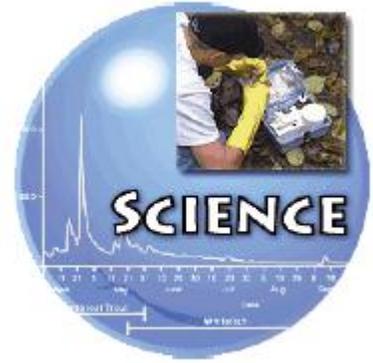


LESSON 19: SALMON FARMING; A POTENTIAL, BUT NOT IDEAL SOLUTION



ESSENTIAL QUESTION:

What combination of factors both natural and manmade is necessary for healthy river restoration and how does this enhance the sustainability of natural and human communities?

GUIDING QUESTION:

Salmon farms seem like an ideal solution for helping wild salmon and increasing the worldwide demand for salmon production, what are the problems associated with salmon farming and are there ways of solving these problems?

OVERVIEW:

This lesson focuses on the economic and ecological values and costs of salmon farming. Salmon farms have been seen by many as an opportunity to help wild salmon runs, by producing fish to meet increased worldwide demand for salmon and taking some of the pressures off wild salmon by commercial fisheries. However, salmon farms have developed several serious ecological and economic problems that must be addressed. Escaped salmon from farms represent competition for food resources and spawning grounds. Their dense populations are susceptible to disease outbreaks and parasite infestations. Their food contains high concentrations of chemicals such as PCB's and mercury which bioaccumulate in their bodies and contaminate the nearby environments.

TIME:

One day for presentation plus research and writing time as needed

MATERIALS:

- **Lesson 19- Salmon Farming.pptx**
- **Lesson 19a- Salmon Farming.pdf**
- **Fisheries Management Paper.pdf**
- Reflection Journal pages (printable handouts)
- Vocabulary Notes (printable handouts)

PROCEDURE:

1. Review Essential Question; introduce Guiding Question.
2. Students should take a few minutes to respond to the first reflection prompts. Discuss their answers and any questions they've generated.
3. Hand out the Vocabulary Notes. *With this lesson you may want to define the words before presenting the PowerPoint Lesson*
4. Present the PowerPoint Lesson

5. Class Discussion: How can we most appropriately meet the seafood demands of the world? Compare and contrast the values and costs associated with maintaining wild runs, hatcheries, and farms.
6. Fisheries Management Paper
7. Read: Articles on “natural/organic fish farms, aquaponics/self-contained farms, etc.
8. Assign *Fisheries Management Paper*
9. Hand out the second Reflection Journal Page. Give students time for a final reflection the lesson.

ASSESSMENTS:

- **Fisheries Management Paper.pdf**

WASHINGTON STATE STANDARDS:

SCIENCE:

1. **EALR 4: LS2D** Ecosystems are continuously changing. Causes of these changes include nonliving factors such as the amount of light, range of temperatures, and availability of water, as well as living factors such as the disappearance of different species through disease, predation, habitat destruction and overuse of resources or the introduction of new species.
 - a. Predict what may happen to an ecosystem if nonliving factors change or if one or more populations are removed from or added to the ecosystem.
2. **EALR 4: LS1C** Multicellular organisms have specialized cells that perform different functions. These cells join together to form tissues that give organs their structure and enable the organs to perform specialized functions within organ systems.
 - a. Explain the relationship between tissues that make up individual organs and the functions the organ performs.
 - b. Describe the components and functions of the digestive, circulatory, and respiratory systems in humans and how these systems interact.

WRITING:

1. **EALR 1:** The student understands and uses a writing process.
2. **EALR 2:** The student writes in a variety of forms for different audiences and purposes.
3. **EALR 3:** The student writes clearly and effectively.

SOCIAL STUDIES:

1. **EALR 5:** The student understands and applies reasoning skills to conduct research, deliberate, form, and evaluate positions through the processes of reading, writing, and communicating.
 - a. Component 5.2: Uses inquiry-based research.

ADDITIONAL RESOURCES AND ENRICHMENT:

<http://www.foodandwaterwatch.org/fish/fish-farming/standards-needed-for-organic-aquaculture>

http://www.articlealley.com/article_753978_105.html

<http://www.e-pao.net/epSubPageExtractor.asp?src=education.Science and Technology.Urea in fish farms Whats left to eat>

<http://www.growseed.org/growingpower.html>

<http://www.geocities.com/aliciainelpaso/fish/farming.html>

<http://www2.canada.com/vancouver/news/westcoastnews/story.html?id=c932d5f3-658d-4032-9517-b423051a5c61>

<http://www.time.com/time/magazine/article/0,9171,391523,00.html>

<http://news.nationalgeographic.com/news/2006/10/061002-sea-lice.html>

<http://www.latimes.com/la-me-salmon9dec09,0,6535872.story>

<http://discovermagazine.com/2009/jan/031>

<http://library.thinkquest.org/05aug/00548/farmed--intro.html>

<http://www.edf.org/page.cfm?tagID=16150>

VOCABULARY TERMS:

- **Aquaculture-** Raising aquatic organisms in contained units for the purpose of producing marketable products. This can include algae, shrimp, oysters, fish, and others.
- **Parasite-** An organism that feeds on another organism, causing long-term harm to the host without generally killing it.
- **Eutrophic-** An ecosystem containing high levels of nutrients and therefore supporting high productivity. However, an overly eutrophic environment can result in algal blooms that cause the waters to become deficient in oxygen through the bacterial consumption of dying algae. These anoxic aquatic environments can then become dead zones to all but algae.
- **Bioaccumulation-** The accumulation of a substance, such as a toxic chemical, in various tissues of a living organism. Bioaccumulation takes place within an organism when the rate of intake of a substance is greater than the rate of excretion or metabolic transformation of that substance
- **Biomagnification-** The increasing concentration of a substance, such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain. As a result of biomagnification, organisms at the top of the food chain generally suffer greater harm from a persistent toxin or pollutant than those at lower levels.



Elwha River Restoration

Salmon Farming; A Potential, But Not Ideal Solution

Reflection Journal 1

What ideas do you have for helping the salmon that will be returning to the Elwha River?

What questions do you have about salmon and their restoration into the Elwha River?



Elwha River Restoration

Salmon Farming; A Potential, But Not Ideal Solution

Vocabulary Notes

Aquaculture:

Parasite:

Eutrophication:

Bioaccumulation:

Biomagnifications:



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Reflection Journal 2

How can we meet the seafood demands of the world and still maintain healthy oceans and rivers?

What questions or comments do you have about salmon, seafood and .or healthy ecosystems?



Fisheries Management Paper

THE DECLINE OF THE PACIFIC SALMON - 125 PTS

PAPER FORMATTING REQUIREMENTS- 25 PTS

- LENGTH: 3-5 PAGES.
- Font/Spacing: Times Roman 12 – 1.5 Spacing.
- Margins: 1" all sides.

The following must be included:

- List every species of Pacific salmon and some vital information about them, such as relative abundance, life span, and habitat requirements. 10 pts
- Describe/map of the oceanic and continental range of Pacific salmon (historically and today). 5 pts
- Discuss why salmon have declined so dramatically across their range and have disappeared from some 100+ rivers and streams in the U.S. 10 pts
- A minimum of one paragraph about each of the five major threats to the existence of salmon. Explain why each threat has reduced or weakened salmon populations. 25 pts
- Discuss the Endangered Species Act and other laws and how they are used to protect Salmon. 5 pts
- Discuss activities or proposed solutions to stop the decline and save Salmon populations. 15 pts
- Discuss the Elwha Ecosystem Restoration Project! Discuss what factors have eliminated all of the salmon runs from this river, and what is being done to return salmon to the river today! 25 pts
- Conclude by deciding for yourself whether Pacific salmon can be saved throughout most of their range or whether they are destined to decline further until there are few or no Salmon left. 5 pts