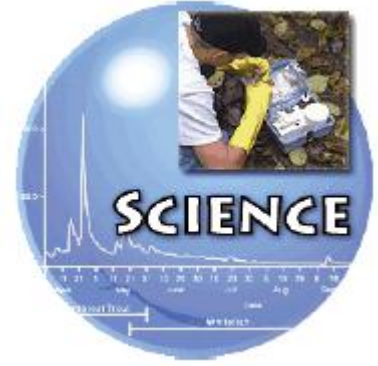


LESSON 16: RESTORING THE ELWHA RIVER



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:

There are many important factors involved in removing the Elwha Dams and restoring the Elwha River. What strategies is Olympic National Park employing to help the river and its anadromous fish recover?

OVERVIEW:

This lesson focuses on the plans to remove the dams, restore the river, and return salmon to the Elwha River watershed. Managers will have to use different strategies depending on the current population levels, life histories, and habitat requirements for each species of salmon, to ensure recovery. Some species will be able to naturally recolonize the river and return to anadromy. During the dam removal process, there is expected to be great amounts of sediment released from the deltas which have formed at the mouth of the reservoirs. To assure their survival, some salmonid species will be stored and propagated in hatcheries, protected from the high levels of suspended sediment. Some species will need to be out-planted up river to facilitate recolonization following dam removal. In addition, a great deal of ecological work will be necessary post dam removal to restore vegetation, engineer logjams, and return the sediment regime to form spawning beds.

TIME:

One class period

MATERIALS:

- **Lesson 16- Restoring the River.pptx**
- **Lesson 16a- Restoring the River.pdf**
- **http://www.interactive-earth.com/visualizations/glines_removal.htm**
- Stream table
- Reflection Journal pages (printable handout)
- Vocabulary Notes (printable handout)

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
5. Present the animation of the Glines Canyon removal .
6. Do the stream table demo
7. Hand out the second Reflection Journal Page. Give students time for a final reflection the lesson.

WASHINGTON STATE STANDARDS:

SCIENCE

1. **EALR 4: LS3A** The scientific theory of evolution underlies the study of biology and explains both the diversity of life on Earth and similarities of all living organisms at the the chemical, cellular, and molecular level. Evolution is supported by multiple forms of scientific evidence.
 - a. Explain and provide evidence of how biological evolution accounts for the diversity of species on Earth today.
2. **EALR 4: LS3E** Adaptations are physical or behavioral changes that are inherited and enhance the ability of an organism to survive and reproduce in particular environment.
 - a. Give an example of a plant or animal adaptation that would confer a survival and reproductive advantage during a given environmental change.
3. **EALR 4: LS2A** An ecosystem consists of all the populations living within a specific area and the nonliving factors they interact with. One geographical area may contain many ecosystems.
 - a. Explain that an ecosystem is a defined area that contains populations of organisms and nonliving factors.
 - b. Give examples of ecosystems (e.g., Olympic National Forest, Puget Sound, one square foot of lawn) and describe their boundaries and contents.
4. **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.

READING

1. **EALR 1:** The student understands and uses different skills and strategies to read.
 - a. **Component 1.2** Use vocabulary (word meaning) strategies to comprehend text.

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.

WRITING

1. **EALR 2:** The student writes in a variety of forms for different audiences and purposes.
 - a. **Component 2.1:** Adapts writing for a variety of audiences.

ADDITIONAL RESOURCES AND ENRICHMENT:

Another great animation

http://www.americanrivers.org/site/PageServer?pagename=AMR_elwhavision

VOCABULARY TERMS:

- **Hatchery-** A facility used to rear juvenile fish for the purpose of stocking rivers or lakes, producing fish for commercial fishing activities, or restoring endangered fish populations.
- **Exotic/Non-native-** A species introduced to an area by humans either purposefully or accidentally that competes with native species, often with serious ecological consequences
- **Course Woody Debris-** Large woody structures such as logs, branches, and trunks that are left behind by stochastic events such as forest fires, wind storms, flooding, or logging activities.
- **Logjam-** An accumulation of large woody structures (mostly logs and branches) along a river's course from high water flows, which deflect or slow down water flows and create backwater pools or sediment accumulations for fish.

DEMO:

Using the stream table, many of these features can be simulated. An engineered logjam can be placed in the river channel, simply by adding sticks or blocks and watching how the river deflects around it and pools behind it. Revegetation can be demonstrated using moss embedded in the sand and showing how the erosional rate is reduced.



Elwha River Restoration
Removing the Dams and Restoring the River
Reflection Journal 1

How do you think dams are removed? How do you think the salmon will return?

What questions or comments do you have about dam removal and river restoration?



Elwha River Restoration
Removing the Dams and Restoring the River
Vocabulary Notes

Hatchery:

Exotic/Non-native:

Course Woody Debris:

Logjam:



Elwha River Restoration
Removing the Dams and Restoring the River
Reflection Journal 2

Do you think the river restoration will be successful, why or why not? What can you do to help in the restoration of the Elwha River or any other river?

What questions or comments do you have about dam removal and/or river restoration?