ls2-1-ecosystems-interactions-energy-and-dynamics). “Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.”
* [MS-LS2-4](https://www.nextgenscience.org/pe/ms-ls2-4-ecosystems-interactions-energy-and-dynamics) Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

[MS-ESS3-3](https://www.nextgenscience.org/pe/ms-ess3-3-earth-and-human-activity) Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment**BRITISH COLUMBIA SCIENCE CURRICULUM****If using this content for grades 4 or 6-8:** |

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|  **TEACHER PREP LESSON 3****Team Talk**Provide two sticky note pads of different colors for each Explore Team and one large poster paper for the class, entitled “anadromous fish habitat needs.” Divide the poster paper into two sides, one column entitled “Know”, the other “Need to Know.” Explore Teams will post their sticky notes to this poster.**Salmon stream assessment**Make arrangements with a [community expert](http://www.juniorseadoctors.org/map) for what part of the salmon lesson they will support with their own lessons, materials, and stream survey design. Community partners may provide their own stream survey materials and data sheets to use in place of those listed below and provided in the journal. If not, gather materials listed below. Note: There is an option to have students make their salmon stream research into a formal presentation, **journal pp 44-50**. Remove these pages if you will be making an overall presentation instead.\*If possible, print field sheets on Rite-in-the-Rain paper\*Macroinvertebrate Survey Prep -print and laminate ID guides to keep in your classroom always. Plan for who will walk in the water to stir up the macroinvertebrates from the bottom and catch them in a screen or kick net.\*Water Quality Survey Prep -order water quality test kits for some or all of the water quality components listed in the journal\*Riparian Vegetation Survey Prep – gather materials\*Stream Complexity Survey Prep – gather materialsPrepare to share results and recommendations for site selection outside of your own classroom or even your own school, if collaborating between several schools.*
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| **MATERIALS LESSON 3:****Team Read:*** Team Read template
* poster paper
* one different colored marker for each group member
* Team Read article: Coho mortality, Seattle Times

 **Salmon Stream Survey**Macroinvertebrate Survey: * + Macroinvertebrate ID guides
	+ dip net or window screen
	+ empty water bottle
	+ sorting trays
	+ magnifying glasses, one per team member

Water Quality Survey: * + Water Quality test kit
	+ strips or sensors for: nitrogen, phosphate, dissolved oxygen, coliform bacteria (optional), and pH

Vegetation Survey: * + Plant ID book or guide for local plants, i.e. Plants of the Pacific NW Coast, Polar and MacKinnon
	+ Long rope or survey ribbon (transect line)

Stream Complexity Survey:* 10 meter measuring tape
* Stop watch
* Fishing bobber or another float
* Dip net or net attached to long pole

EXTENSION ACTIVITY**Fun extension**: [Survive the Sound challenge by Long Live the Kings.](https://www.survivethesound.org/home) Compete with other schools and organizations to see if your fish will survive its journey from its home stream up and out of the Puget Sound. Each fish represents and actual steelhead tracked by scientists. Sign up for a fish in April-May to compete! | **WEBLINKS LESSON 3:**Migration Slideshow [https://pacificeductioninstitute.sharepoint.com/:p:/s/Program/EXOWPEr-DL9Jj67u52wmrE0BdSjJlIxfmmcTWSscvKAoJg?e=ep8DoY](https://pacificeductioninstitute.sharepoint.com/%3Ap%3A/s/Program/EXOWPEr-DL9Jj67u52wmrE0BdSjJlIxfmmcTWSscvKAoJg?e=ep8DoY) Migration Student journals [https://pacificeductioninstitute.sharepoint.com/:w:/s/Program/ET\_OOatLi25LkpajUNuBsLsBx29M9E0KYdFQDYulqs5Mug?e=vwr49D](https://pacificeductioninstitute.sharepoint.com/%3Aw%3A/s/Program/ET_OOatLi25LkpajUNuBsLsBx29M9E0KYdFQDYulqs5Mug?e=vwr49D) Student Research Library[https://pacificeductioninstitute.sharepoint.com/:f:/s/Program/Es4BrqVVyARIt\_f\_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=HQc5Ow](https://pacificeductioninstitute.sharepoint.com/%3Af%3A/s/Program/Es4BrqVVyARIt_f_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=HQc5Ow) Student Research Library Original Articles[https://pacificeductioninstitute.sharepoint.com/:f:/s/Program/Es4BrqVVyARIt\_f\_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=HQc5Ow](https://pacificeductioninstitute.sharepoint.com/%3Af%3A/s/Program/Es4BrqVVyARIt_f_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=HQc5Ow) How Science Works Web Interactive<https://media.hhmi.org/biointeractive/click/understanding-science/#/intro/1> How Science Works Process of Science website (explore this whole site, it is AWESOME!)<https://undsci.berkeley.edu/article/howscienceworks_01>ArcGIS FishView<https://www.arcgis.com/apps/MapTour/index.html?appid=eedbd8d9bffc4a45acb8345056ef6c9c>Salmon research resources for Explore Teams[https://pacificeductioninstitute.sharepoint.com/:f:/s/Program/Es4BrqVVyARIt\_f\_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=HQc5Ow](https://pacificeductioninstitute.sharepoint.com/%3Af%3A/s/Program/Es4BrqVVyARIt_f_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=HQc5Ow) Coho mortality syndrome video clip<https://www.youtube.com/watch?app=desktop&v=Nfnn4CMSysY&feature=youtu.be>Team Read article<https://ucdavis.box.com/s/warkwcfsr91lm6whjckiupkkqcy487ec> Team Read Template and Instructions[https://pacificeductioninstitute.sharepoint.com/:b:/s/Program/Ecuv\_ke9SnlDp4EGihMOrs8BtJY7CUaAIR4g2HU8IiV63Q?e=F5FoRQ](https://pacificeductioninstitute.sharepoint.com/%3Ab%3A/s/Program/Ecuv_ke9SnlDp4EGihMOrs8BtJY7CUaAIR4g2HU8IiV63Q?e=F5FoRQ)  Puget Sound Stream Benthos (macroinvertebrates) stream health map<https://pugetsoundstreambenthos.org/Biotic-Integrity-Map.aspx>Salmon Defense sčədadxʷ (salmon) cartoon with Billy Frank Jr. <https://www.youtube.com/watch?v=D15itTjuY-g>  |

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| **TIME** | **TEACHER GUIDE LESSON 3: SALMON STREAM SURVEY** |
|  Session 12 min5 min10 min10 min20 min10-20 min | **ENGAGE**1. Just for fun, show **slide 27** and invite Explore Teams to list all the species they can that depend on salmon to survive. Give a small prize or just kudos to the Team that comes closest to 137!
2. Ask students which habitat in the salmon migration humans have had the most impact upon. Accept all answers. Show the Riparian Zone video, **slide 28**. All this background research has prepped them to become a salmon fry and create their Dream (or Nightmare) Stream! **Journal pp 18 – 19**, **slide 29**. They can do this on **journal p 18** or on a salmon-shaped paper cut-out with colored pencils, markers, paints, etc.
3. Ask students if they are ready to put science to work to find a safe home for baby salmon. If you or someone in your community are raising salmon, this survey will determine if one or more sites are suitable salmon habitat to release your fry. Let students know they will divide into research teams by stream survey component (decide ahead if you will divide by Explore Teams, classrooms, or even schools if doing the survey district-wide). Show **slides 30-31** to remind them of the components they are looking for in a dream stream. Show **slide 32** and have students consider the survey options. Note that each survey has a type of scientist associated with it, just to let students know these are jobs people do. There are many careers associated with these, including tech-level positions, social media managers, and more.
4. To help students understand and select their survey component, go over all survey components using **slides 33 – 53**, then have them choose using **slide 54**.

**EXPLORE**1. Provide printed or electronic [salmon habitat research articles](https://pacificeductioninstitute.sharepoint.com/%3Af%3A/s/Program/Es4BrqVVyARIt_f_c29pKKQBSZkrI3k6T1tf-30sDT52cw?e=q7vpUy) to each team, according to their survey topic. Divide background research resources equitably amongst teams, considering varying reading levels and conduct a [Team Read](https://ucdavis.box.com/s/ewpsxr21jo0yjp55omttjpjxlgz6q97a), **slide 55**. Divide each relevant article into sections for each team or give one, whole article to each student. Ask the Science Communicators to share out the background research results (article summaries) with the class.
2. Ask who is ready to do actual scientific research of our own, **slide 56**! Support teams in developing a research question that will guide their specific survey, using **slide 57**. For additional guidance here, review the Guiding the Process of Science tutorial in our online training video at [www.explorethesalishseatraining.org](http://www.explorethesalishseatraining.org)
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|  Session 215 min35 min | **EXPLORE CONTINUED**1. Walk students through the [How Science Works project tracking tool](https://media.hhmi.org/biointeractive/click/understanding-science/#/intro/1) , **journal p20**, **slide 58** (link to tool also in slide). Give them a few minutes to explore and identify the step they are currently on in their salmon research by circling steps they’ve taken and connecting them in order with arrows. Congratulate them on already having launched their own process of science! Have the Research Associates create & manage a How Science Works project tracker online. Save the tracker to a group folder.
2. Show students the available materials (your own or provided by your community partner) and the field sheets for each stream survey component, **journal pp 24-39**. Support them to plan their surveys, **journal pp 21-23.** Teachers are encouraged to review the Guiding the Process of Science tutorial in our online training videos ([www.explorethesalishseatraining.org](http://www.explorethesalishseatraining.org)). If you are working with a community partner, communicate with them before this step to determine how to best guide the research design for your students.
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| Session 3½ day | 1. Work with community partner(s) and volunteer chaperones to carry out the stream assessment or modify for in-class, virtual stream survey. In virtual surveys, the community partner will conduct and film the planned survey to share live or recorded. Either way, students will analyze the data from their stream survey component next.
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|  Session 450 min | **EXPLAIN**1. Help students create graphs, **journal p. 40,** and encourage them to determine what their data means.

Shape  Description automatically generated with low confidence1. Have students summarize their learning from Indigenous knowledge**, journal p.41**. Dig into any identified problems and proposed solutions for habitat improvement.
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|  Session 550 min20 min**Total: 4 hours** | **ELABORATE**1. Show the [salmon defense video](https://www.youtube.com/watch?v=D15itTjuY-g) as inspiration.

Shape  Description automatically generated with low confidence1. Icon  Description automatically generatedHelp students prepare to communicate their research results, **slide 60**, by completing the Get CERIAS forms, **journal p42,**  **slide 61**.

**EVALUATE**1. A white logo with a black background  Description automatically generated with medium confidenceAsk that student scientists meet with their research community to argue...I mean discuss! their results using evidence shown in their graphs and from tribal knowledge in a [Get CERIAs Forum.](https://pacificeductioninstitute.sharepoint.com/%3Ab%3A/s/Program/EXCTtXAYqNpCrw8oXZM2I30B9RfqWrjbEk7qPt3jNtM58g?e=tZiyZf) Record their evidence-based recommendations for a salmon-safe stream site for releasing the fry. Offer incentives for even the quiet team members to speak out. Return to their maps on **journal p 22** and vote on a release site! Optional: prepare and present the project using **journal pp 44-50**
2. Administer the Migration post-assessment, **slide** **62**.
3. Celebrate! Stamp the last page of the Migration student journals.
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