

FY16 RSM-EWN IPR

Seattle District, Ediz Hook Post-dam removal shoreline change analysis

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BLUF: Two dams on the Elwha River were removed in late 2011, sending a large pulse of sediment into the Elwha River Littoral Cell (ERLC). Ediz Hook located at the downdrift end of the ERLC began a beach nourishment program in 1978 to mitigate for loss of sediment supply from the delta and shoreline armoring. Now that sediment from the ER delta has been restored, we are investigating how this large sediment pulse will affect O&M of Ediz Hook over the next 50-year life cycle

Problem Statement/Issue

- Ediz Hook protects the only deep-draft NAV channel on the Strait of Juan de Fuca
- USCG has a strategic air station on Ediz Hook for S&R
- O&M program partners with City of Port Angeles to renourish Ediz Hook with cobble ~5-10 years. O&M funding and cost-share \$\$ are not routinely available (deferred maintenance)
- Loss of nearshore habitat due to beach coarsening

Approach to Address Problem

- Determine if O&M demands will decrease & if so when will this occur?
- Can sand/gravel vs. cobble be utilized in future nourishment(s) to increase habitat value?
 - Develop sediment budget over ERLC
 - Perform shoreline change modeling to help guide future management decisions

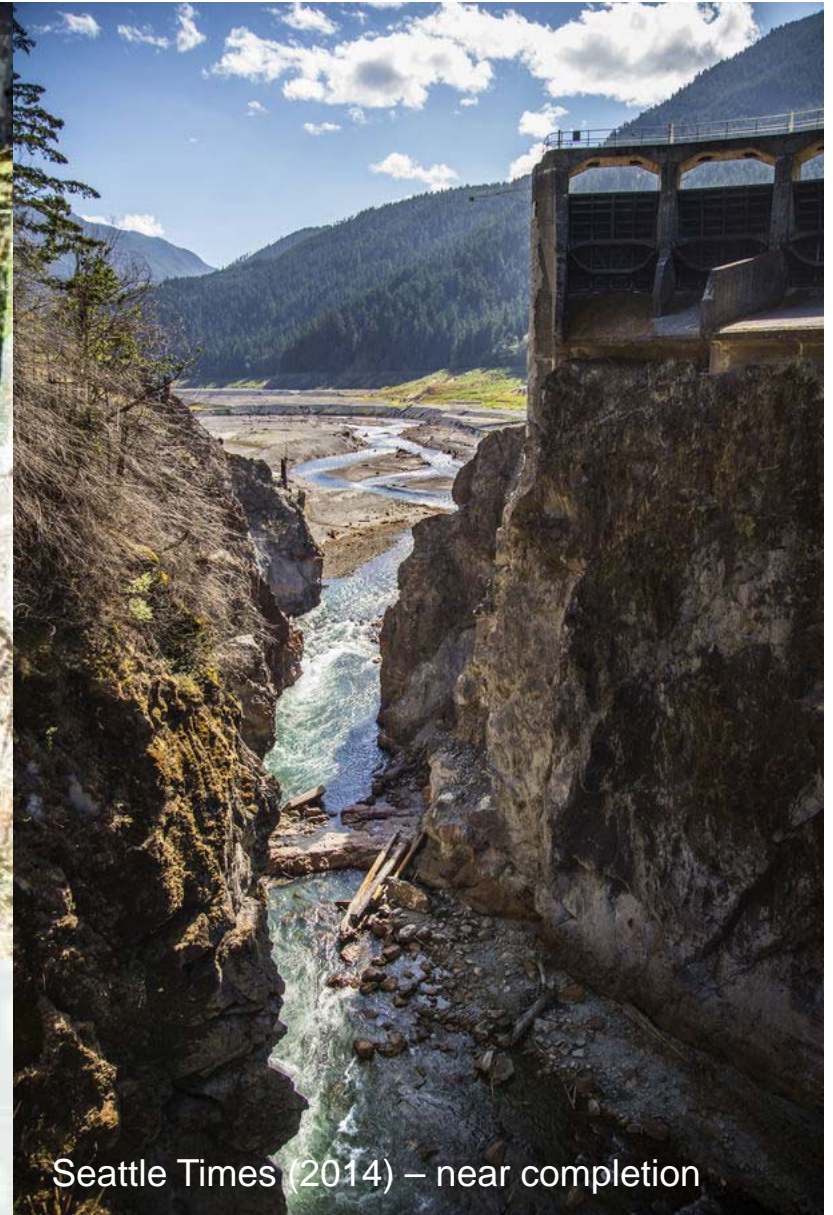




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Glines Canyon & Elwha Dam removal

- Authorized by Cong. in 1992 to restore migratory fish habitat
- Notching down the spillway to provide a controlled release of sediment downstream



Seattle Times (2014) – near completion



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Approach to Address Problem (Tools, Models, Technologies)

- Define Sediment Budget for ERLC
 - Quantify temporal and spatial scales of Elwha bluff erosion – seasonal high density surveying (USACE/WDoE)
 - Quantify temporal and spatial scales of riverine input from Elwha River into the nearshore delta – seasonal high density surveying (USGS/WDoE)
- Construct shoreline change model
 - Build GenCADE model
 - Utilize existing CMS-WAVE model for wave transformation
 - Calibrate/Validate GenCADE model to observed survey data
 - Perform long-term shoreline change scenarios and sensitivity tests to guide future O&M decisions

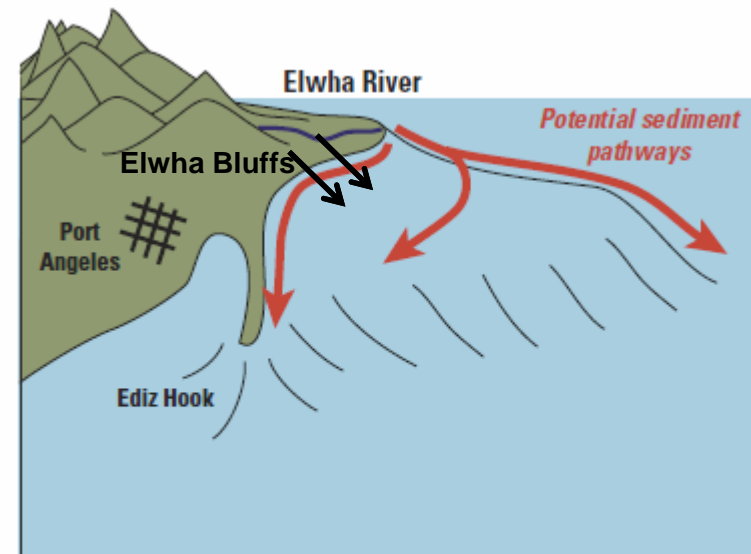
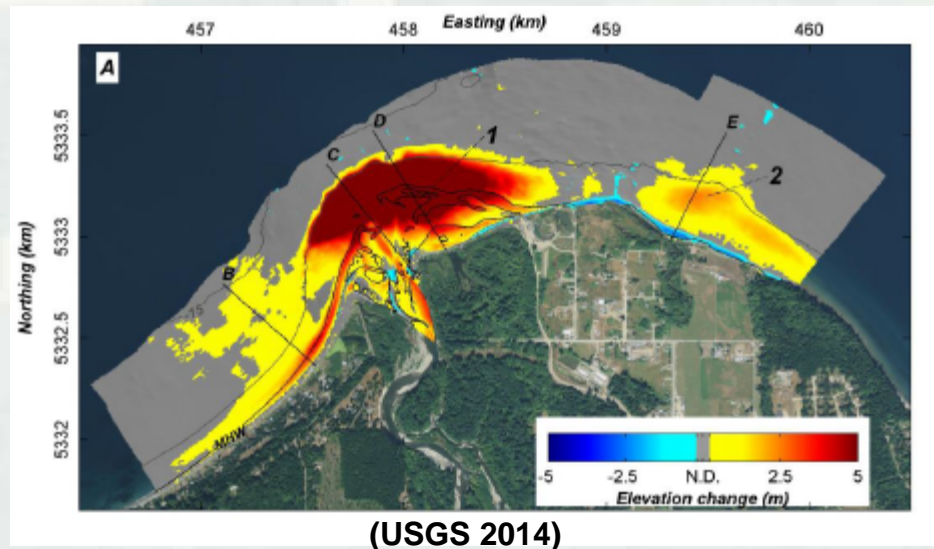
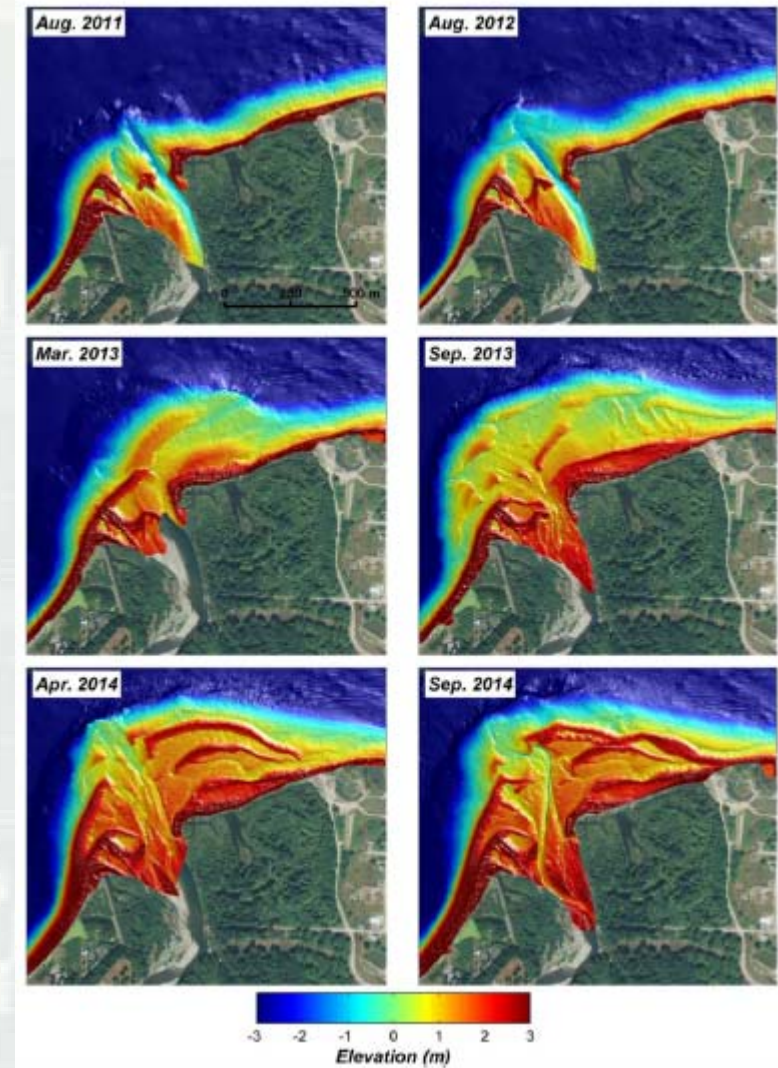


Figure 9.5. Schematic diagram showing the potential transport pathways for sediment offshore of the Elwha River mouth, Washington. Actual transport directions will be determined by sediment grain size and the strength, direction, and persistence of coastal currents and waves.



(Miller et al 2014)



Delta progradation

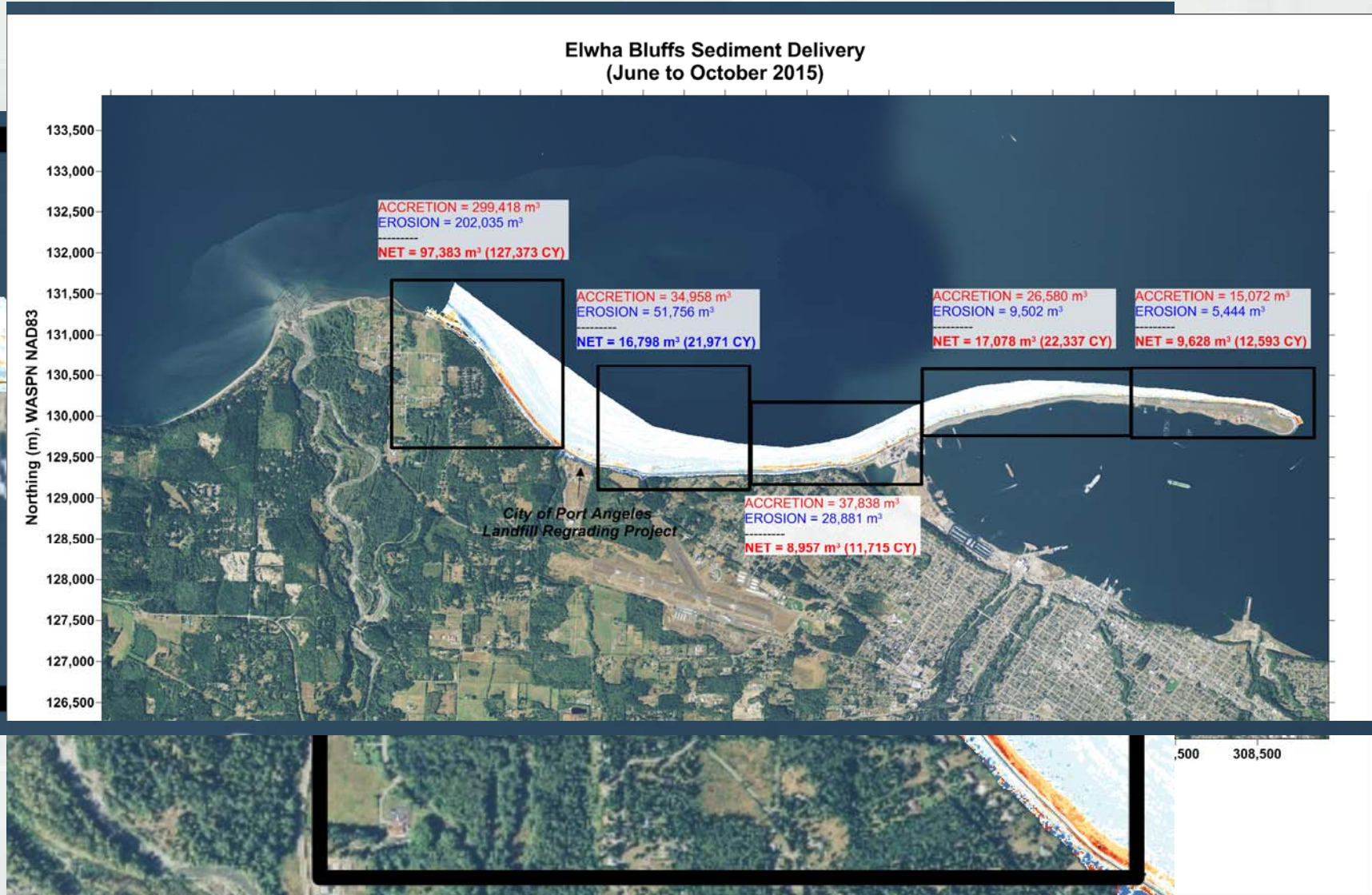


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Approach to Address Problem
(Sediment Budget for Elwha bluffs and Ediz Hook)

Multibeam Bathymetry & Lidar Topography
data collected by Ecology CMAP, June & Oct. 2015



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Ediz Hook Post-dam removal shoreline change analysis

USACE RSM PDT

- David R. Michalsen, Coastal Engineer
- Scott H. Brown, Coastal Engineer
- Elizabeth A. Chien, NAV Coastal Program Manager

Stakeholders/Partners

- Washington Department of Ecology (WDoE)
- U.S. Geological Survey
- City of Port Angeles
- Coastal Watershed Institute - NGO

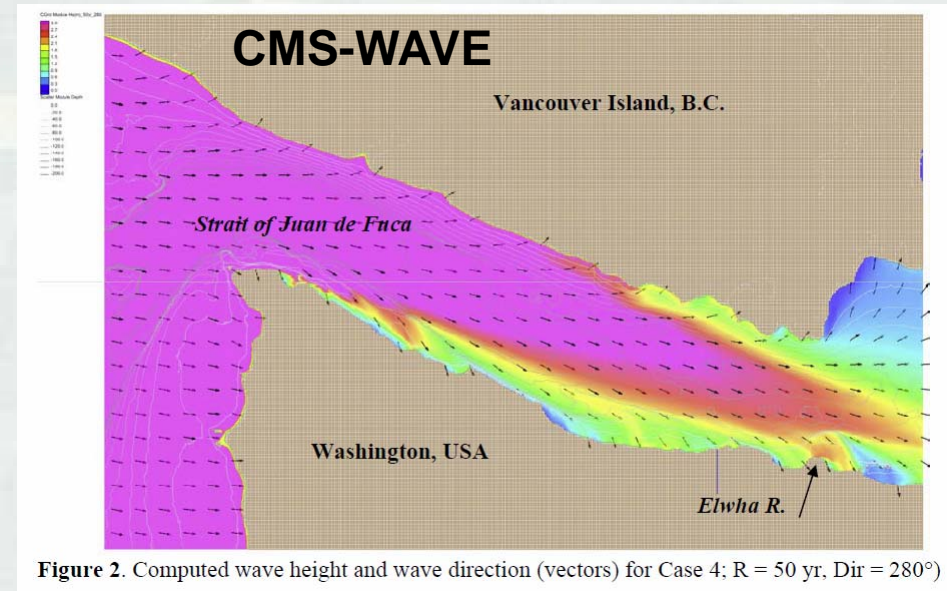
What key leveraging opportunity(s) did stakeholders/partners provide?

- Boat based lidar, multibeam hydrosurvey, GPS backpack surveying equipment
- Surveying field crew
- Grain Size data
- Nearshore wave data
- Aerial photos



GenCade modeling

- Coupled with existing CMS-WAVE spectral wave model developed for the Strait of Juan de Fuca
- Recent delta and bluff surveys used to specify sink/source boundary conditions
- Empirical longshore transport coefficients ($K1$ and $K2$) coefficients are calibrated/validated using survey data / aerial photos



GENCADE



Calibration from Jan 2001 to Dec 2011 (at time of dam removal)



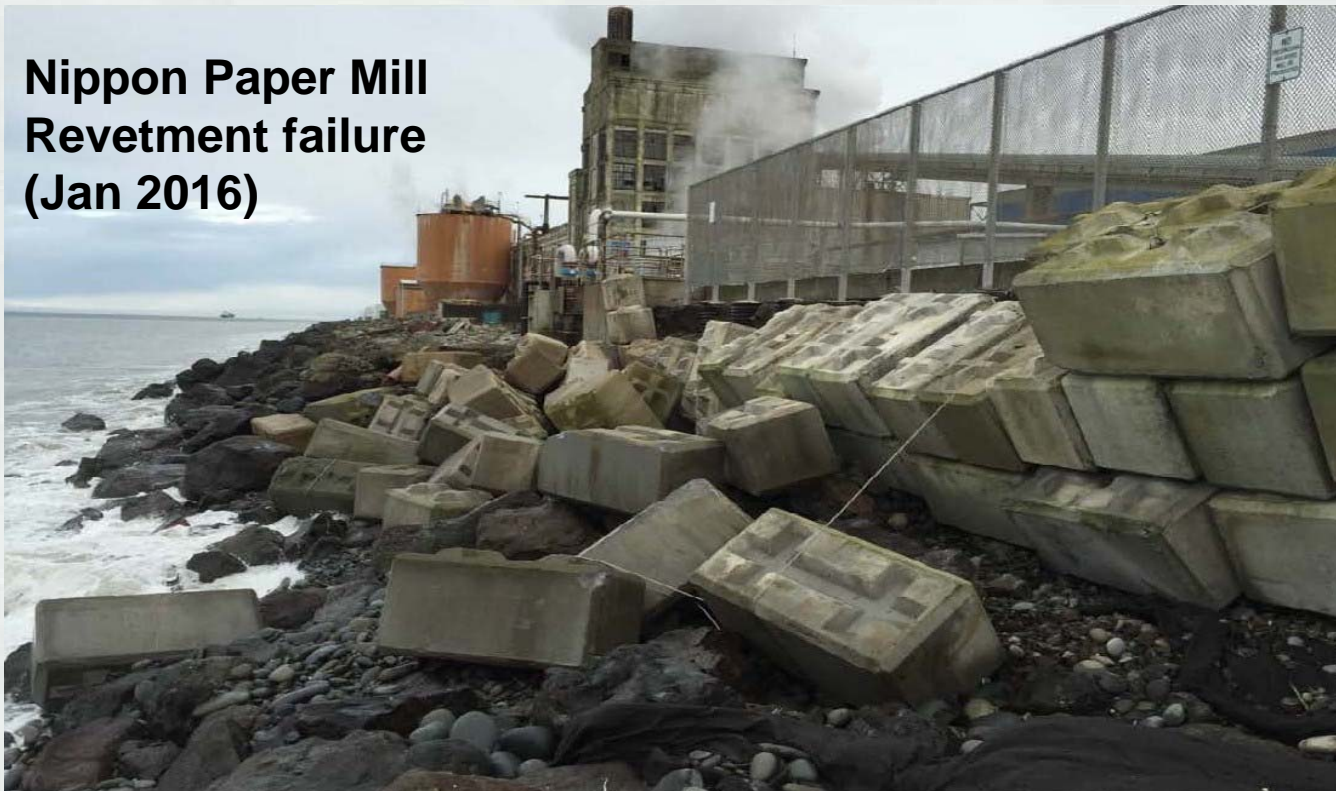
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UPs – 3 Positives from effort

- Successful collaboration between federal, state, city, and NGO
- Lidar survey was used to generate quantities for EM Repairs in JAN 2016 (below) and upcoming O&M repairs in FY16
- Case study for GENCADE on the West Coast.

**Nippon Paper Mill
Revetment failure
(Jan 2016)**



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DOWNs – 3 Negatives from effort

- ✓ O&M responsibility to maintain federal revetment viewed negatively by NGOs in context of on-going nearshore ecosystem restoration initiatives
- ✓ O&M with cobble is still most effective type of beach nourishment for immediate toe protection on Ediz Hook revetment, long-term nourishment with finer sand/gravel may be feasible?
- ✓ Challenging to integrate Navigation project short term needs with long term ecosystem restoration initiatives being investigated in Planning Branch



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Value to the Nation

- Cost savings to O&M program
 - Decrease frequency and magnitude of nourishment
- Environmental benefits
 - Providing baseline information to guide Section 206 CAP study with City of Port Angeles – NGO very interested in using results to site potential projects
- Improved partnerships
 - Quantification of bluff erosion rates through our surveying/mapping efforts will help the City/County/State with their Shoreline Master Program which makes decisions regarding development in high risk areas

