Riparian Plant Patterns along the Elwha River:

Studying the interactions between soils, seeds, and plant diversity on the Mills Lake delta

Abstract

The presence of two dams on the Elwha River in Washington State has had long-term affects on riparian plant communities. This study examines riparian vegetation patterns that have emerged along the Lake Mills Delta. This data will help scientists to monitor future changes in plant communities along the Elwha River after the dams are removed.

Introduction

Before the Glines Canyon and Elwha dams were built on the Elwha River in the early 20th century, the plants surrounding the river had adapted to the natural patterns of flooding and sediment deposition within the watershed. The two dams disturbed the ecosystem to such a degree that several components of the system have changed in response. One such change has occurred within **riparian plant communities**. After over 90 years, the new patterns of plant growth (location, species type, etc.) following the dam construction are well established. Today, as we look at removing the dams in order to restore the ecosystem, scientists are studying current patterns of riparian vegetation in order to be better prepared for the new set of changes that could take place after the dams are removed.

Herb Robert with its characteristic 5 petals, pink flowers, and pentagon shaped branching leaves.

One of the changes that could occur is an increase in **invasive plant species** along the Elwha following dam removal. Some examples of invasive species in the Elwha are Orchard grass, Scotsbroom, and Herb Robert. Once they are growing, it is often very difficult to remove invasive species. The drained and bare lake beds of Lake Mills and Lake Aldwell could become prime locations for invasive species growth.

By studying riparian plant communities now, scientists will be able to make hypotheses about where and which plants might grow on the drained lake beds after the dams are removed. Will invasive species increase? Will seeds embedded in newly exposed sediment germinate? Will the species composition change? This information

This bird's-eye view of the upper dam shows the reservoir created and delta which has formed. The photo on the right is a close up of the delta with the new trees and other riparian plants which are growing out of the sediment which has been deposited. This formation is expected to change rapidly after dam removal, as the sediment and vegetation moves down stream. Photo by Robert Lundahl

will help land use managers better plan for future changes as the ecosystem is restored.

Dr. Rebecca Brown and one of her graduate students, Cara Hulce, are two of the scientists working on the answers to these questions. They narrowed their research into one question:

How will riparian plant communities change in the Lake Mills soils and sediments following dam removal on the Elwha River?

Dr. Rebecca Brown (right) and her graduate student, Cara Hulce (left) collect data on the Lake Mills Delta. Photo courtesy of Central Washington University

Methods

In order to answer their questions, Dr. Brown and Cara need to know the present patterns of plant growth so they can monitor changes that occur. They are collecting **baseline data** that can be used as a comparison to future plant communities.

For their study site, Dr. Brown and Cara decided to work at the Lake Mills Delta, an area that was disturbed by the construction of Glines Canyon Dam and creation of Lake Mills. This is where the Elwha River meets Lake Mills. The delta includes a lot of exposed sediment created by the pile up of rock, sand, and trees brought down the **river system** due to natural patterns of flooding and upstream erosion. This site could be helpful for predicting how vegetation will change with time because the exposed sediment was deposited gradually through time, creating a sequence from old sediments deposited around 60 years ago to more recent sediments deposited in the last 3 years.

Forty-two 10X10m plots were selected and semi-permanently marked on the Lake Mills Delta for this study. Plots were chosen based on several factors, including surface age (when the surface was created by deposited sediment), the kinds of plant species growing at the site, sediment texture, and proximity to river or lake.

Rebecca and Cara use surveying equipment to measure elevation in their study plots.
Photo courtesy of Central Washington University

1. Document patterns of riparian plant community **succession** through time by comparing plant communities growing across a sequence from older to more recently deposited sediments. Researchers identified all plant species growing within the 42 vegetation plots and estimated the abundance of each species. They also collected data regarding surface age, elevation, exact location, soil fertility, soil texture, topography, and disturbance history in each plot.

2. Determine if seeds buried in sediment will germinate. In each vegetation plot, soil samples (with seeds) were taken from several locations in the plot. These samples were pooled together and stored in a cold environment for four weeks to force the seeds to break seed dormancy, which improves germination. The seeds were then germinated in a greenhouse for nine months to identify both species composition and abundance.

Discussion

Researchers spent July and August 2007 collecting data for this investigation, and are currently analyzing their results. In particular, Dr. Brown and Cara are examining patterns of plant community change through time by comparing vegetation on sediment deposits that were deposited a long time ago compared to more recently deposited sediments. Preliminary results show that invasive species are prevalent throughout the system. This data will help scientists predict *how riparian plant communities in Lake Mills will change following dam removal on the Elwha River*.

Glossary

Invasive Plants: Non-native plants that spread rapidly in new the new locations

Impoundment: A body of water created by the collection or confinement of water, such as a reservoir.

Riparian Plant Communities: All of the plants living together in the same area along the banks of a river, stream, or lake.

Baseline Data: The earliest data base in a long-term research series.

Succession: Community development over short term.

River System: The collection of stream channels draining a river basin.

Researcher Biography

Dr. Rebecca Brown, Eastern Washington University

Rebecca is an ecologist who studies assemblages of plants that grow along rivers. She teaches ecology and botany at Eastern Washington University. Before coming to Eastern, she earned her doctorate at University of North Carolina and then worked at the Academy of Natural Sciences in Philadelphia. Her research has shown that riparian plant communities (plants that grow along rivers) often have many, unique native species and are prone to invasion by exotic plants, and that dams affect riparian plant communities. She has studied dozens of rivers across the United States including rivers in the southern Appalachian mountains of North Carolina, eastern Pennsylvania, Maryland, Upstate New York, and Washington State. Dr. Brown is passionate about working on rivers and enjoys paddling on them in her kayak when she has free time.

Curriculum Writer's Biography

Suzanne Gray, Science Teacher, Sequim Middle School

At age four, Suzanne sat her parents down and declared herself a "mountain woman". She hasn't turned back. Through middle and high school in both Maine and Washington State she spent countless hours observing pond life and exploring the dry forests on the eastern slopes of the Southern Cascades. She attended Huxley College of the Environment at Western Washington University as an Environmental Education major which allowed her to spend 1/3 of those college years outside of the classroom. After working as an Outdoor Educator for five years, she returned to the classroom (Antioch University New England) for a Master's of Science with a teaching certification. She currently works as a middle school science teacher in Sequim, WA.

Elwha Research Learning Unit

This research summary is a piece of a larger Elwha Research Learning Unit which has been funded by the Research Learning Network and coordinated by Olympic Park Institute. This is one of seven research summaries which capture the diverse and exciting science which is being done in preparation for the upcoming Elwha River dam removals. All seven summaries are examples of the important work which fits together to help us better understand the Elwha River Ecosystem and neighboring Strait of Juan de Fuca. Three of these research topics have been turned into activities which have been designed for us to practice the scientific process by using real research from this inspiring dam removal effort. For the complete learning unit, go to OlympicParkInstitute.org or ElwhaScienceEd.org.