Apr 6th, 2:15 PM - 2:30 PM

Experiential education and outreach based on nearshore monitoring of the Elwha River restoration project

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Elwha River Restoration:

Two Dams have been removed from the Elwha River

- Salmon recovery
- Restore **sediment discharge** to the coast.

How can we communicate the impact of restoration projects to the public:

- **Higher-Education Activities**
- **Outreach Activities Focused on K-12**

Elwha River Restoration – in action

Start: Sept 2011

Photos courtesy National Park Service

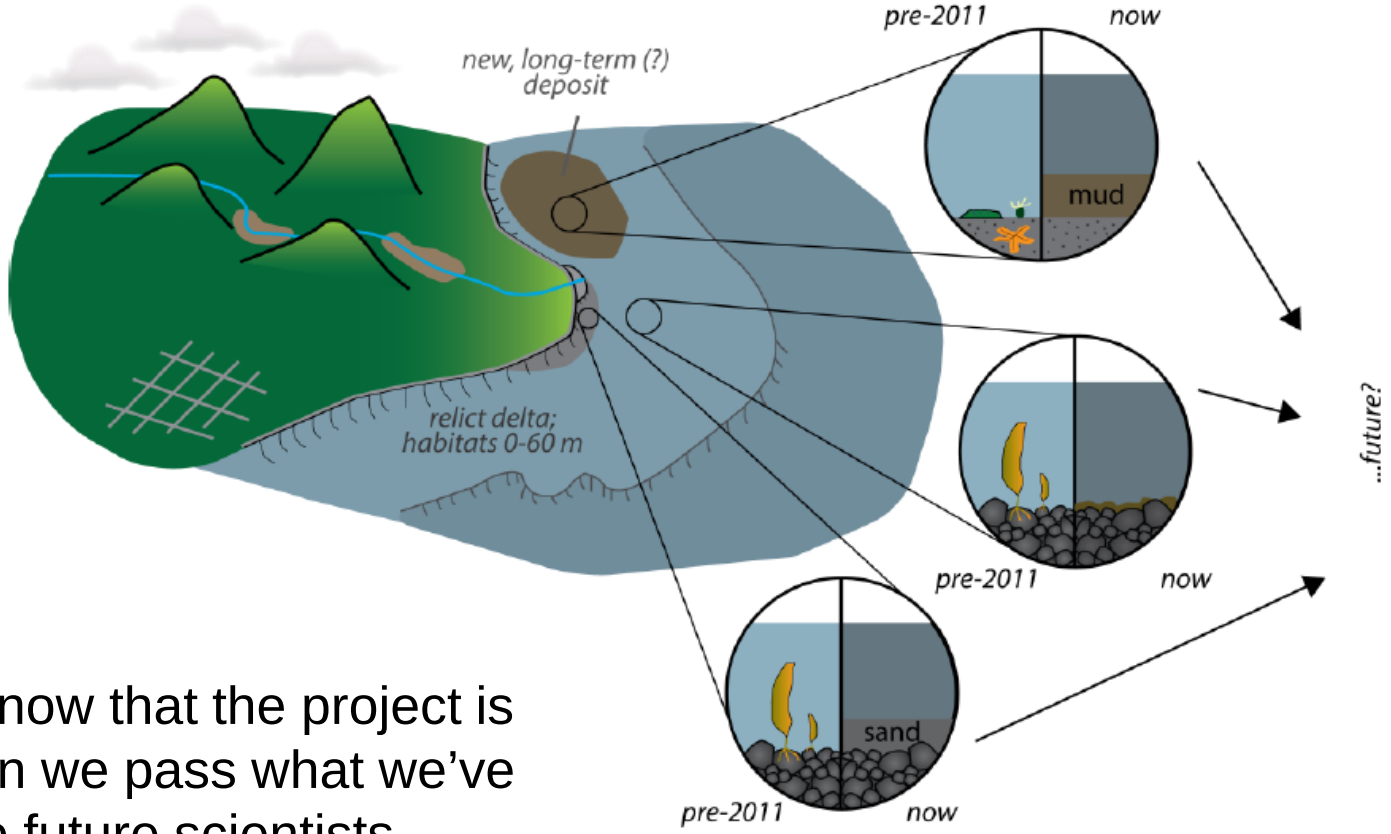
Glines Canyon Dam

Elwha Dam

Done! Sept 2014

But… where's the mud??

And… what ecosystems sustained short- and long-term impacts (+ and -)?



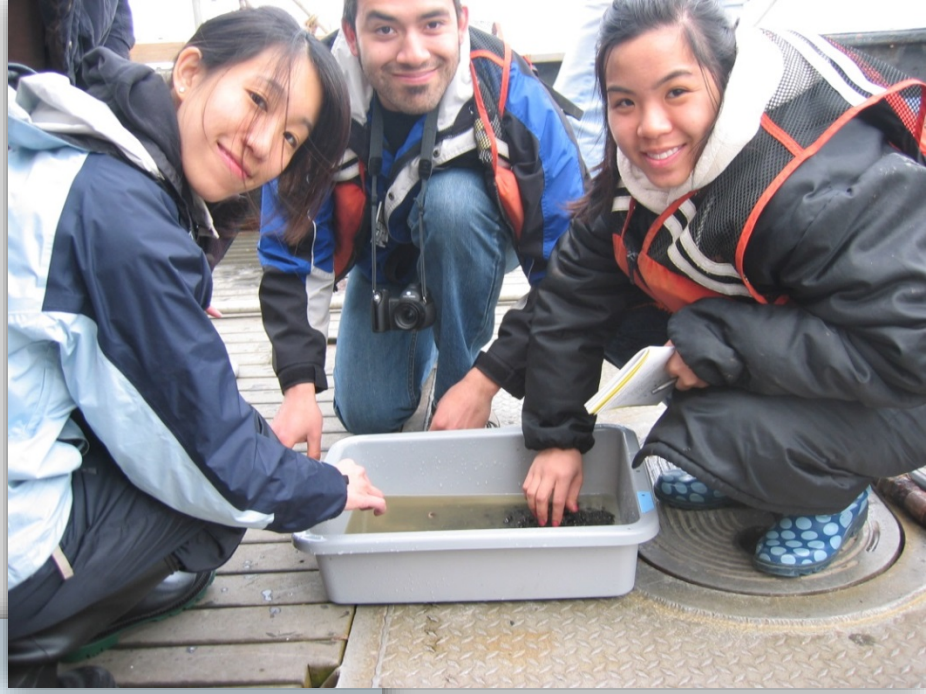
Additionally, now that the project is over, how can we pass what we've learned on to future scientists, managers, and citizens?

Higher Education Activities:

This research program has been incorporated into:

UW and PC Undergraduate Research

UW Graduate Research



Research vessel time contributed by UW

Curriculum content at UW and PC

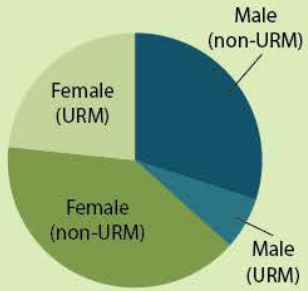
New Course:
FHL Research Apprenticeship

Friday Harbor Labs - Marine Sedimentary Processes Research Apprenticeship

15 credits; research immersion

Course appeal

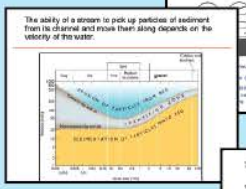
- Quarter in residence off campus, at an active marine lab
- Outdoor/natural laboratory; opportunities for field experience
- Topic with specific regional interest for geology/ocean majors and non-majors alike
- Course offered at a level accessible for non-geology/ocean majors
- Opportunity to focus intensively on a topic for an entire course load/quarter

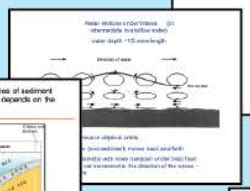


FHL Research Apprenticeship
Course content designed for experiential learning:

Classroom

Lecture material





Skills workshops

Local field trips

Field

Collaborative field work

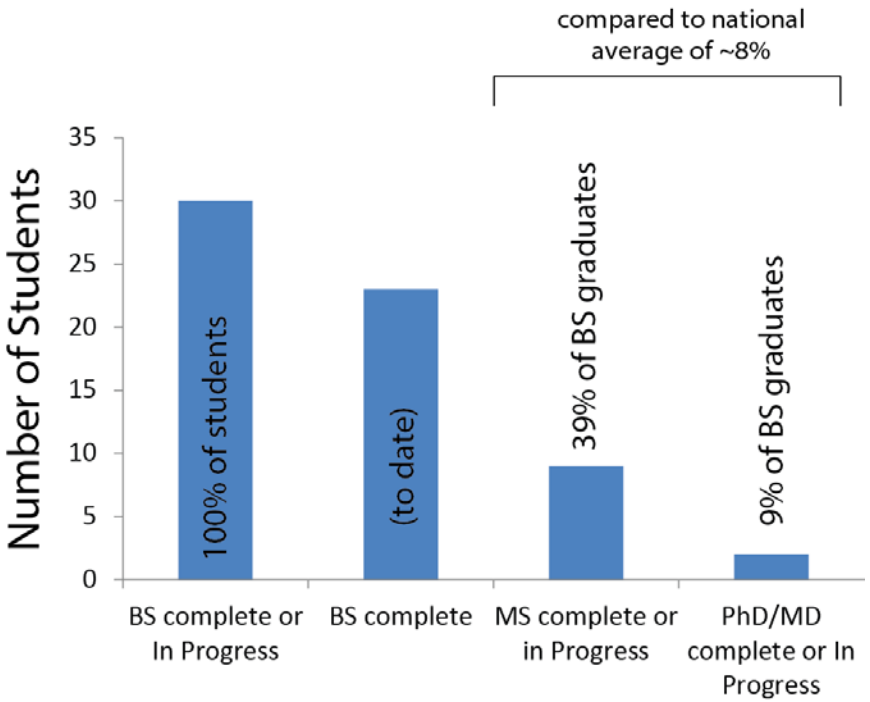
Laboratory

A sediment analysis lab created from scratch!

With emphasis on:

data interpretation,
writing a scientific paper,
and presentation skills

Student Outcomes:



Survey question: Did any aspect of the class help you on your current path? And do you currently use any of the skills you learned in the class?

"**Designing projects**, and always thinking about the end goal, as well as having the mentorship throughout the process has benefited me a lot especially now that I am expected to be independent."

"... I felt in control of my own questions and research. This **chance to show self-reliance** has helped me understand how to properly conduct a research project."

"The class was structured such that basically everything we did was related to the final goal of completing a scientific manuscript of original research.... **The steps taken to achieve this goal were all connected**, which facilitated my learning very well."

"I **first used Matlab** during this apprenticeship, and now I use it all the time"

"Writing up the report at the end of the class was the most dull, but also likely the most essential part. Writing forces students to sit down and think hard about what they have learned, the results of the research, and **how to communicate those results to the academic community**."

"...the exposure to academic research helped me realize that I wasn't a good fit for it. The **biggest aspect of the class I still use is collaborative working skills.**"

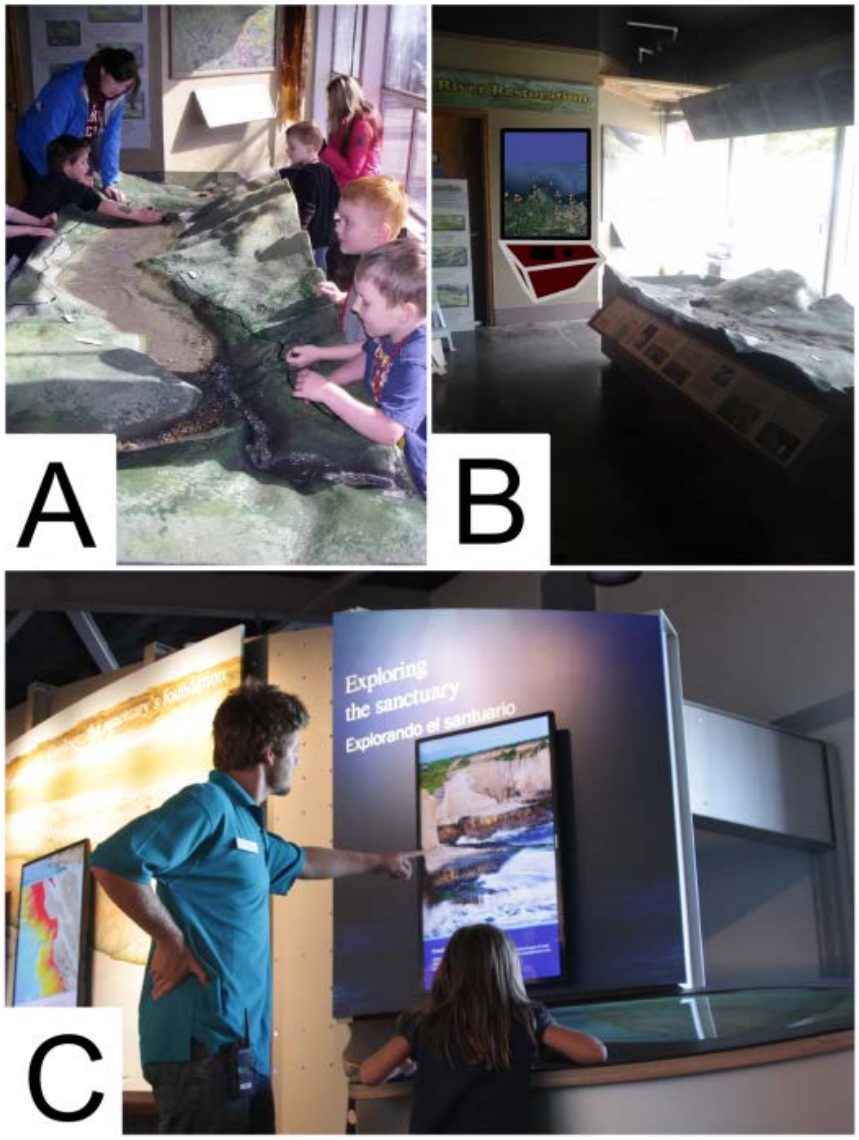
Research and Community Benefits

By engaging students in a major research project of regional and environmental significance, we hope to:

- *expand the reach* of the research to a broader subset of future scientists
- raise *awareness* about local and regional scientific issues
- expose students to the range of tasks required to answer research questions, and help them build *scientific research skills*
- help students better *communicate scientific results* to a broad audience
- improve *dissemination* of scientific results

In turn, student participation in the class has enriched the dataset collected as part of the larger research project, stimulated new questions about the impacts of our studies.

Outreach Activities focused on K-12



The **Feiro Marine Life Center**'s existing Elwha-focused interpretive material is static (panel A).

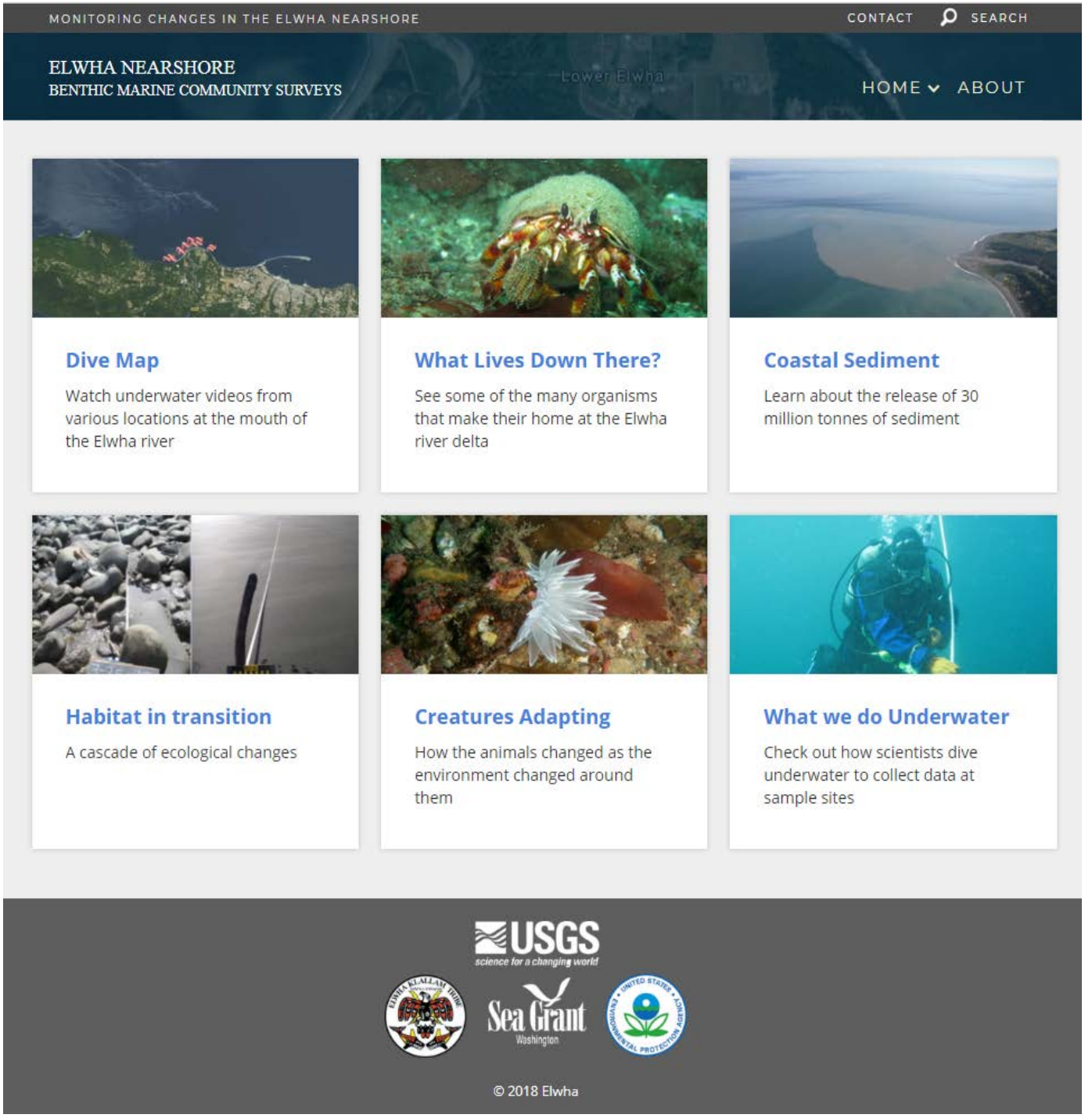
We are in the process of adding of a digital interactive display (panel B),

This is based on interactive displays at places like the Monterey Bay National Marine Sanctuaries interpretive center in Santa Cruz, CA (panel C; image courtesy of Lisa Uttal, Director)

At the center of the display is an interactive Web Page.

The “Landing Page” with storylines

In addition to the display at Fiero Marine Life Center, the web page will be accessible from any computer, anywhere.



Each story goes into more detail and provides appealing imagery for a range of knowledge levels.

Home
What we do Underwater
Creatures Adapting
Habitat in transition
Coastal Sediment
What Lives Down There
Dive Map

IMAGE GALLERY

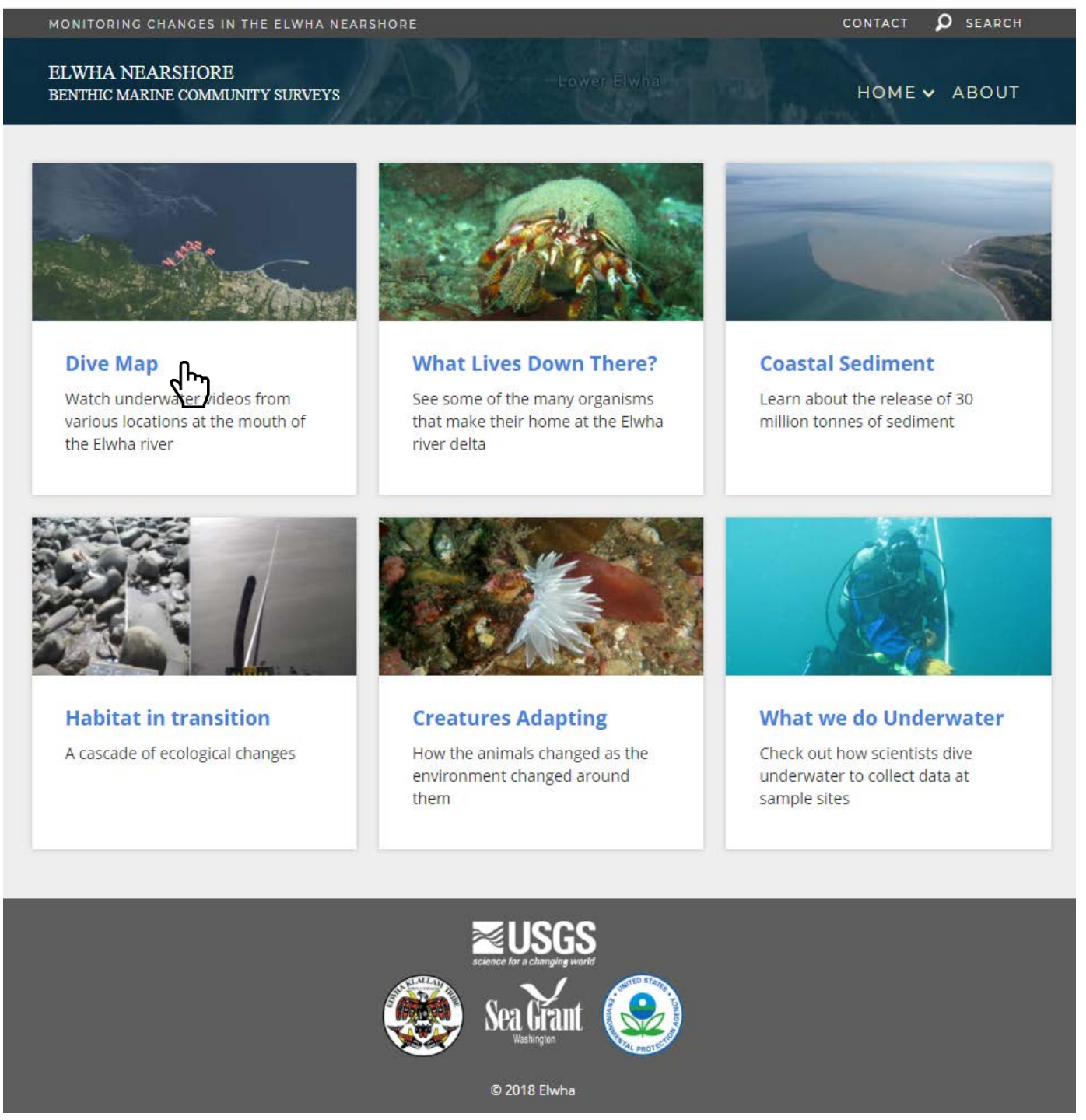
See some of the many organisms that make their home at the Elwha river delta

Near the Elwha River delta, fresh river water mixes with saltwater coming through the Strait of Juan de Fuca and flows over a variety of bottom substrates and kelp beds, providing a broad range of habitat for many organisms. As a result the shallow depths of the Strait of Juan de Fuca nearshore are home to a diverse array of underwater life.

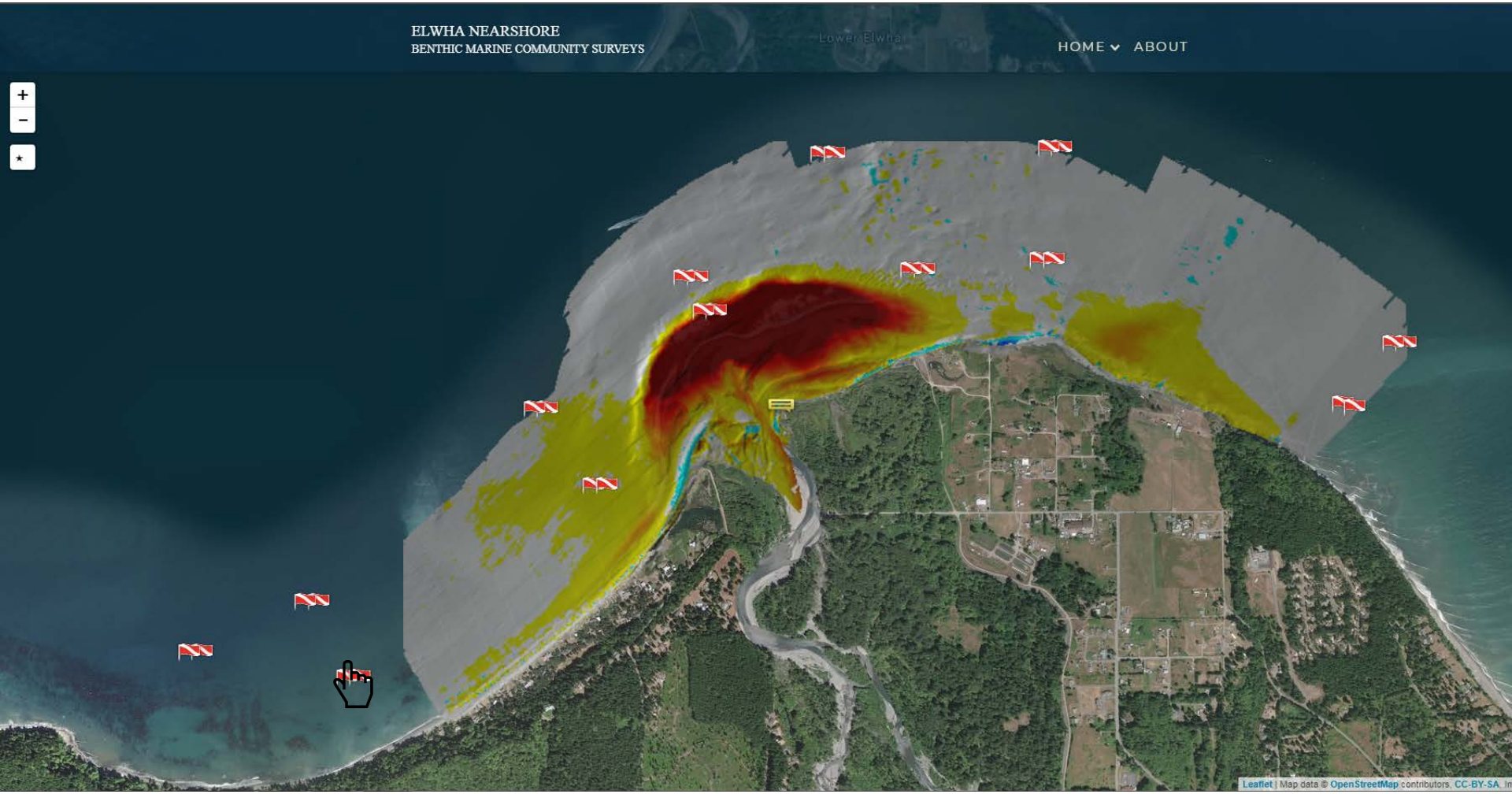
sponge

If you were to dive underwater near the Elwha River delta, you might find yourself swimming through an underwater forest of kelp. You may

One highlight is the “Dive Map” with underwater video



Click on any of the dive sites to see what has happened to marine habitats before, during, and after dam removal



Site: A1, Lat: 48.1387, Long: -123.5855, Date: 8/9/2016, Depth: 8.0 m

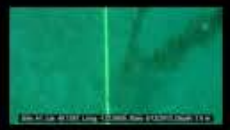
Permanent Site: A1 East Transect; Depth: 8.0 Meters (26.1 Feet); Distance from river mouth: 1.8 Kilometers (1.1 Miles) West; Pre/Post Dam Removal: 5 years post-dam removal; Lat/Long: 48.13870775, -123.5855312; Site Description: Transect is in eastern part of Freshwater Bay. Sediment is primarily sand/sandy mud. Previous small boulders appear to be buried. Seaweeds are very sparse. The patch of eelgrass (Zostera marina) seen in 2011-2012 has not returned. Feather duster tubeworms Eudistylia vancouveri start to be seen towards the western end (1:30 seconds) and past the end point of the transect (2:00 seconds). Another tubeworm, Diopatra ornata is common but hard to see on the video (appears as small clumps of seaweed and detritus 1:03 seconds). Location: Elwha River Nearshore, Strait of Juan de Fuca, Washington, USA Editor: Chloe Dawson; USGS Contact: Nancy Elder, Fishery Biologist, Marrowstone Marine Field Station, (nelder@usgs.gov)

A1 East Transect

2016

2015

2014



2013

2012

2011

2010

Summary:

The Elwha Restoration Project provided a unique opportunity to educate about sedimentary processes during restoration activities at a range of levels:

- A research-focused course at the Friday Harbor Labs trains students in restoration impacts and the scientific method
- Curriculum elements have been added to courses at Penninsula College and University of Washington (and beyond)
- The upcoming Feiro Marine Center display and on-line Elwha Nearshore website will connect with learners of all ages

photos courtesy Niall Twomey & Emily Eidam

Acknowledgements:

Significant credit goes to graduate students involved developing and teaching the courses (including Kristen Lee Webster, Rip Hale). Dr. C. Nittrouer and was co-instructor and developer for the course in 2008. The research apprenticeship program at the Friday Harbor Laboratories is funded by the Mary Gates Endowment and the Henry and Holly Wendt endowment. The scientific program was supported under NSF grant OCE-0960788 and Washington Sea Grant R/ES-65. The UW School of Oceanography helped support ship time for the research cruises.