US Geological Survey Nearshore Mapping

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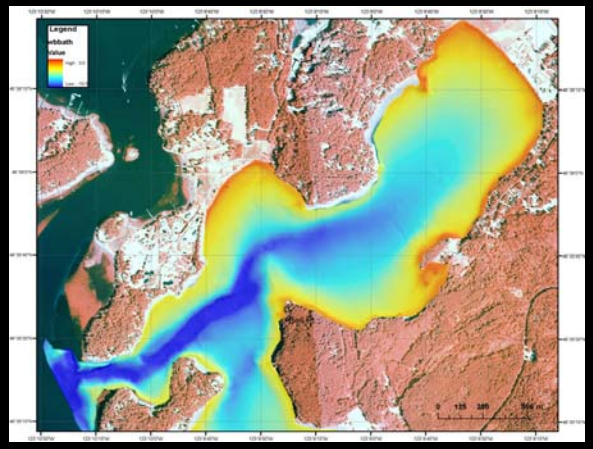
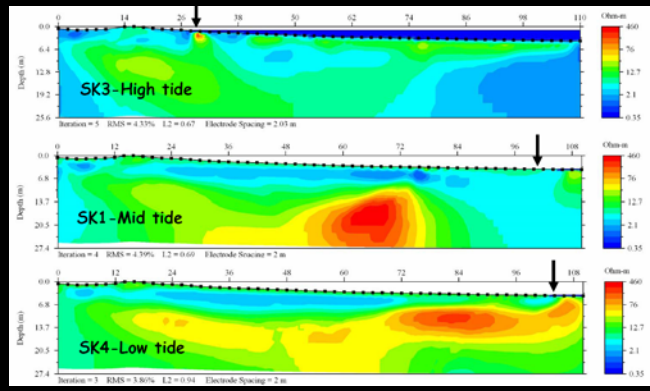




USGS Coastal Habitats in Puget Sound (CHIPS) Project
Large River Deltas, Urban Impacts, Elwha Dam Removal

70-80% loss estuarine habitat since 1850
(density-dependent mortality, Beamer et al. 2005)

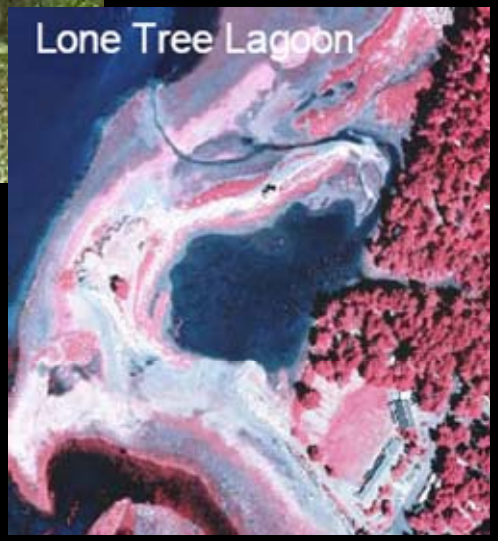
Objectives:

1. Characterize nearshore habitat and function

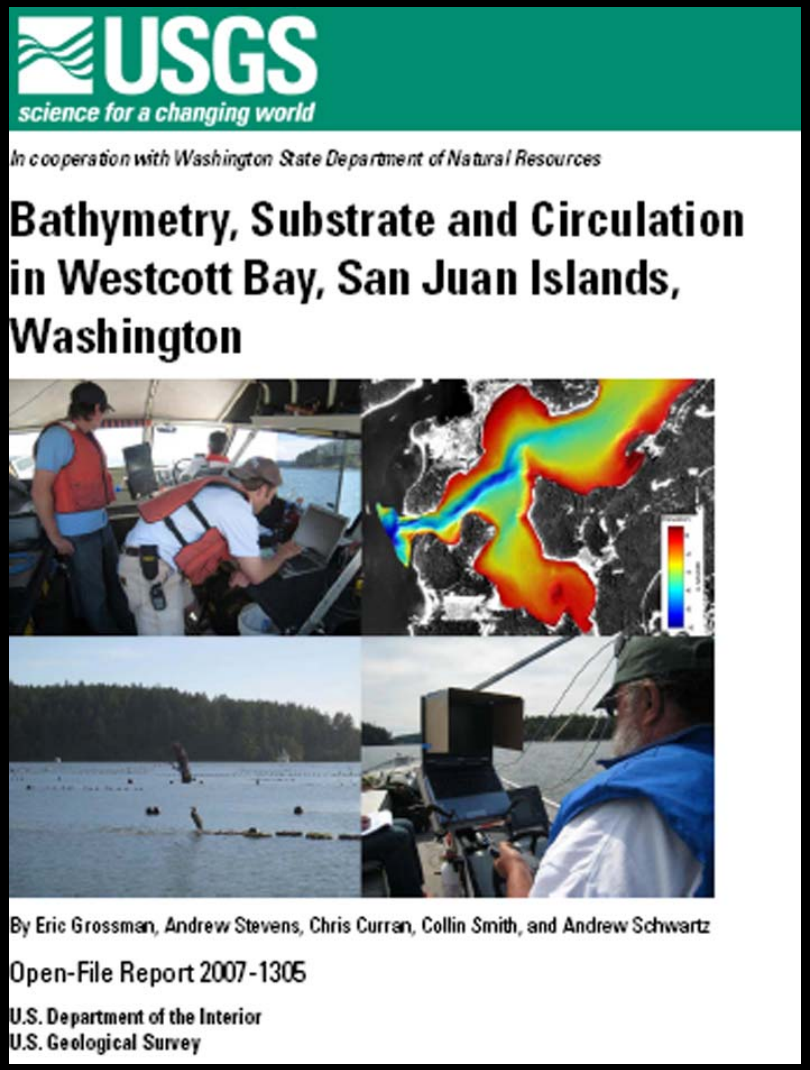
2. Quantify processes affecting habitat availability, connectivity, change

Simultaneously map with multiple sensors

Distribution, Structure, Function, habitat use baseline data



- Hydrodynamics, sedimentation
- Extent of impacts


USGS
science for a changing world

In cooperation with Washington State Department of Natural Resources

Bathymetry, Substrate and Circulation in Westcott Bay, San Juan Islands, Washington

By Eric Grossman, Andrew Stevens, Chris Curran, Collin Smith, and Andrew Schwartz

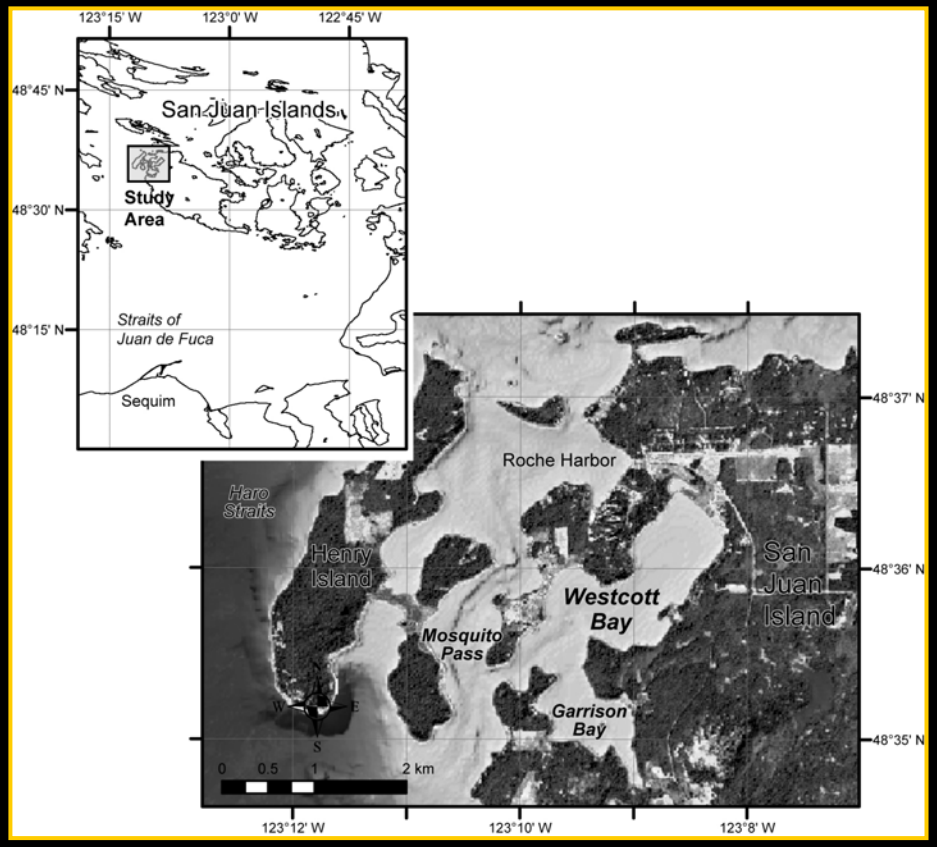
Open-File Report 2007-1305

U.S. Department of the Interior
U.S. Geological Survey

http://pubs.usgs.gov/of/2007/1305/

Eelgrass Stressor Project

Examine sediment/turbidity stress on eelgrass die-off and recovery



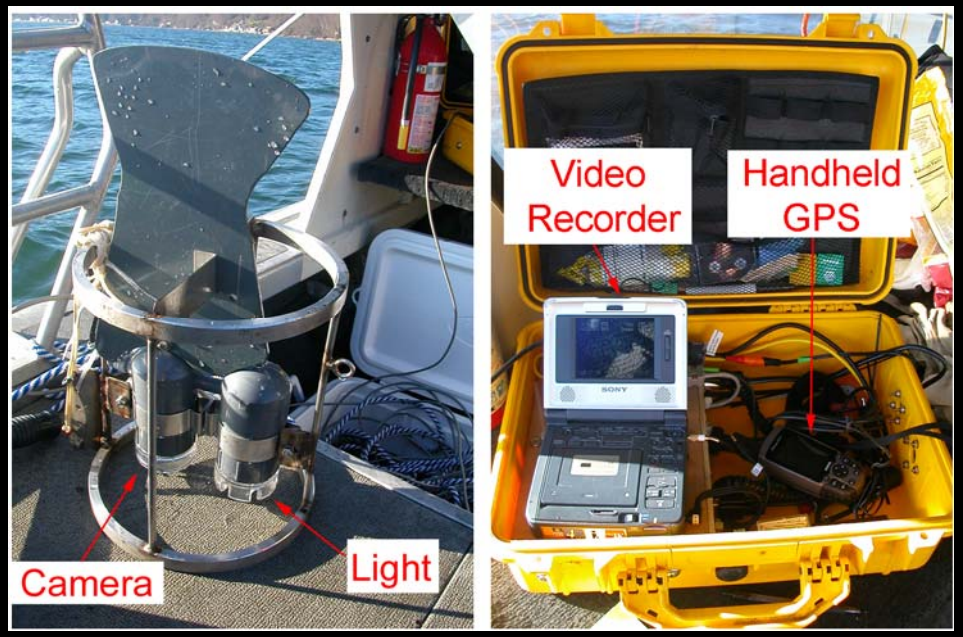
200, 430 kHz BIOSONICS
-bathymetry, substrate, vegetation

600 kHz ADCP
-currents

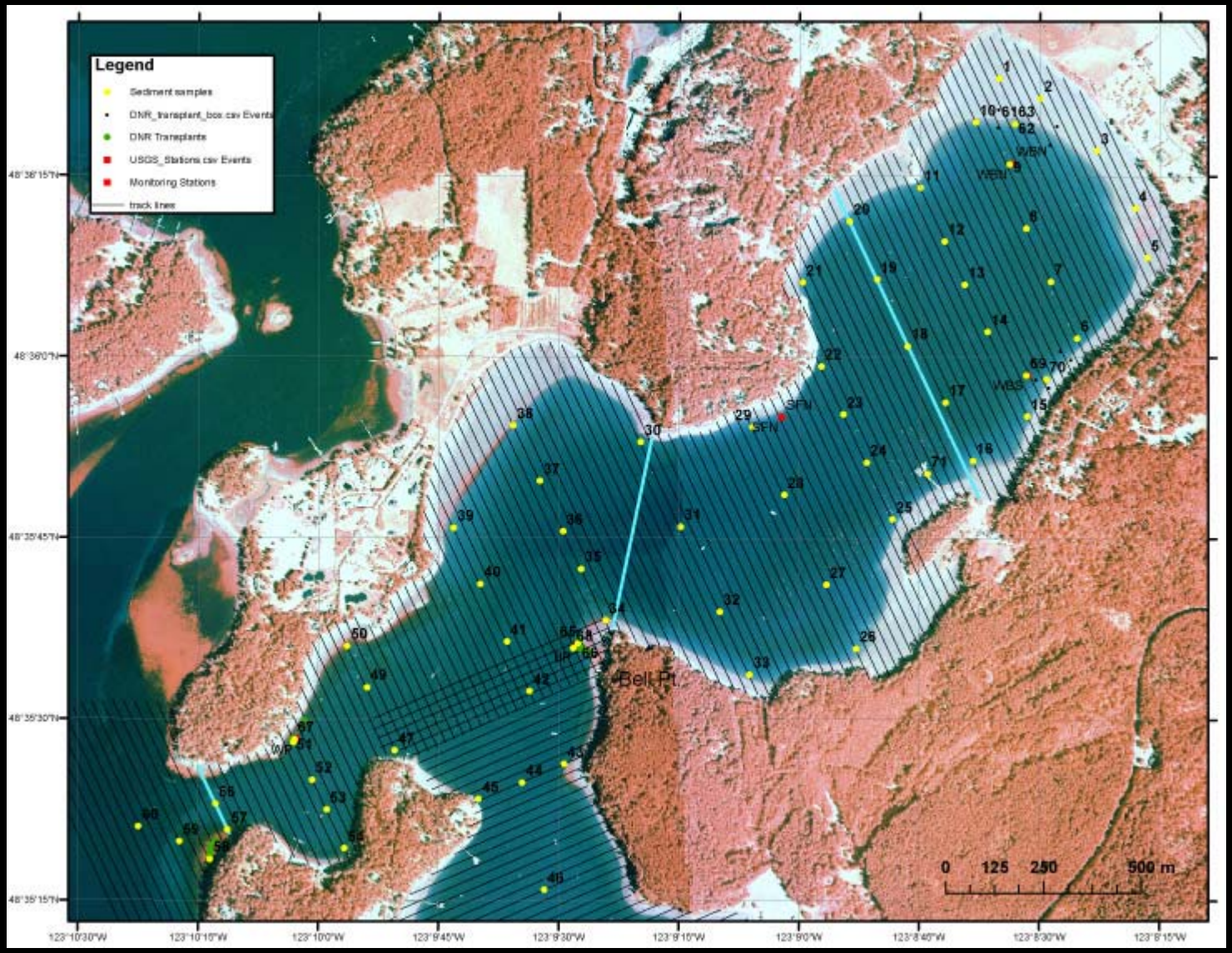
Trimble RTK-DGPS
-positioning, tides

Van veen grab

Video

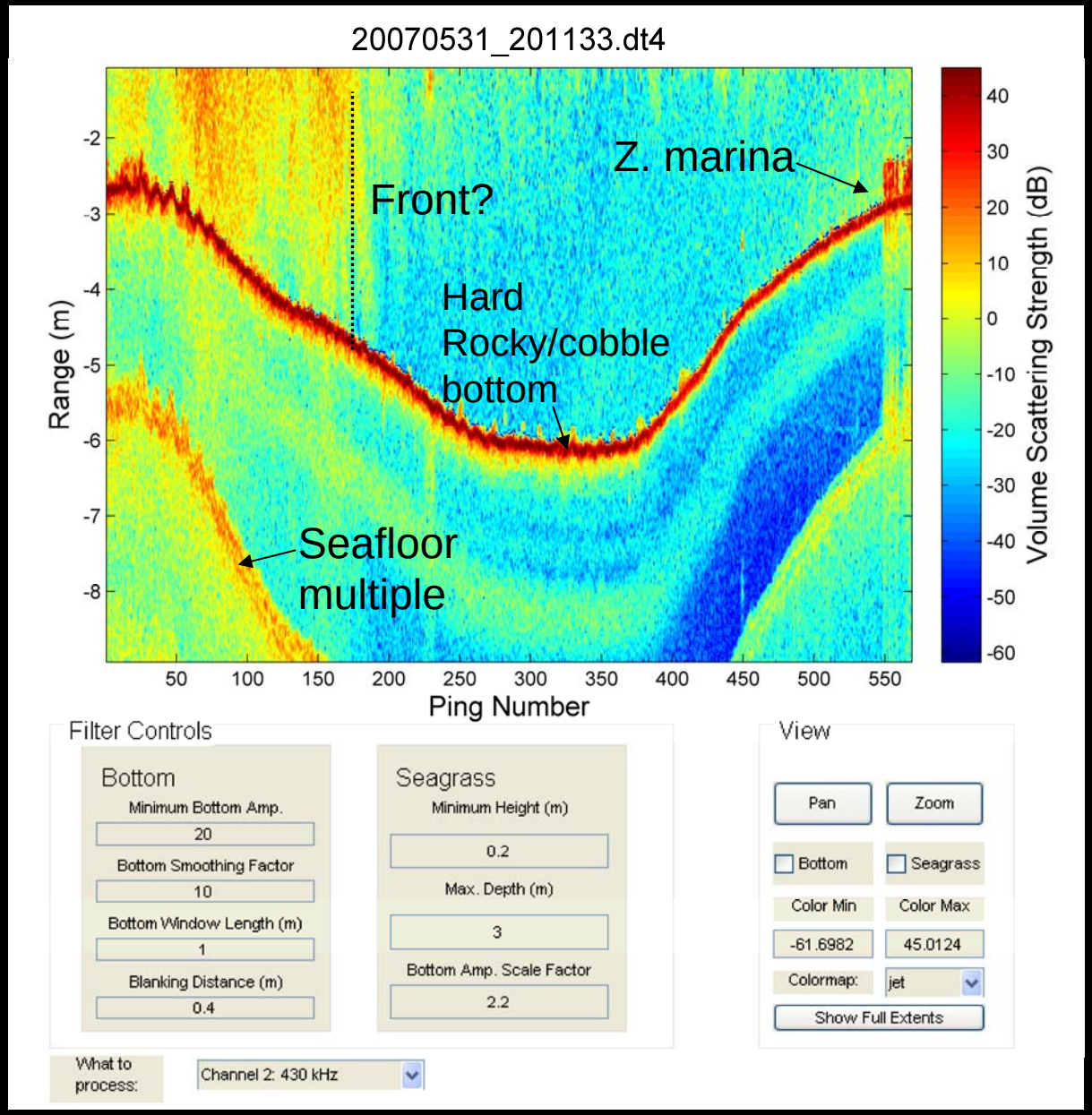


Survey Design

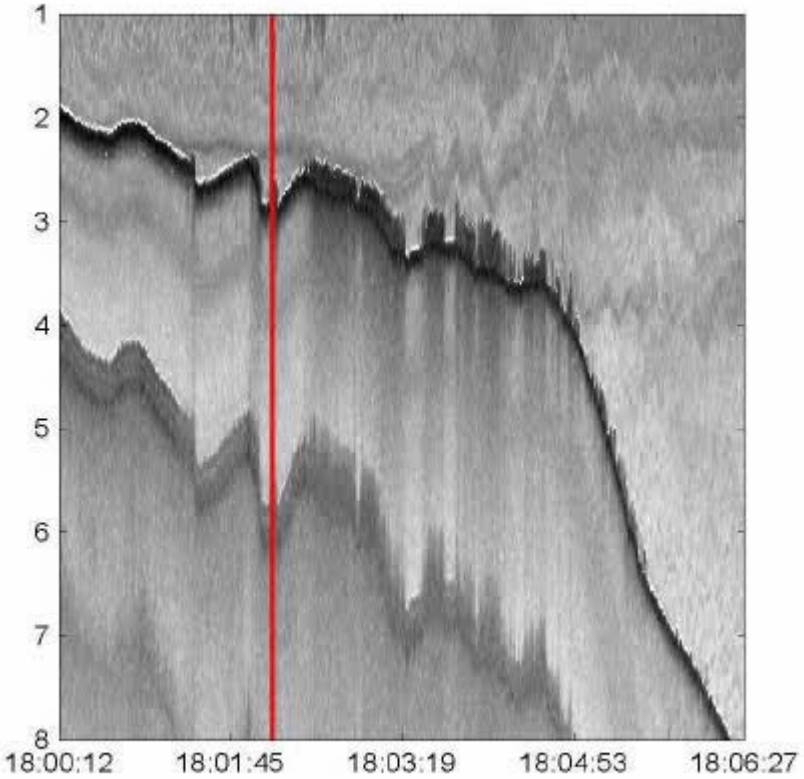


Data/ Processing

GUI Andrew Stevens

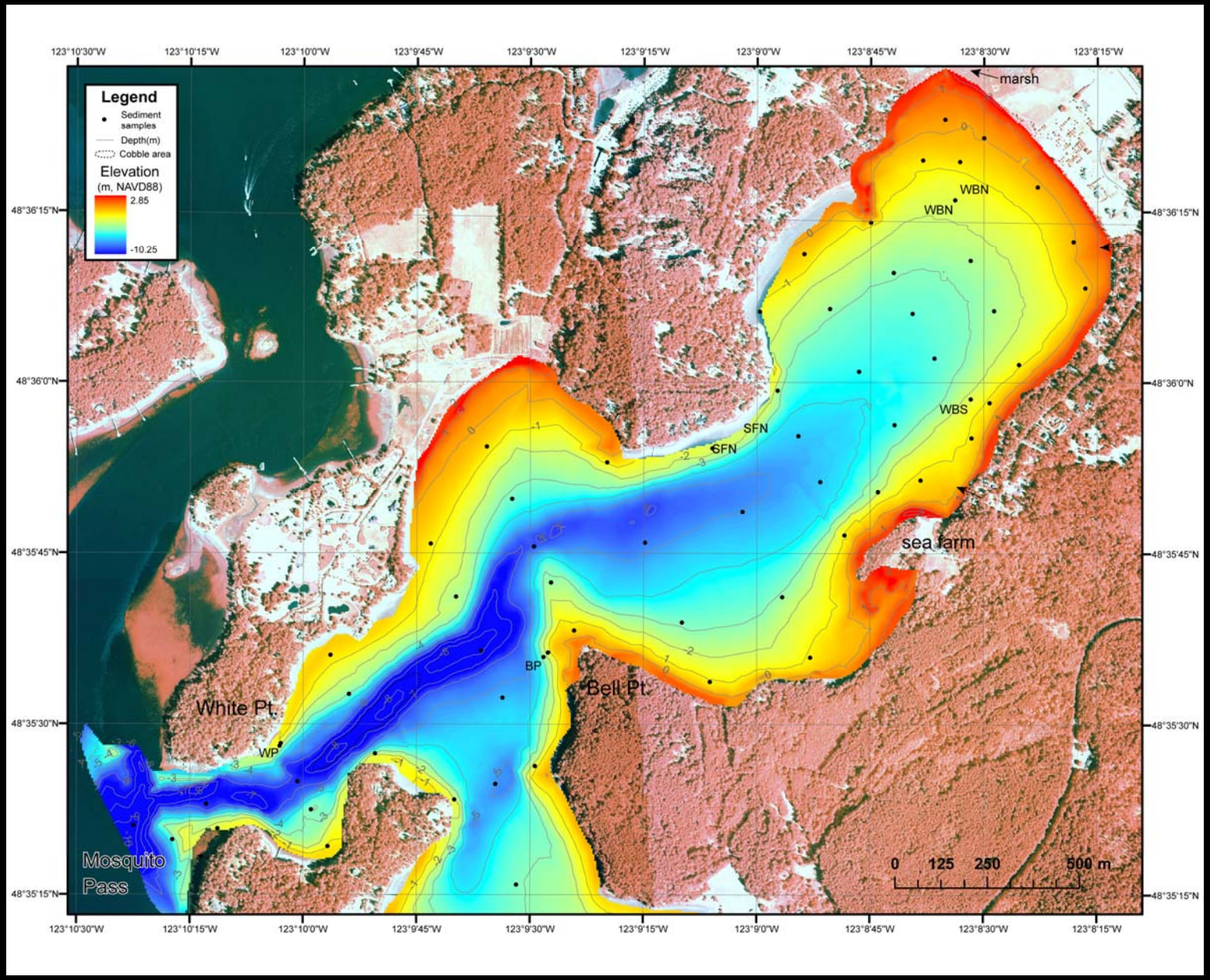


Video Ground-truth

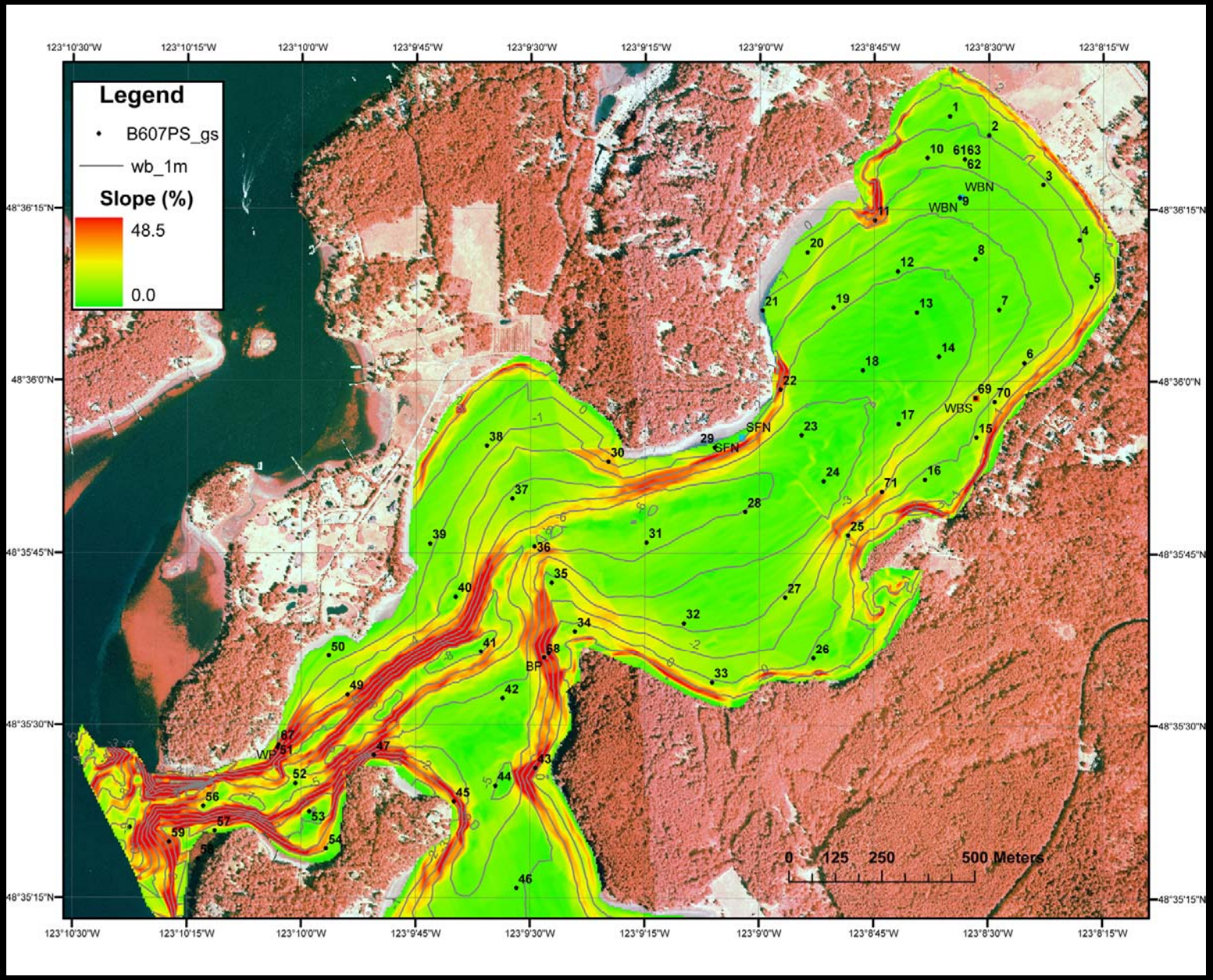


High-res Bathymetry

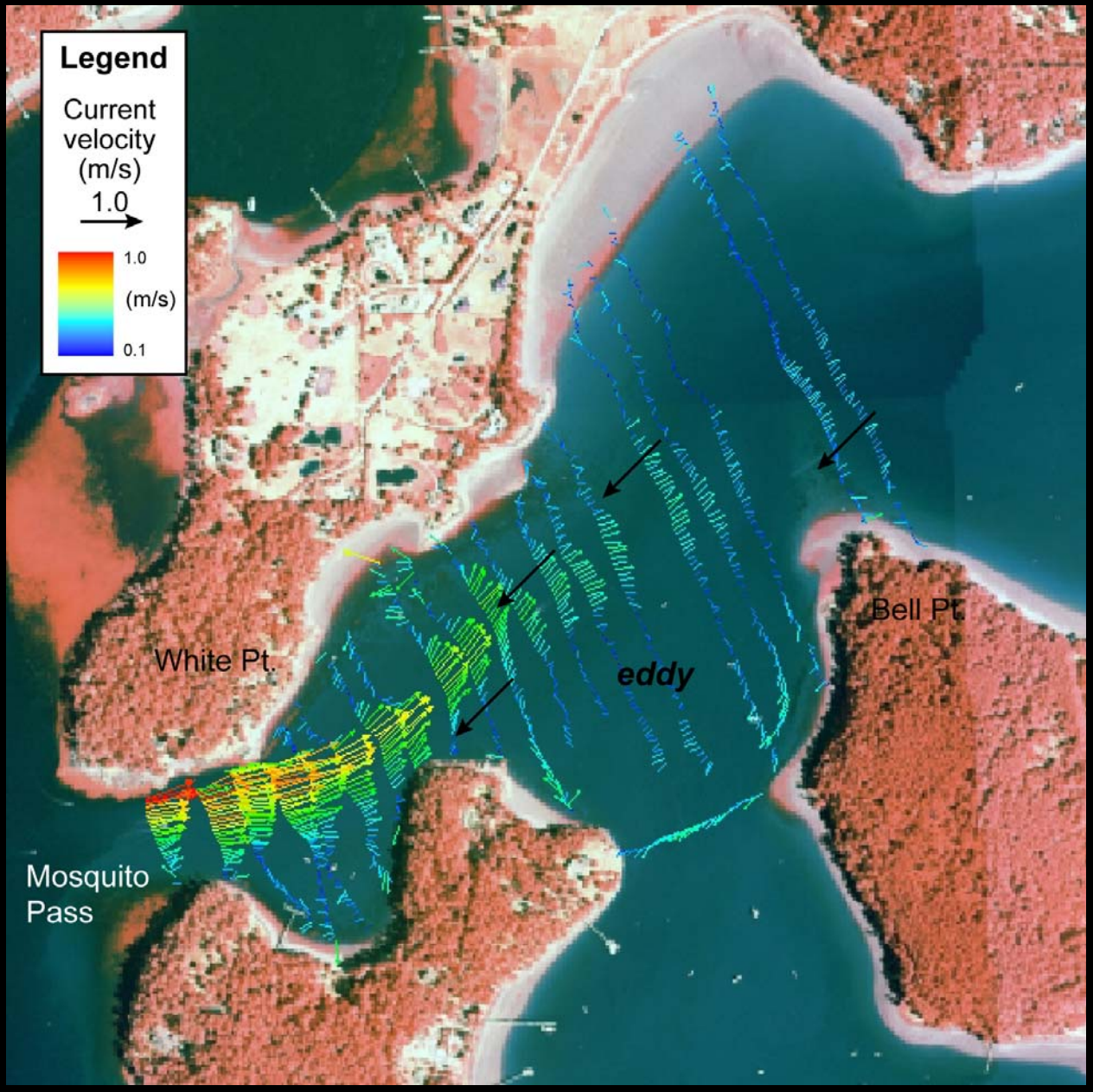
Vertical RMS ±10 cm



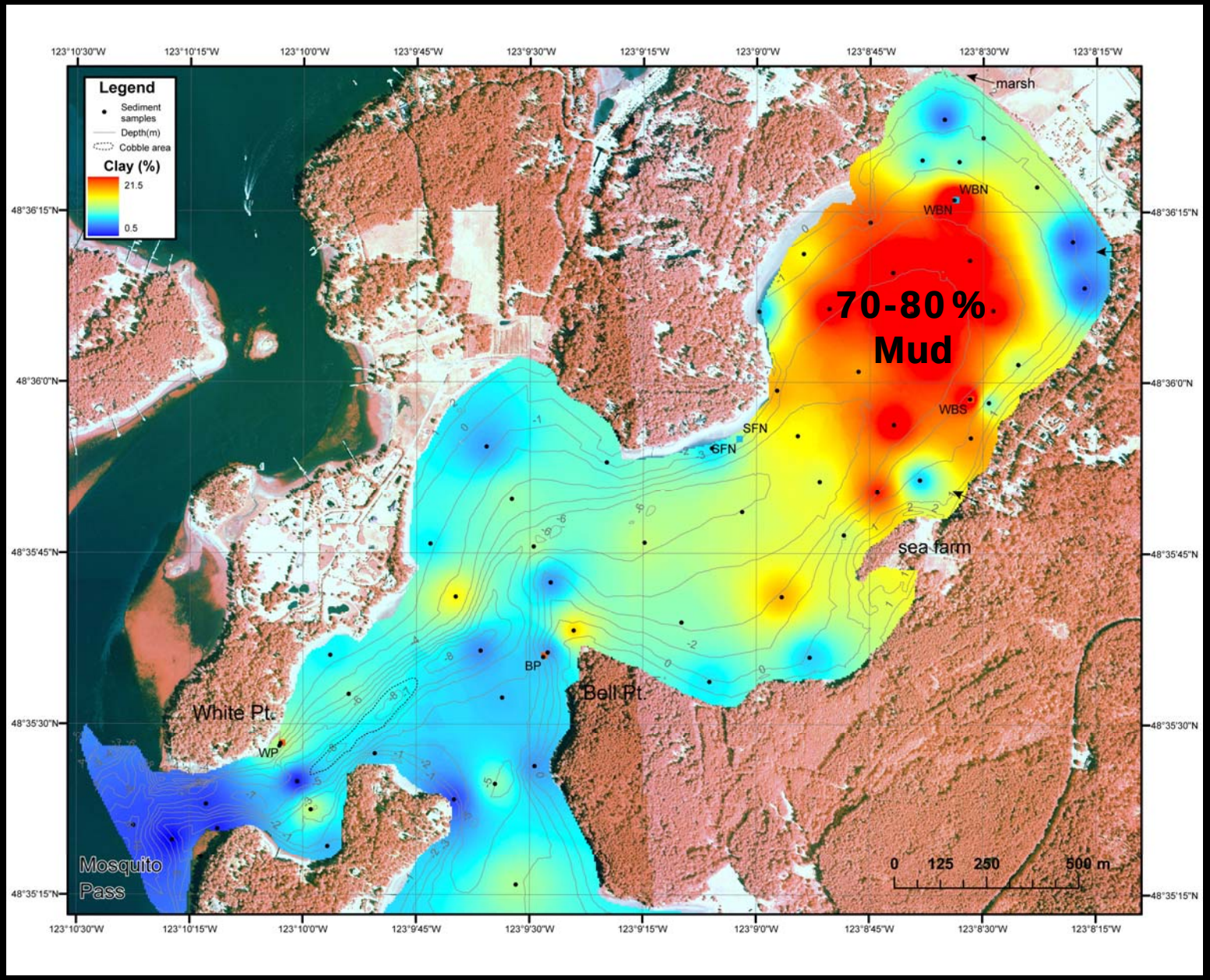
Slope / morphology



Currents/ Circulation

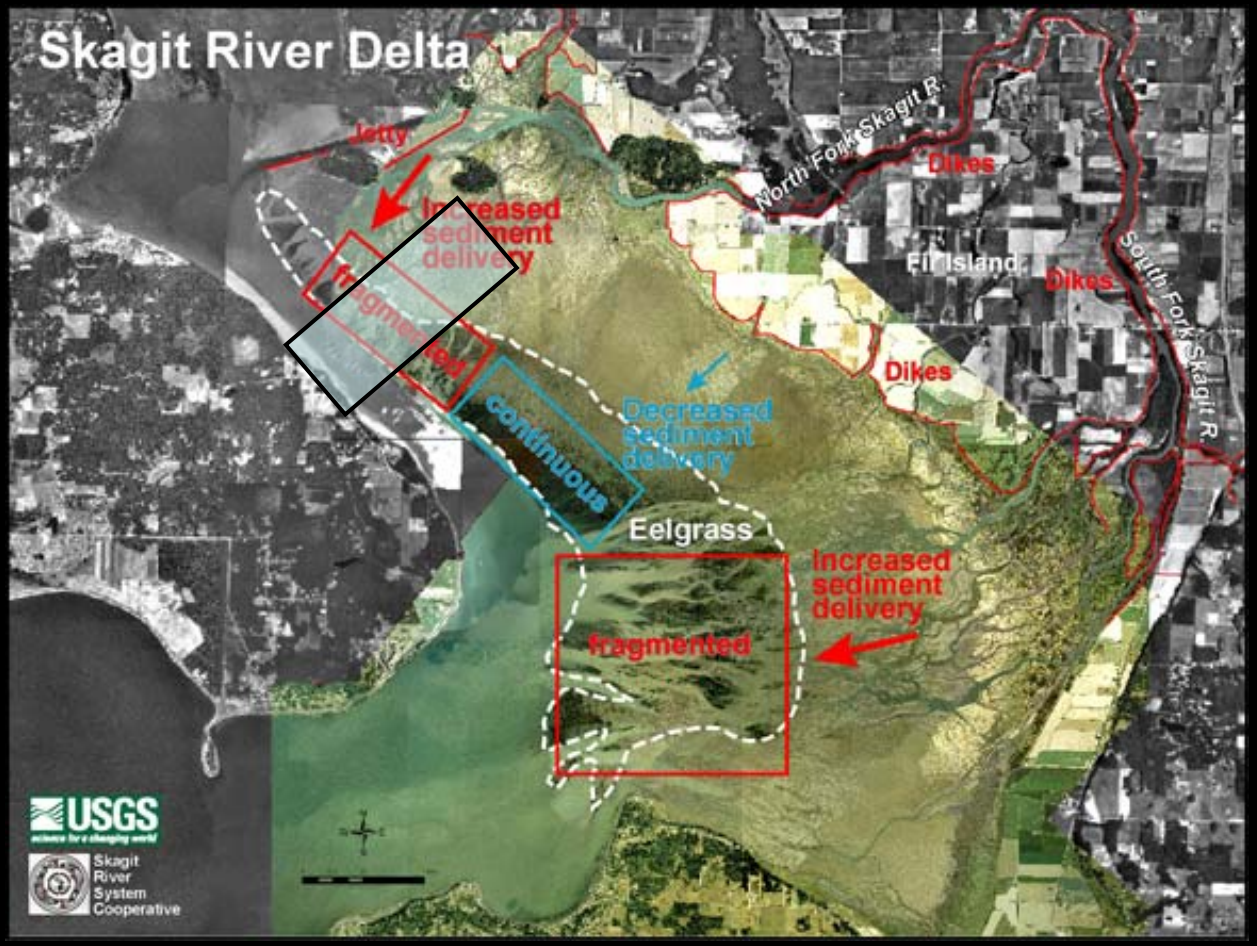


Substrate Type / Sediment Grain size



Skagit River Delta

Examine land use (channelization) impacts to nearshore (sedimentation, salinity gradients)

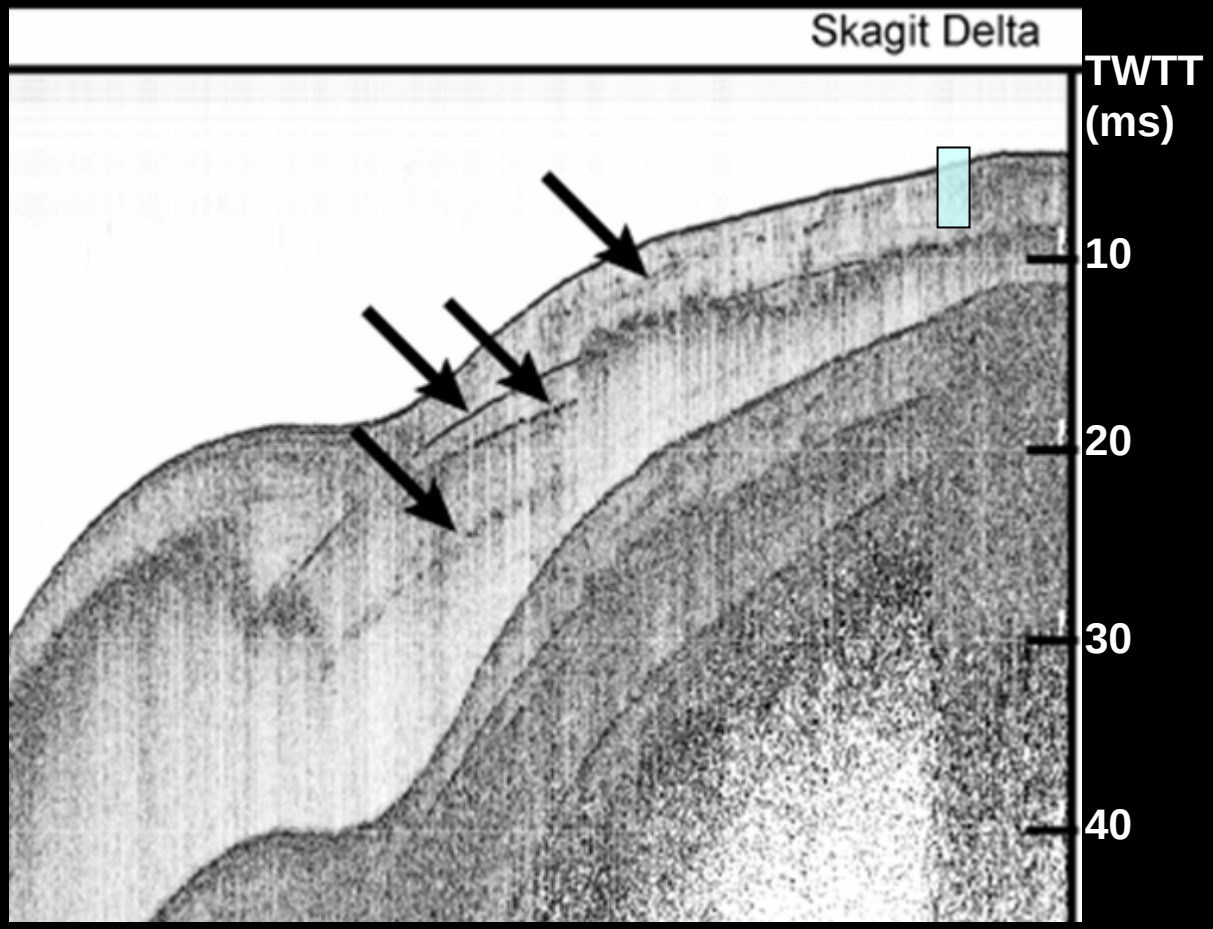


CHIRP Seismic Reflection along with multibeam

Sweep Freq: 0.5-12 kHz
SR: 0.25 sec
PL: 10 ms

-geologic framework,
-sediment thickness,
-oceanography

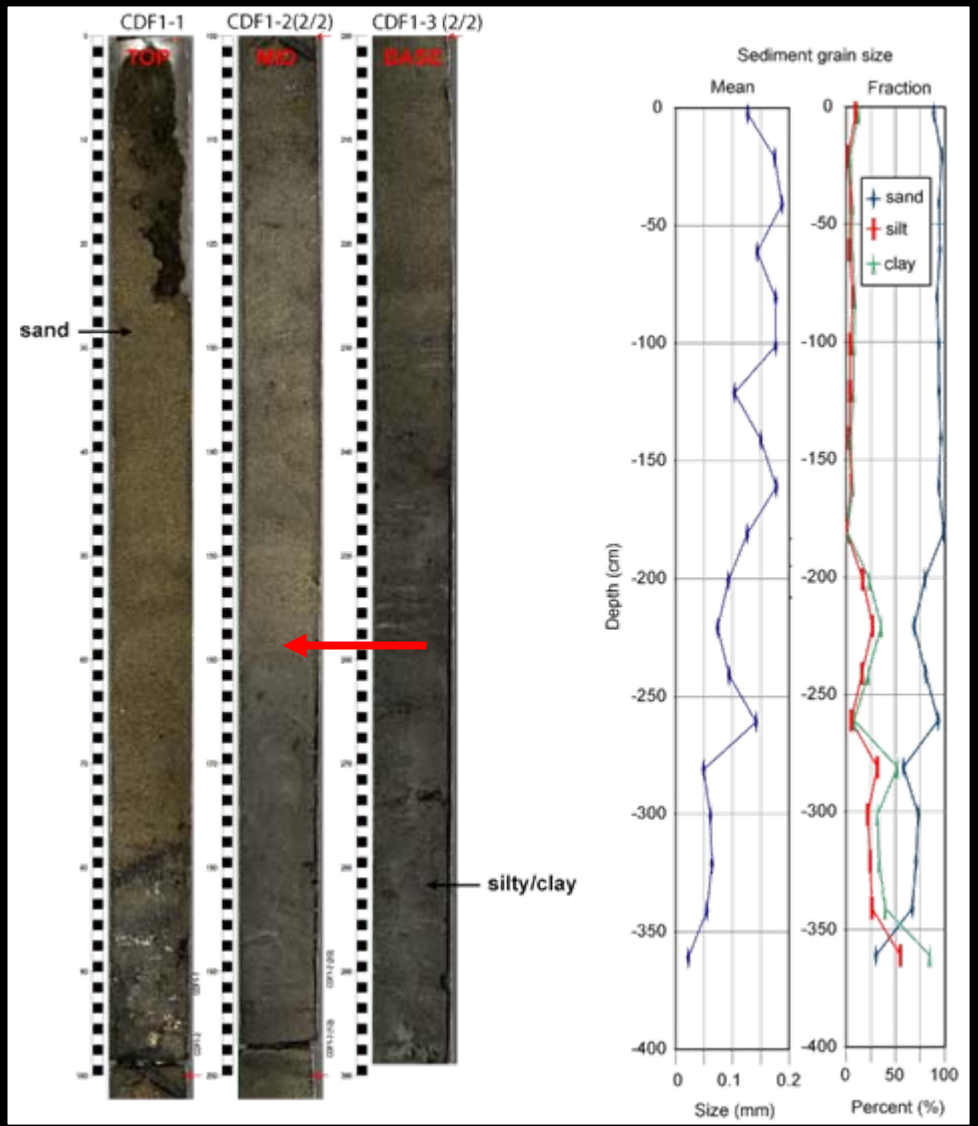
Sediment bypassing tide flats
Prograding delta front



Coring
Sediment analyses

$^{210}Pb/^{14}C$ materials <150 yr BP at -10 m!

Abrupt change c. 1850
Sand overlying old mudflat

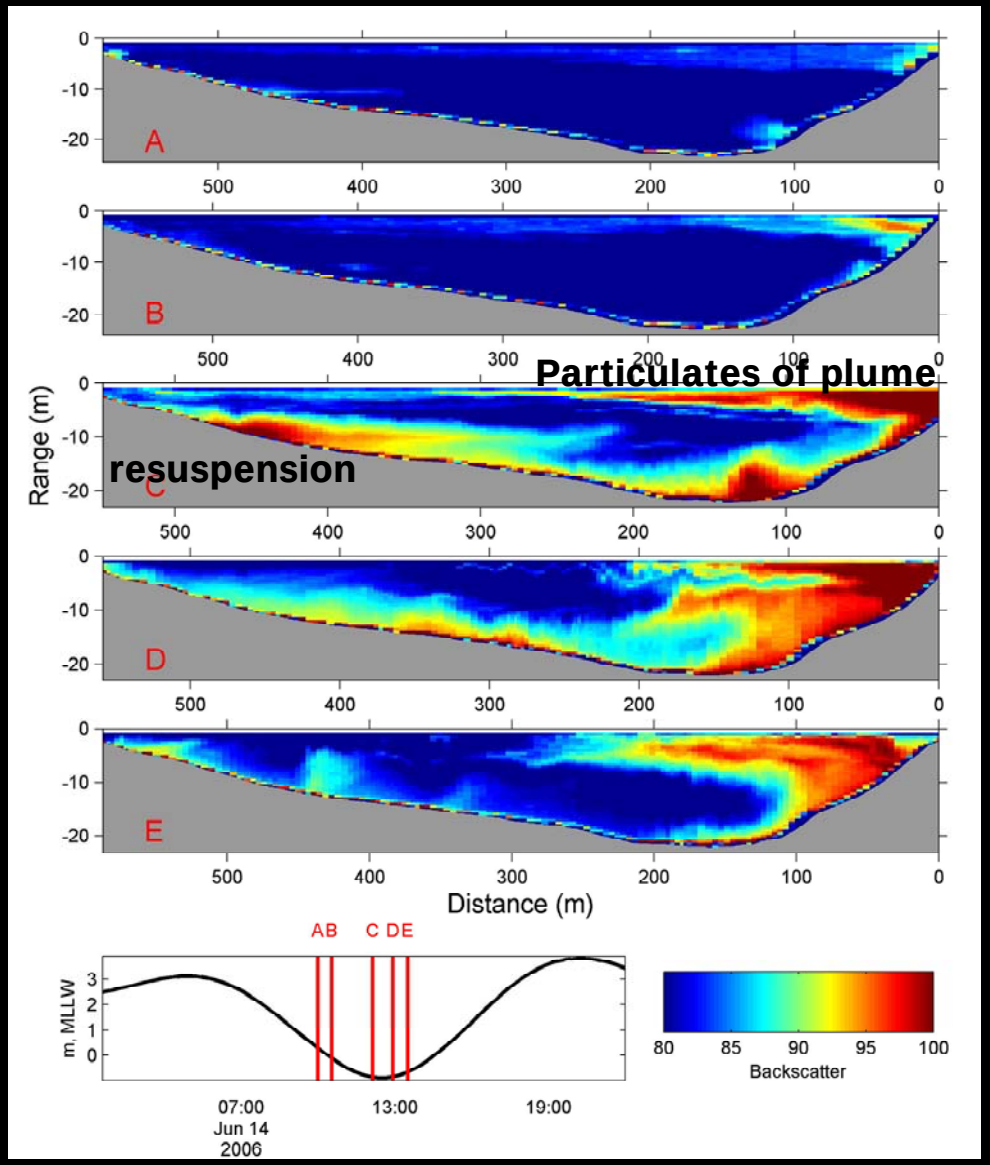


Fines bypassing delta, north transport

Hydrodynamic measurements

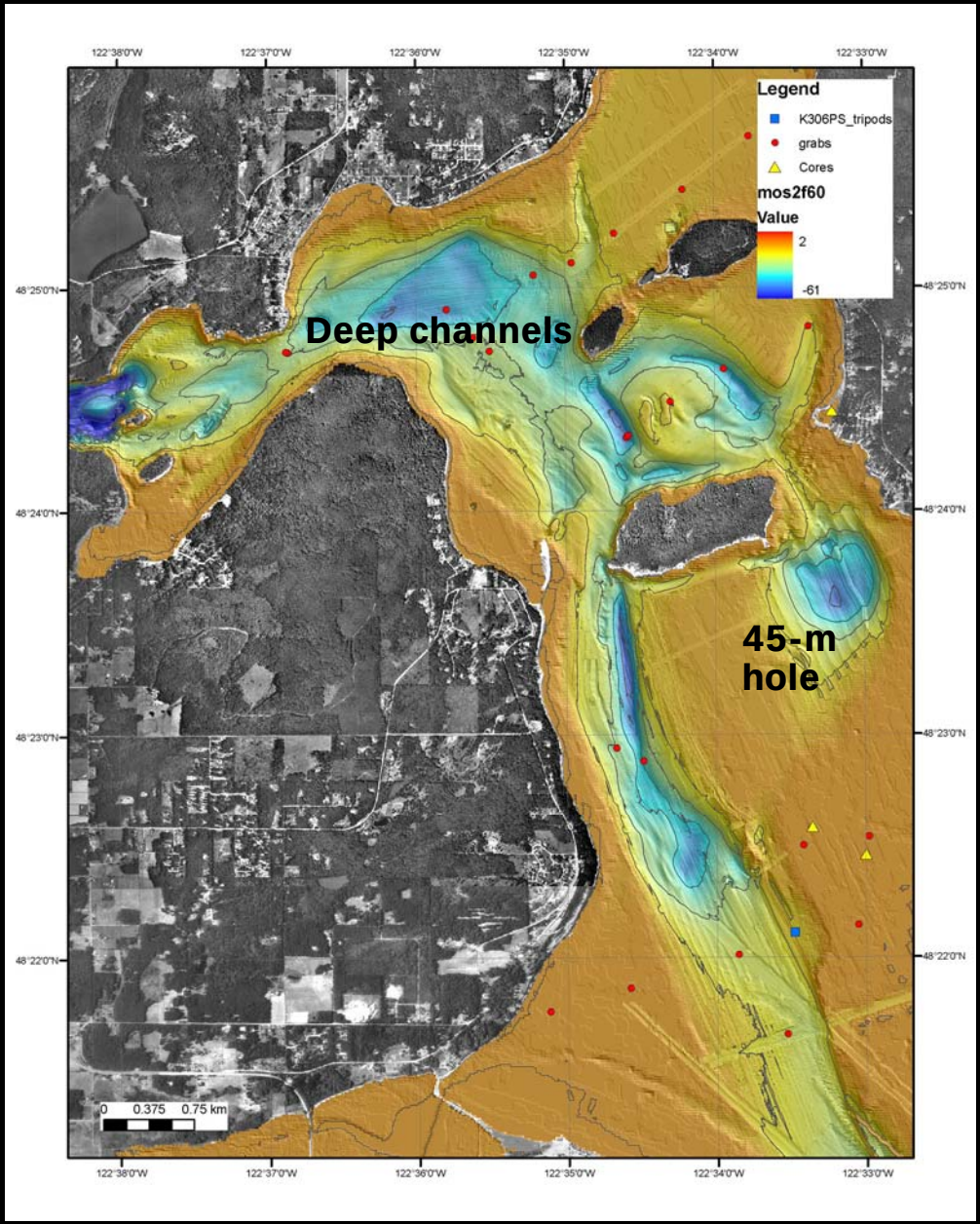
Time-series deployments

Roving surveys



Multibeam bathymetry

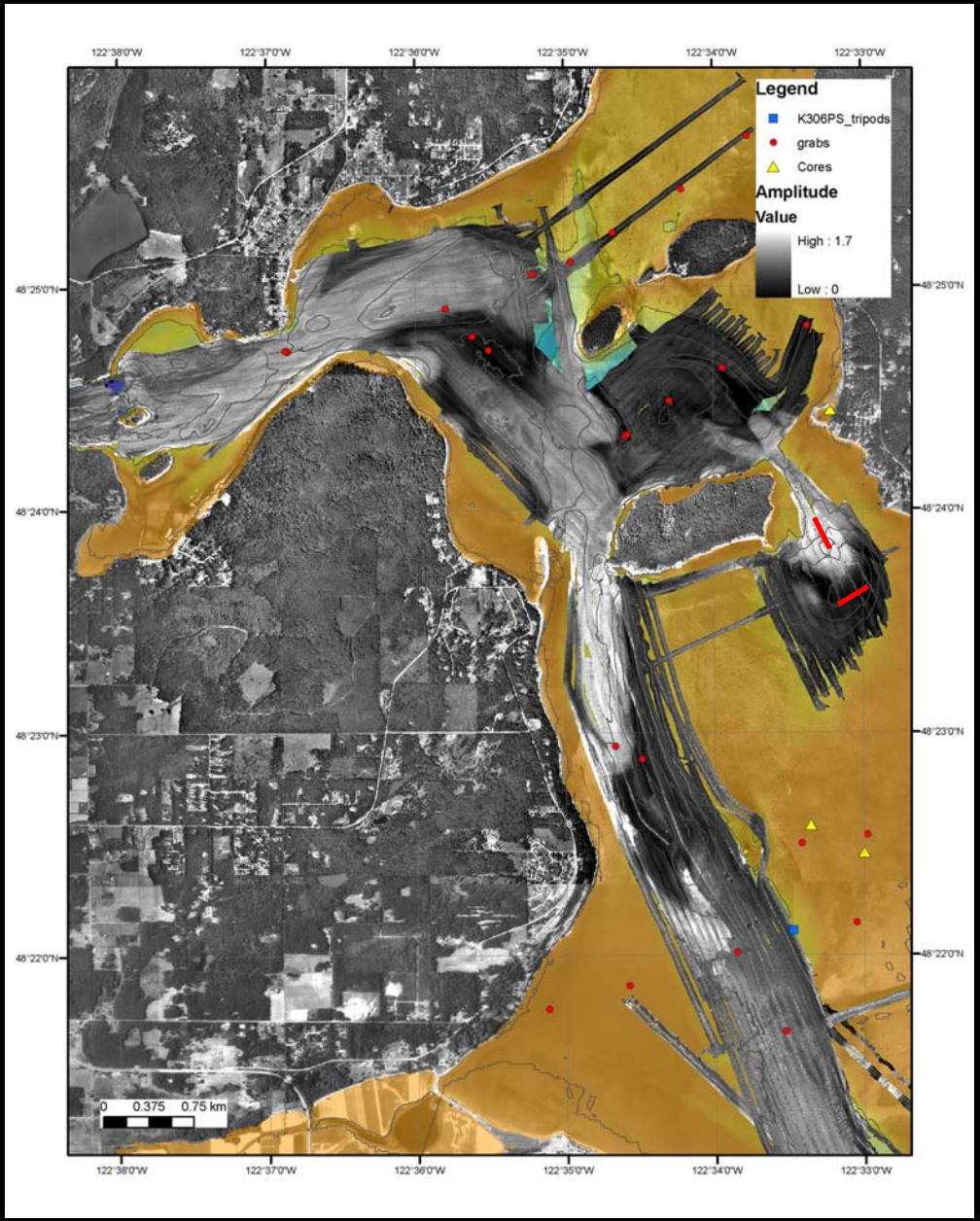
Complex morphology and habitat



Acoustic Backscatter

Diverse substrates

- Dark=soft (mud)
- Bright=hard (rock)



Acoustic Backscatter

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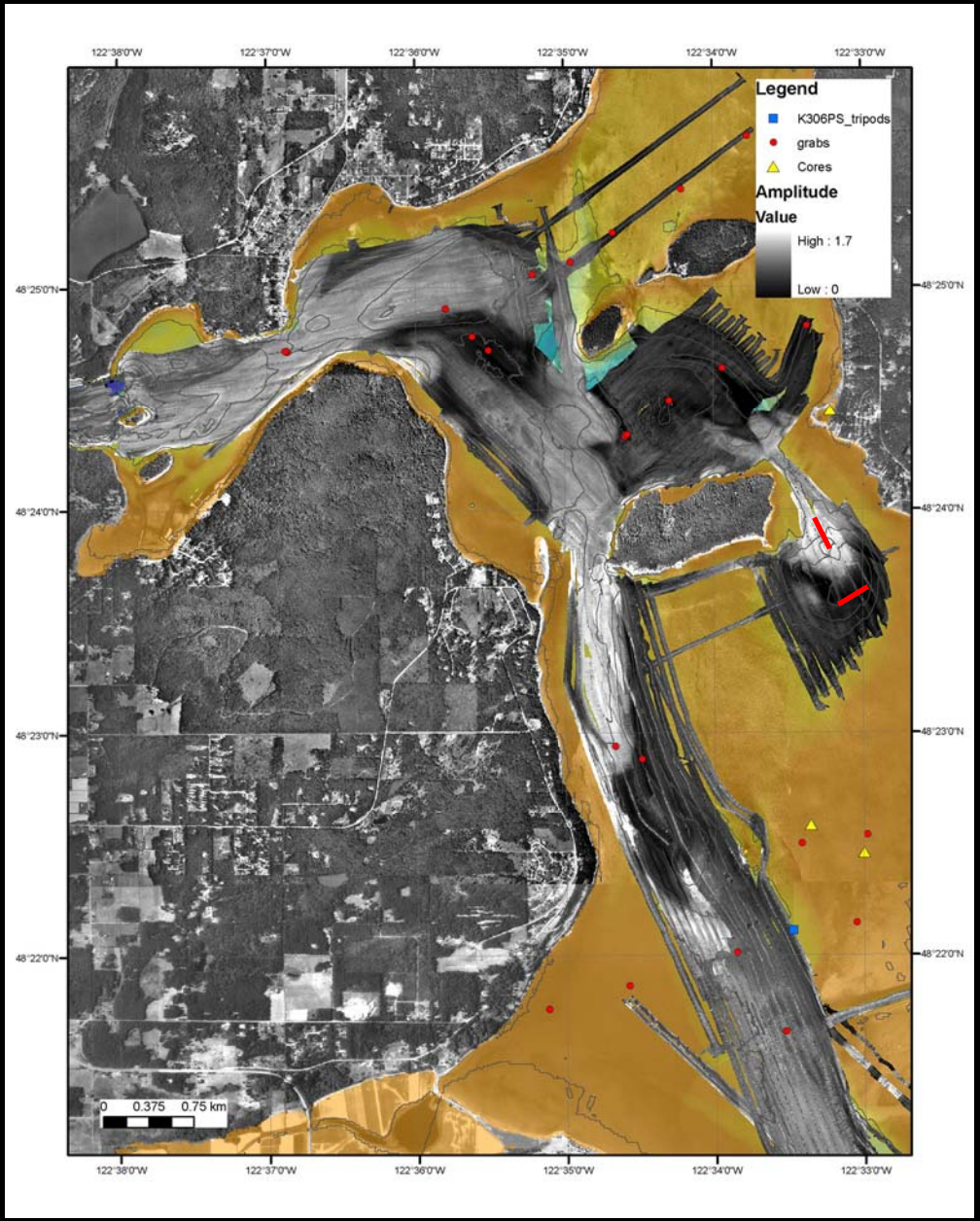
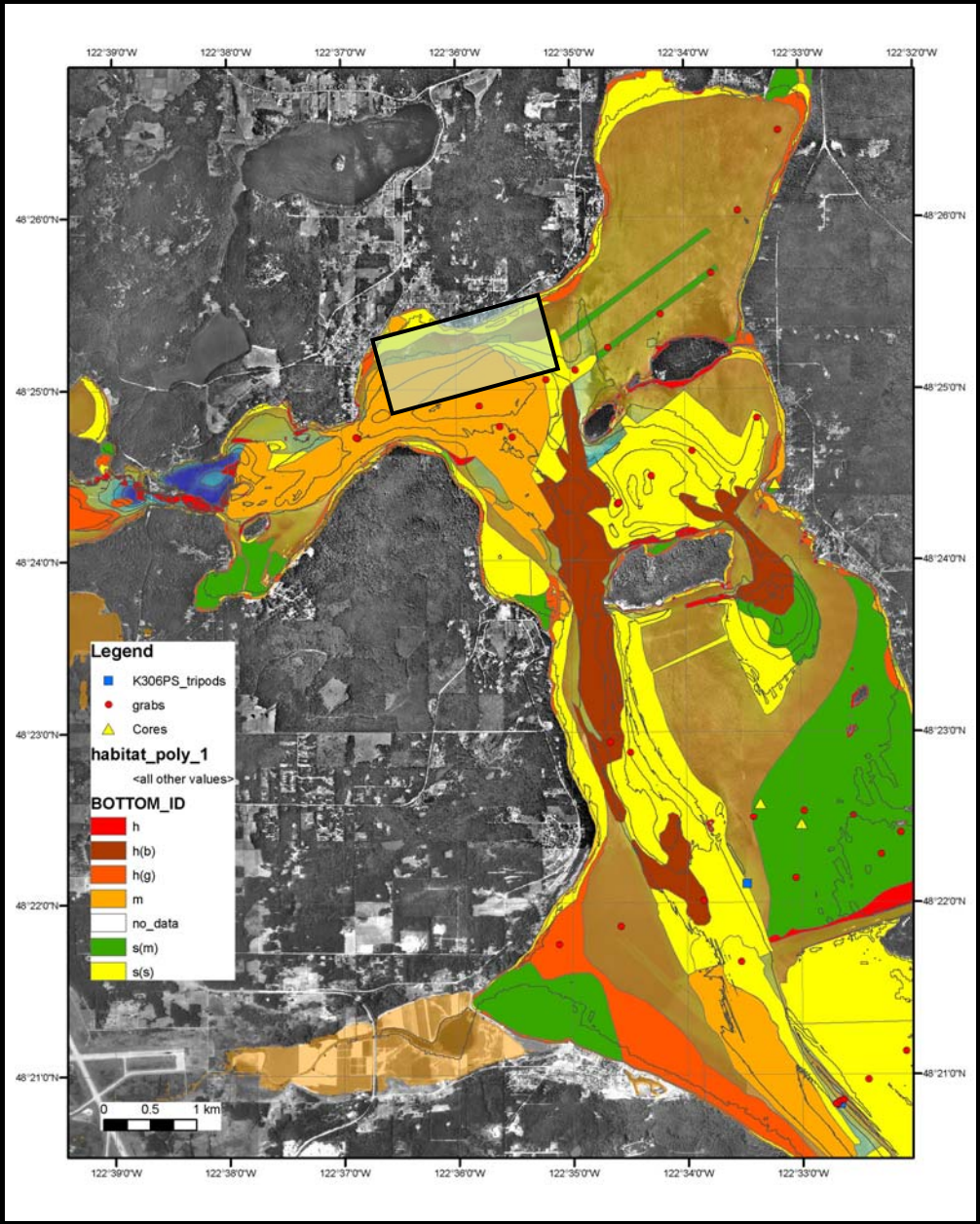


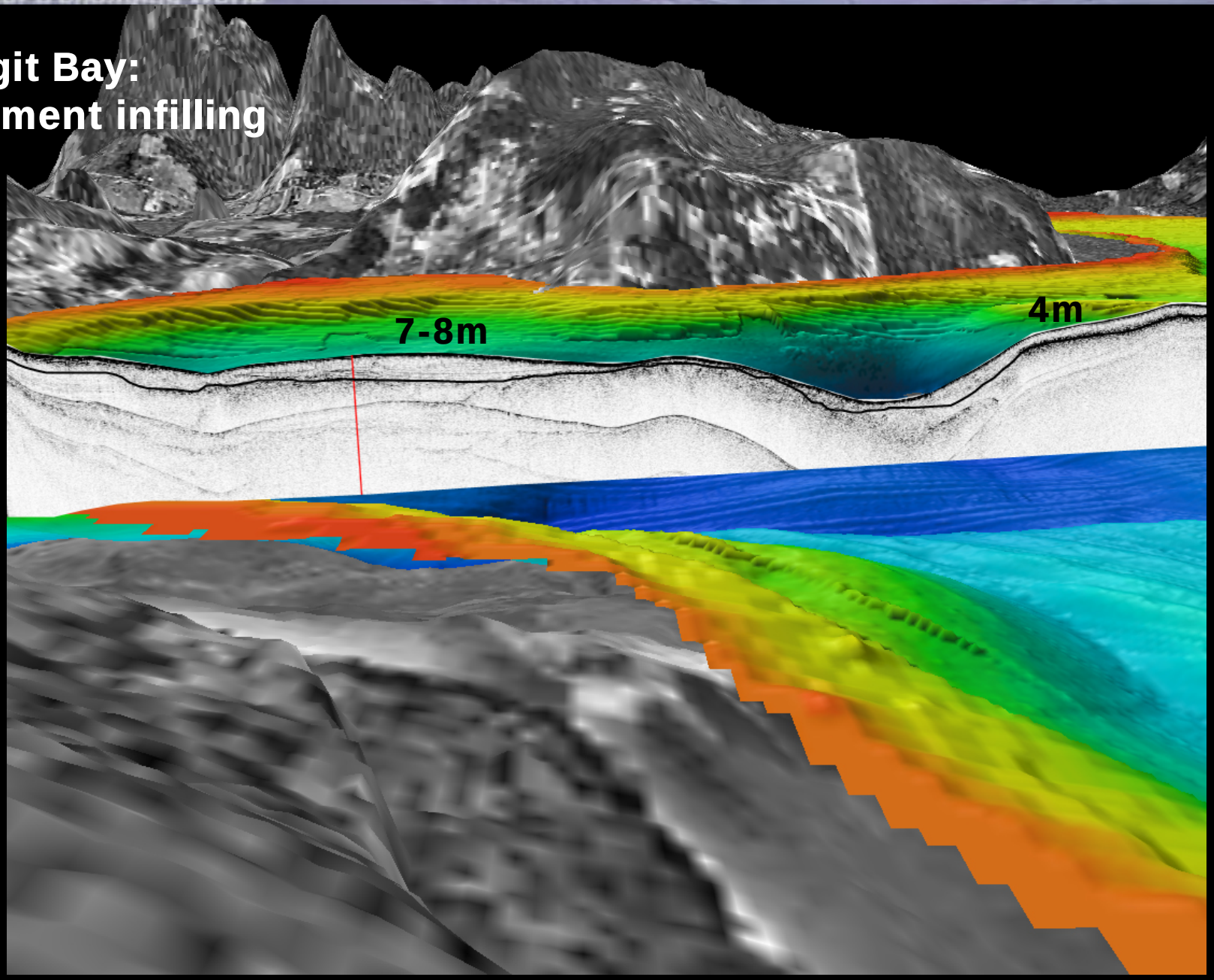
Substrate/Habitat map following Greene et al. 1999 Classification

Rock, cobble and sand dominate central bay= high scour

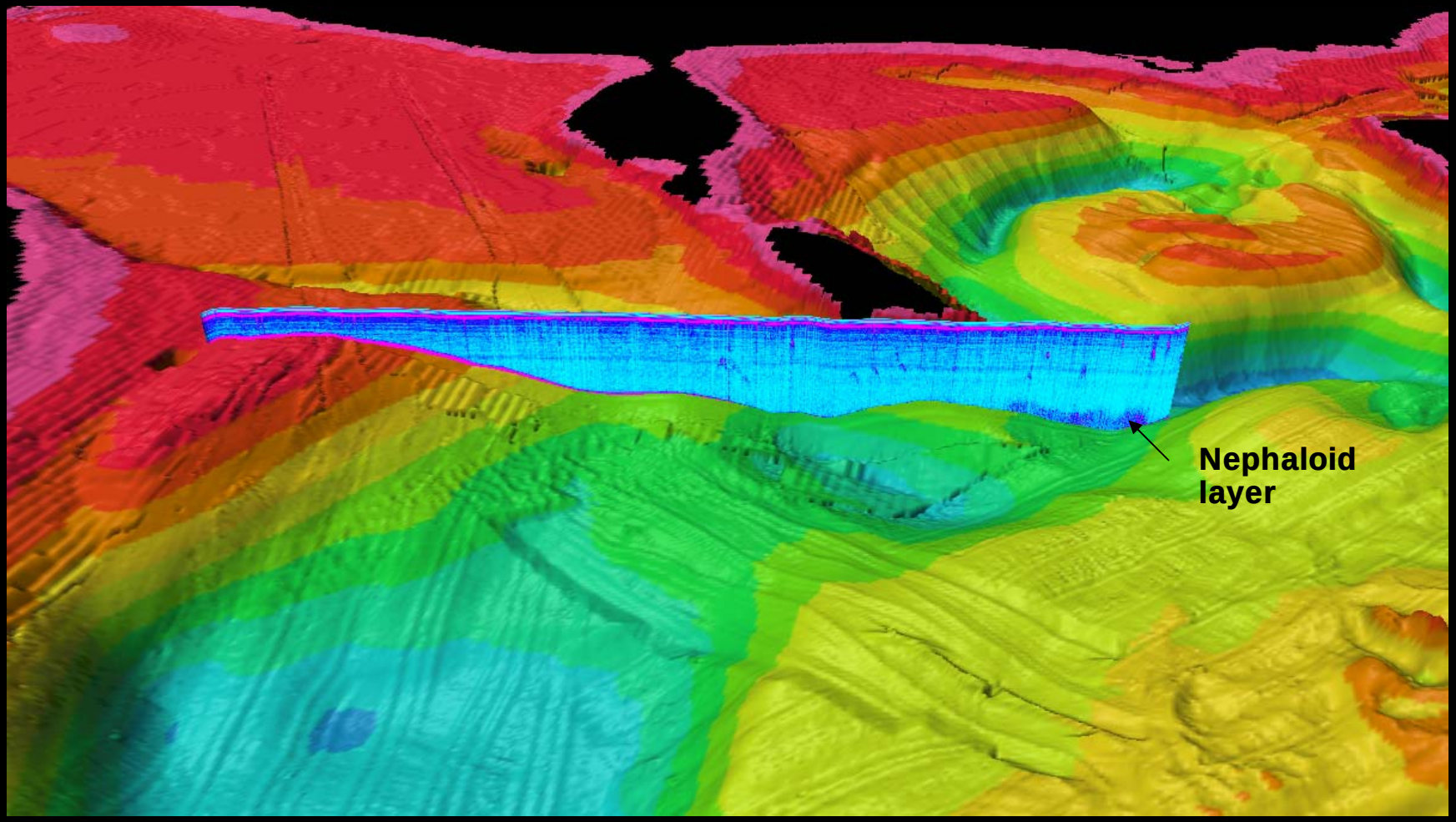
Mud in calm embayments



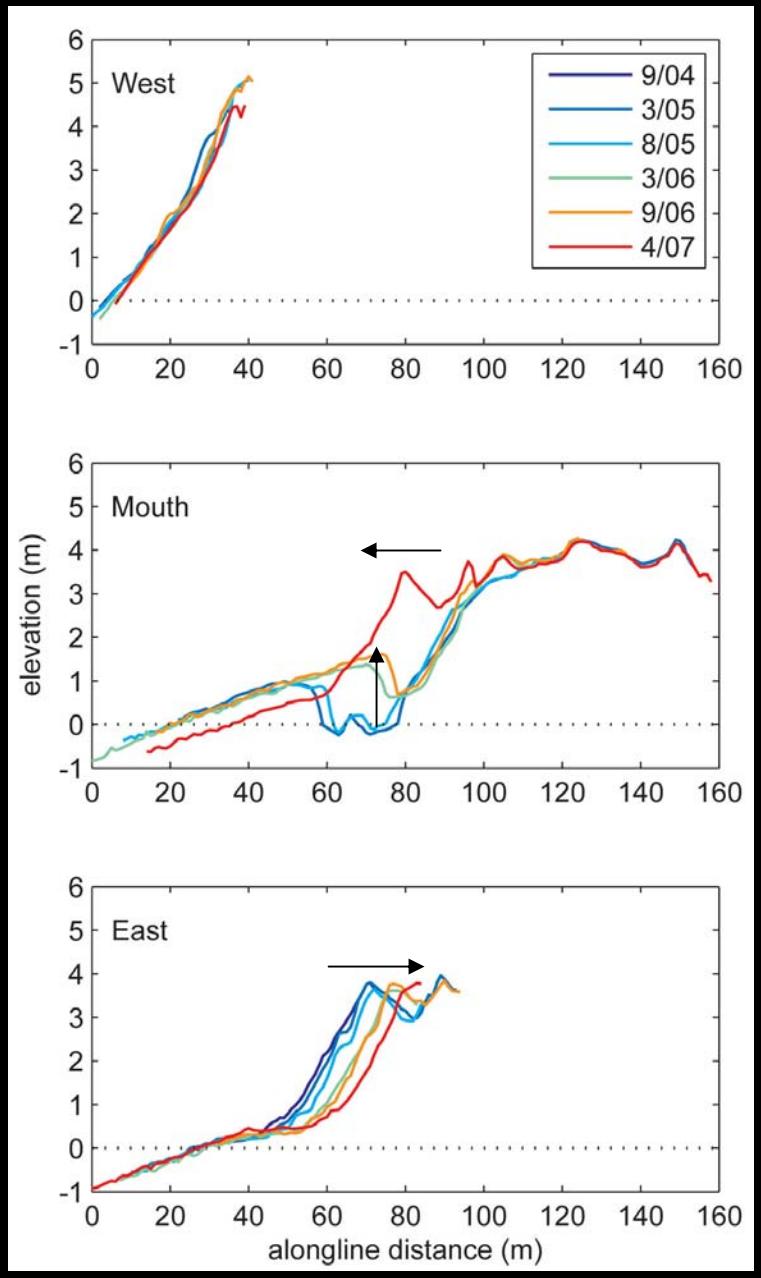
Skagit Bay: Sediment infilling



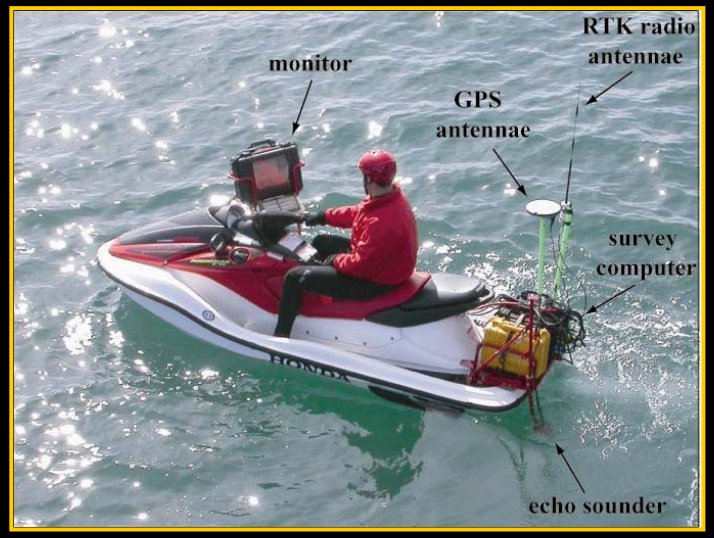
Seismic Reflection - oceanography



Elwha Beach Change

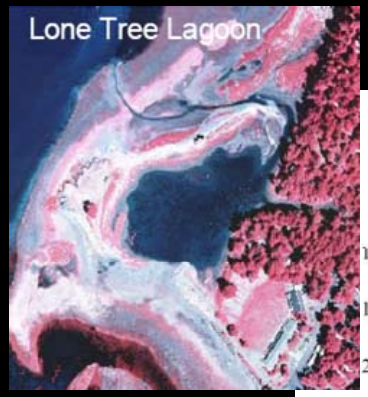


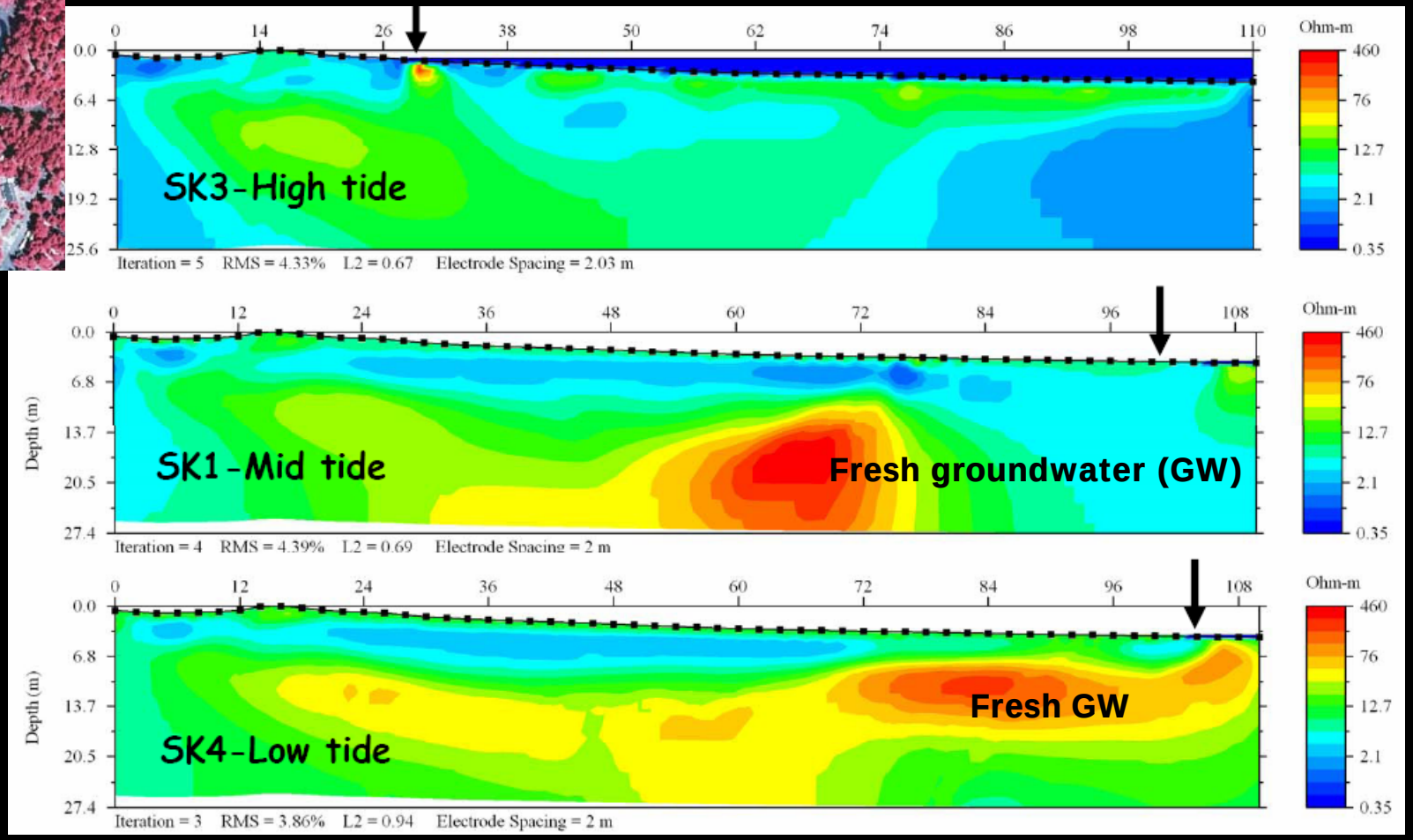
200 kHz echosounder on PWC



Electrical Resistivity

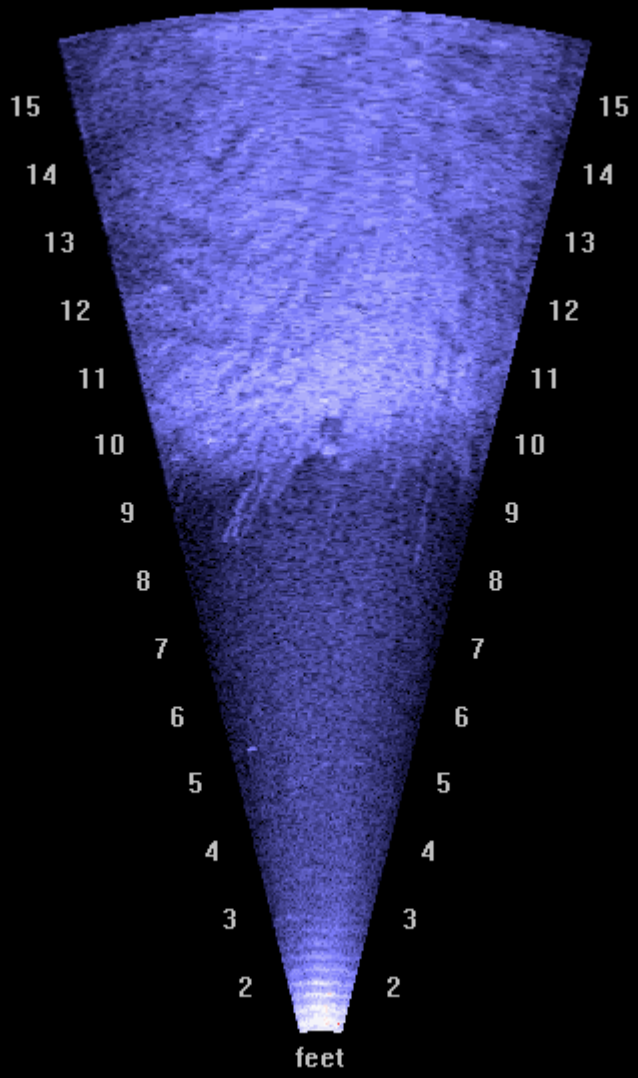
Submarine Groundwater Discharge conditions
- salinity gradients for juvenile salmonids
- temperature for forage fish spawning?





Ongoing Efforts:

Integrate fish mapping with substrate/habitat mapping

Acoustic camera

1.8 to 1.1 MHz, 30 m range
0.70 to 1.2 MHz, 80 m range
Depth rating 150 to 3000 m