

How Many Salmon Are Enough?

Salmon Escapement Activity Manual

Contents

Lesson Overview	2
Student Activity Sheet: Biology	3
Biology Questions	3
Student Activity Sheet: Graphing	4
Student Assessment Instructions	4

Lesson Overview

This lesson was created to allow you to modify and adjust as you see fit with your students. You'll find this lesson contains basic steps; if you have more advanced technology, feel free to supplement the lesson with that..

This lesson is a result of working with park biologist Dan Young and his team, happily known as the Fish Crew. They work at several locations within the park to count and index salmon. They seek to learn if the populations are sustainable and if they are reaching the escapement goals set out by the Alaska Department of Fish and Game. The Fish Crew works each summer, counting fish as they pass through counting towers or under weirs and sampling the otolith (ear bone) of some salmon to learn the ages of the fish.

The Fish Crew's work in Lake Clark is at the forefront of the scientific world. They work hard to preserve their natural resources, identify problems, and keep the park as wild as can be. They also work closely with the Dena'ina people who call Lake Clark home. As a result, the science here is a mix of western technology and Alaska Native understanding of the land.

Lake Clark National Park and Preserve hosts only a fraction of the visitors many larger parks do, but those who visit are not disappointed. There are mountains to hike, lakes to kayak, rivers to pack-raft, and salmon spawning grounds to fish. We hope that someday you and your students might have the chance to visit one of the worlds last remaining wild spawning grounds of sockeye salmon, take in the breathtaking views of the lake from the top of Tanalian Mountain, and sit down to chat with village elders about the people who have always been.

Happy Teaching!

Jessica Winn
Teacher-Ranger-Teacher

Student Activity Sheet: Biology

Using the information from the lesson presentation and your knowledge of biology, please answer the questions in complete sentences and have well thought out responses. Be sure you have successfully answered each part of each question.

Biology Questions

- Using the organisms from the presentation (salmon, bears, wolves, humans, spruce trees, mushrooms, martins, voles, and mosquitos), create a food web that shows how important salmon are to the ecosystem. There should be connections to and from salmon to everything it impacts.
 - What role does salmon play in establishing the Lake Clark ecosystem?
 - How are humans linked into this system?
- What impact might humans have on this ecosystem? Give positive and negative examples with explanations.
- Commercial fishing is an issue for many fish populations. Explain why it might be a problem and such problems can be addressed.
- Draw conclusions about the Newhalen River Escapement and Telaquana Weir Escapement projects.
 - What is the importance of a balanced environment?
 - How are they (the river and weir data) helpful for scientists who are trying to find ways of maintaining a balanced environment?
 - Why might scientists want to know the age of the salmon spawning each year?
- Consider this quote by Andrew Kirby, a fish technician:

“Salmon have an amazing natural resilience to human and natural disturbance. Salmon in Alaska are doing well compared to the lower 48 because Alaska has a largely intact natural system. Bristol Bay sockeye returns are a good example of that stability and resilience. The region has large and stable returns despite high levels of commercial exploitation. Individual watersheds and rivers in the area have a large amount of variability in the amount of salmon over time. That natural variation (and sometimes decline) is often viewed by the public with concern, but is a normal part of a healthy system.”

 - What is natural variation?
 - Explain why the public may view a decline as a concern.
 - Give examples of reasons scientists may have seen a population decline in certain years.
 - How might this quote relate to the idea of ecological resilience?
 - How can we help maintain the resilience of salmon for years to come?

Student Activity Sheet: Graphing

Using the data provided, follow the steps to gather information and analyze trends among the salmon populations at the Newhalen River.

1. Make a graph using the data from the past 10 years (Daily Accumulation 2004-2014). Be sure you have your axes properly labeled and you have given your graph a title.
2. Answer the following questions based on the graph you have created.
 - a. What may have caused 2014 to be such a slow year?
 - b. What trends are obvious when you look at the graph you have created? (Note: you are looking for similarities in increases, decreases, or plateaus on the graph)
 - c. What might be the reasons for the trends you have noticed?
 - d. List and explain possible reason 2006, where the population started very low but finished with a drastic increase.
 - e. In 2009, Mount Redoubt, a nearby volcano, erupted, spewing ash that settled in the river. Explain how that might have caused the unusual trend that year.
 - f. Make a conclusion about the amount of fish that have escaped up the Newhalen River during the past ten years.
3. Make a graph using the data from 1980 and 2014 daily counts. Be sure you have your axes properly labeled and you have given your graph a title.
4. Answer the following questions based on the graph you have created.
 - a. Explain the concept of resilience in terms of your graph. How might the data, though very different, show that the salmon are resilient despite what has happened over the past 25 years?
 - b. In 1980, scientists monitored the river 24 hours a day, and a large number of fish escaped up the Newhalen River. In 2014, scientists monitored the towers for ten minutes every hour, extrapolating the data, and recorded far fewer fish as escaped. How might this change in counting methods affect the overall counts?
 - c. Which method for counting fish appears to be more accurate? Why?
 - d. How might the scientists improve the counting methods to count for all the fish without having to work 24 straight hours, as in 1980? Explain your reasons.

Student Assessment Instructions

For your assessment, you will create two graphs. Please read through each set of instructions. You will not only be graphing data, but you will also be analyzing the information and graphs for trends and writing about those as a part of your assessment.

First, create a graph of the Telaquana Weir Daily Counts. After creating the graph, answer the following questions:

1. Why might it be important at this location to specify that they were counting sockeye salmon?
2. What trends are obvious when you look at the graph you have created? (Note: you are looking for similarities in increases, decreases, or plateaus on the graph)
3. What might be the reasons for the trends you have noticed?
4. Make a conclusion about the fish that have escaped on at Telaquana Weir.

The second graph will be a comparison by years of the Newhalen and Telaquana escapement projects. You will plot the two rivers on the same graph, and then explain the trends and why you think the graph looks the way it does. You will make predictions about the populations of fish and the area.

1. After creating your graph, analyze the data for trends in either fish numbers or by years.
2. Telaquana Weir hasn't been in place as long as Newhalen. Does that make the data more or less valuable? Explain your rationale.
3. The numbers at Telaquana are very low in comparison to the Newhalen; explain why that might be.
4. How do both of the graphs together show the resilience of salmon as a species?
5. Why are salmon so important to this ecosystem?