SUSTAINABILITY AMBASSADORS

Science and Engineering Practices
Salmon Habitat Restoration

LESSON 4

CASE STUDIES: Analyzing Salmon Restoration Projects Near Us

Problem Statement: How can our classroom take responsibility for stewardship actions that measurably improve the ecological conditions of our watershed address allowing both salmon and people to thrive?

Subject: Human Geography, Science, Engineering, Math, Civics, Common Core
Grade Level: Middle School or High School

HOW TO USE A CASE STUDY

It is extremely useful to have an interesting model to study when you are trying to understand how a system works so that you can adapt and apply what you learn from the model to your own problem solving challenge.

A case study is a research approach that is used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context.

The case studies selected here are real-world projects from our watershed that are already completed or in development. They provide a range of unique ecological, engineering, policy, and equity challenges. When you compare one case study to another you will notice that the available reports, webpages, photos, or videos are not always of the same style, format, or point of view. You might consider these documents like chapters in a “Living Textbook” where the case studies shared have been written up for different real audiences for different purposes.

YOUR TASK - BACKWARDS DESIGN

As you analyze the content provided in the links below for each case study, you will need to sharpen your ability to discern how each of them in some way applies the **practices of engineering design**. You will need to do this by thinking backwards. The final “preferred” solution is before you. Use the framing INQUIRIES listed under the **eight Science and Engineering Practices** to guide you. It may not work for you perfectly in every situation, but you will learn alot by applying this backyards design methodology.

- **BLANK WORKSHEET** (just the eight practices)
- **MENU OF INQUIRIES** (multiple sub-questions for each practice)

CASE STUDY A: Longfellow Creek - River Mile 0, Seattle Public Utilities

Longfellow Creek was historically known as *Smelt* for the large quantity of Smelt that could be harvested by natives. It is a stream located in the Delridge Neighborhood of West Seattle and connected to the Duwamish River Estuary through a large pipe right where the river empties into Elliott Bay. Longfellow Creek provides critical habitat for salmon migrating to and from Puget Sound. Yes, they swim up through the long dark tunnel to get to the available spawning grounds. Urban development upstream of the creek has greatly reduced spawning habitat and exposed salmon to high amounts of pollution.

CASE STUDY B: Boeing Plant 2 Habitat Restoration and Sediment Cleanup - River Mile 3, Boeing

Boeing Plant 2, was one of the key aircraft manufacturing facilities during World War II. Here, B-17 planes were produced in high volumes and at incredible speed. After many years this aged site was no longer useful. It occupied nearly one mile of the Duwamish River shoreline, degrading and polluting critical salmon habitat. In 2013, the EPA, Port of Seattle, and Boeing completed a restoration and sediment cleanup of the whole property with great benefits for salmon.

CASE STUDY C: Duwamish River People's Park - River Mile 3.5, Port of Seattle

Duwamish River People's Park, formerly referred to as Terminal 117, is located south of the South Park Marina on the Duwamish River. It used to be a Superfund "Early Action Site" because of pollution caused by the Duwamish Manufacturing and Malarkey Asphalt Company until it ceased operations in 1993. The Port acquired a portion of the property in 1999. In 2003, the EPA designated Terminal 117 as a **Superfund site** and the Port and City of Seattle were responsible for cleaning up the contamination. With extensive community involvement, Terminal 117, once a toxic site, became a People's Park.

CASE STUDY D: Downey Farmstead - River Mile 22, City of Kent

Downey Farmstead, is a historic 22-acre site that sits empty and undeveloped on the Green River just before river mile 22. Frager Road, which runs along this site near the Green River, will be moved to the other side of the property to clear space for construction. This property will be reshaped into a network of side channels to create juvenile salmon habitat and to improve the Green River's flood capacity.

CASE STUDY E: Riverview Park - River Mile 23, City of Kent

Riverview Park, is located along the Lower Green River just downstream of Mill Creek, past river mile 23, near downtown Kent. Riverview Park is situated around a newly built side channel of the Green River. This new channel will provide critical salmon habitat for the warm summer and refuge from high flow events in the main channel during the winter.

CASE STUDY F: Leber Homestead - River Mile 24, City of Kent

Leber Homestead, was originally an 8.6 acre orchard that was abandoned in 1969. This property sits where Mill Creek empties into the Green River before river mile 24. The currents here are too fast and strong for juvenile salmon to avoid being swept out to sea too early in their lifestyle. The project will create a side channel for juvenile salmon to feed, rest, and grow, in a calm environment until they are big enough to travel out into Puget Sound.

CASE STUDY G: Lones Levee - River Mile 38, King County

Lones Levee, located just before river mile 38 of the Green River, was a flood protection measure built in the 1960's to save nearby properties from flooding. But, it also removed critical habitat for salmon traveling in the river. The degraded levee was removed and replaced with a new integrated design that both restores salmon habitat and protects the residents from flooding.

CASE STUDY H: Newaukum Creek - River Mile 41, King County

Newaukum Creek is a critical stream for salmon returning to spawn, it empties into the Green River just before river mile 41. This creek is where adults lay eggs and juveniles grow until they make the journey out to the ocean. Historic agricultural development removed much of the riparian habitat and wetlands which made water temperatures unsuitable for salmon survival. It was essential to bring back plants and trees to shade and cool the creek for salmon.

CASE STUDY I: Culvert Replacement Projects - King County

A **culvert** is a large pipe that moves water underneath a roadway. Throughout the Green Duwamish Watershed, many culverts block salmon from migrating. **Replacing** these culverts with more effective designs to let salmon swim through is critical for them to reach their spawning habitat. In collaboration with federal, tribal, state, and city officials, King County has developed a Fish Passage Restoration Program to allow ***"the most salmon to swim to the best habitat in the shortest time."***

In 2021, King County completed a two-year field inventory of all county stream assets to determine which block upstream salmon migration. To complete the inventory, the county identified and visited more than 3,000 locations and found more than 900 county assets that are partial or total fish passage barriers. 730 of the county barriers were ranked, with scores ranging from 1 to 95 (out of a maximum of 100) on the strength of the barrier.

Some of these priority culvert replacement projects have been completed, some are planned, and some are waiting for funding. All of them would provide better access to more habitat for salmon.

165 More Project Snapshots

WRIA 9 Salmon Recovery Plan UPDATE 2021

CHAPTER 7 of the 2021 Plan Update provides a science-based framework for identifying, prioritizing and implementing salmon recovery actions over the next 10-15 years. The Plan Update integrates over a decade of new science and monitoring; provides updated habitat goals; outlines refined recovery strategies and embedded policies and programs; updates the capital projects list; and outlines a monitoring and adaptive framework for tracking implementation and making strategic adjustments. See Landing Page

Which projects are nearest to your school?

Since 2005, 165 projects have been completed or are in progress, totalling over $160 million of investments. 118 more have been identified and prioritized.

CHAPTER 7 - Introduction to Capital Projects

- Marine Nearshore Subwatershed (39 Project Snapshots)
- Duwamish Estuary Subwatershed (19 Projects Snapshots)
- Lower Green River Subwatershed (45 Projects Snapshots)
- Middle Green River Subwatershed (15 Projects Snapshots)
- Upper Green River Subwatershed (1 Project Snapshot)

UNPACK THE ENGINEERING DECISIONS

Students can opt for either of these two worksheets as they design backwards to discern and apply the science and engineering practices in their own salmon stewardship actions. It is important to know that these practices do not always follow in order, any more than do the "steps" of scientific inquiry. At any stage, a problem-solver can redefine the problem or generate new solutions to replace an idea that just isn't working out.

A. **BLANK WORKSHEET** (just the eight practices)
B. **MENU OF INQUIRIES** (multiple sub-questions for each practice)

SHOW WHAT YOU KNOW

Okay, so what are the main ideas here? How would you summarize the key takeaways from this case study? How would you compare the salmon habitat restoration design elements used at this site to two or three other case studies? Be ready to take part in some creative way to tell the story of what you are learning, what is still needed, and how each of us can do our part.

Maybe something like this…

- Student panel of "Habitat Restoration Experts"

- Student podcast on “Salmon Restoration Efforts in our Watershed”
- Series of short videos or a slide presentation summarizing key insights

WHAT CAN WE DO?

Volunteer for Salmon!
Outdoor volunteer opportunities are waiting for you. Sign up now so you know the right seasons to help out, usual fall for tree planting and spring for removing invasive species.

- Miller and Walker Creeks Stewardship
- Salmon Monitoring Program - Community Salmon Investigation (CSI) for Highline
- Duwamish Alive!
- Earth Corps
- Nature Consortium
- The Dirt: Calendar of hands-on volunteer opportunities in King County
- Seattle Parks Volunteers
- King Conservation District

Go See Salmon

Bookmark the Salmon SEEson webpage so you know where to go each fall with your friends and family to see salmon when they are coming back upriver to spawn.

More Ways to Steward Your Watershed Address

1. Help plant 3 Million Trees
2. Switch to these strategies for Natural Yard Care (in 15 different languages!)
3. Take personal action at Puget Sound Starts Here
4. Don’t Feed the Tox-Ick Monster - 7 Simple Actions
5. See playlist of 20 King County informational videos on Yard Talk
6. Build a Rain Garden at 12,000 Rain Gardens
7. Advocate for Green Stormwater Infrastructure around your school neighborhood
8. Follow the indicators that scientists track on the dashboard Puget Sound Vital Signs

HELP IMPROVE THIS LESSON

1. What advice do you have for making this lesson better?
2. How would you teach parts of this lesson to younger students?
3. Are there broken links that we need to know about?
4. Did you find even better links in your research?
5. Would you like to share examples of your work so that other classrooms can learn by your example?

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Learn More about Sustainability Ambassadors
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