Unit Title: How are salmon populations (chinook) on the Columbia river changing over time?

Subject(s): Science

Grade(s): 7

Workgroup Members: Olivia Spagnuolo, Jenna Mobley, Emily Bosanquet

| **STAGE 1 – DESIRED RESULTS** |
| --- |
| **Summary of Mini Unit:**  Students will use data to understand population changes in salmon species in the West through *analysis and interpretation* of the return rates of specific species to the Columbia River watershed. Students will apply their knowledge of habitat needs to identify and explain *why* we see changes in populations over time.  Standard(s): *I can analyze and interpret data to explain scientific phenomena.*  Extension:  *I can use Claim-Evidence-Reasoning to explain a scientific phenomenon.*  *I can use a model to explain a scientific phenomena.* |
| **Driving Question:**  How are adult salmon populations (chinook) on the Columbia river changing over time? |
| **Learning Outcomes (SWBAT):**  Students will predict and analyze data on return rates of chinook and other salmon/steelhead species to understand patterns of change in salmon population over time in the Columbia River.  Students will apply their understanding of life cycle and habitat needs to interpret the data on salmon return and start to identify variables that explain the patterns in the data.  Extension:  Students can use CER to explain why we see the patterns of population change in salmon over time. To do this students will identify variables that may explain the changes in population. Students will use published data/research to support claims. Students may also find additional data sets on the variables they identify to compare to support the claim.  Students can identify ways to restore and care for salmon habitat and the watershed, using ideas from Indigenous knowledge and White Salmon River case study of the Condit dam removal.  Students can apply their knowledge of food webs to construct a model food web of the salmon. Students will predict the impact of changes in salmon population on the food web, specifically predicting the population impact to other species in the food web based on predator-prey dynamics. |

Scope and Sequence:

| EQ: How are salmon populations in the Columbia River changing over time? | |
| --- | --- |
| **Lesson 1. Intro: What is a salmon’s life cycle?**  Learning Targets (LT):  I can research to identify the life cycle of salmon and illustrate each stage.  I can identify the habitat needs for salmon survival.  I can make a prediction on how salmon populations are changing over time based on my understanding of salmon life cycles. | Warm Up: anchor w video/ interview to show on the ground reality of salmon migration on the Columbia.  Work through stations in the classroom to piece together the salmon life cycle as a sketch model.  Read to identify habitat needs of salmon and impacts. Note taking on sketch model.  Write a prediction, answering: “How do you think the amount of salmon are changing in the Columbia River?”. What ideas do you have to explain your prediction?  Slide deck (please copy and edit): [Salmon Life Cycle](https://docs.google.com/presentation/d/1Q482xcGqjogJNu04NtEccEms5PvrmrTNR-4Vgbc9T6I/edit#slide=id.g183fd69dee1_0_14) |
| **Lesson 2: Review lesson: What is data, how do we “see” data?**  LT:  I can identify what data is and how we collect it.  I can use data to create graphs to show patterns and relationships between variables.  I can analyze various types of graphs to describe patterns. | **Investigation ideas** – what do you know about how salmon populations are measured?  Explore ways different data is collected. What ways do we measure phenomena?  Define variables, ways to describe patterns (trends), ways of presenting data (types of graphs). NYTIMES  Practice interpreting graphical data (using various relationships and pop cultural references). Intro vocab to describe patterns: increasing, decreasing, fluctuating, gradual change, rapid change, negative/positive relationships (correlations)  Compare data sets (filmgoers v. critic and healthy food)  Sketch prediction: “How do you think the amount of salmon are changing in the Columbia River?”  Extension: Ways to collect data in the classroom and graph (measure class height? Summarize data: calculate mean, median, mode. Create scatter and histogram) |
| **Lesson 3:** **How do we take lots of data points and make sense of them?**  LT:  I can identify how salmon data is collected.  I can examine large data sets to identify key variables to answer the question: How are salmon populations changing over time?  I can apply the idea of code to explain how larger datasets are simplified (summarized) to turn the data into a graph. | Video on how adult salmon are tagged/ counted as they return at Bonneville  <https://www.youtube.com/watch?v=zoHpE5scs2I>  <https://www.youtube.com/watch?v=wJGYkxSmC40>  <https://www.youtube.com/watch?v=GoPNB-aA82E>  Use large data from Bonneville Dam, chinook salmon to understand how many data points there are! How can we put all this onto a graph?  Olivia led a lesson on how coding works and how a computer pulls relevant variables into a graph. |
| **Lesson 4:** **How do we know what has happened to salmon populations over time?**  LT:  I can define the idea of species population.  I can analyze the graph to describe patterns of how salmon return rates have changed over time.  I can use my research to identify what additional data variables we need to explain the pattern in salmon population.  Extension:  I can start to recognize the difference between correlation and causation. Can we say warmer water *causes* a decrease in salmon return rates?  I can use published data to support causal relationships between variables I identify as impacting salmon populations.  I can construct a claim and support my claim using evidence to reason why salmon populations have changed over time. | [Assessment:](https://docs.google.com/document/d/1DTMfeRXh0h4iA-_pbqWywwcdra5kULPI1XBtadCfAGo/edit)  *Standard: I can analyze and interpret data to explain scientific phenomena.*  Students analyze patterns in the graph. Students describe patterns in the data: increasing, decreasing, fluctuating, and pointing out outliers/anomalies.  Students interpret graph to puzzle out (hypothesize why we see the patterns in the data that we do).  Students use their knowledge of impacts to salmon population (Lesson1) to determine variables that would explain salmon population changes. (variables include: dams, water temp, dissolved oxygen, predators) and reason why these variables would impact salmon.  Extension:  Assessment: *I can use Claim-Evidence-Reasoning to explain a scientific phenomena.* (engaging in arguments from evidence).  Students use published research (reading) to support ideas of what variables impact salmon population change. Use or identify evidence to support their claim EX: “Salmon population are decreasing over time as warmer water temperatures impact salmon health”  Extension: Students find/code variables to show patterns in variables that explain changes in salmon population (EX of variables: Water temp, dissolved oxygen, dam construction/removal, pollution, predation)  Claim may include various variables to cite as evidence EX: “Salmon populations are decreasing due to changes in the environment”. |
| **Lesson 5: Review: How to make a graph.**  LT:  I can identify the steps to explain how a graph is made and share these steps in a creative way. | Students create a zine to outline the steps of how field datasets are collected and coded (simplified) to create a graph to answer a question. |
| **Lesson 6:** **How can we care for our ecosystems and watershed?**  LT:  I can use the case study of White Salmon and the Condit Dam removal to investigate restoration practices and watershed health. | How do we care for our rivers and ecosystems  Reciprocal relationship/Indigenous practices |
| **Lesson 7:** **What does change in salmon populations mean for the food web? What predictions can you make?**  LT:  I can predict the impact of changes in salmon population change to the marine foodweb. | Assessment: *I can use a model to explain a scientific phenomena.*  Create model of current food web (provide research materials)  Make predication of how change in salmon population will impact each part of the food web. Students sketch a population graph to demonstrate their prediction. |

| Resources for lessons: |
| --- |
| [The US has spent more than $2B on a plan to save salmon. The fish are vanishing anyway. - OPB](https://www.opb.org/article/2022/05/24/pacific-northwest-federal-salmon-hatcheries-declining-returns/)  [Columbia Riverkeeper | Salmon are Dying from Hot Water Featuring Don Sampson](https://www.youtube.com/watch?v=NhGpHGucp7Y)  [The Fate of Alaska’s King Salmon and Starving Orcas - The New York Times](https://www.nytimes.com/2023/07/19/dining/alaska-king-salmon-orcas.html)  [Salmon's life cycle and their incredible impact on our ecosystem](https://www.youtube.com/watch?v=P_ROqvC59D4)  <https://www.nationalgeographic.com/animals/article/coastal-beavers-help-salmon-recovery-washington>  <https://www.scienceworld.ca/wp-content/uploads/20211013_2015_SalmonCards-1.pdf>  <https://www.scienceworld.ca/resource/salmon-food-web/> |