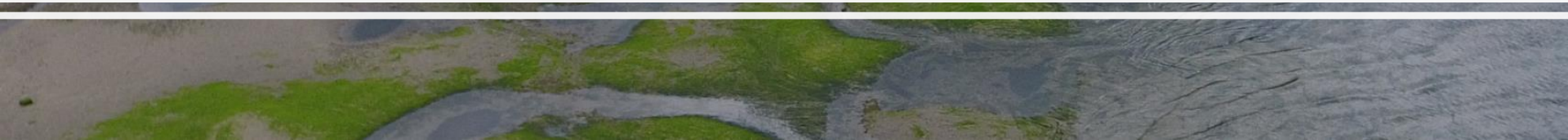


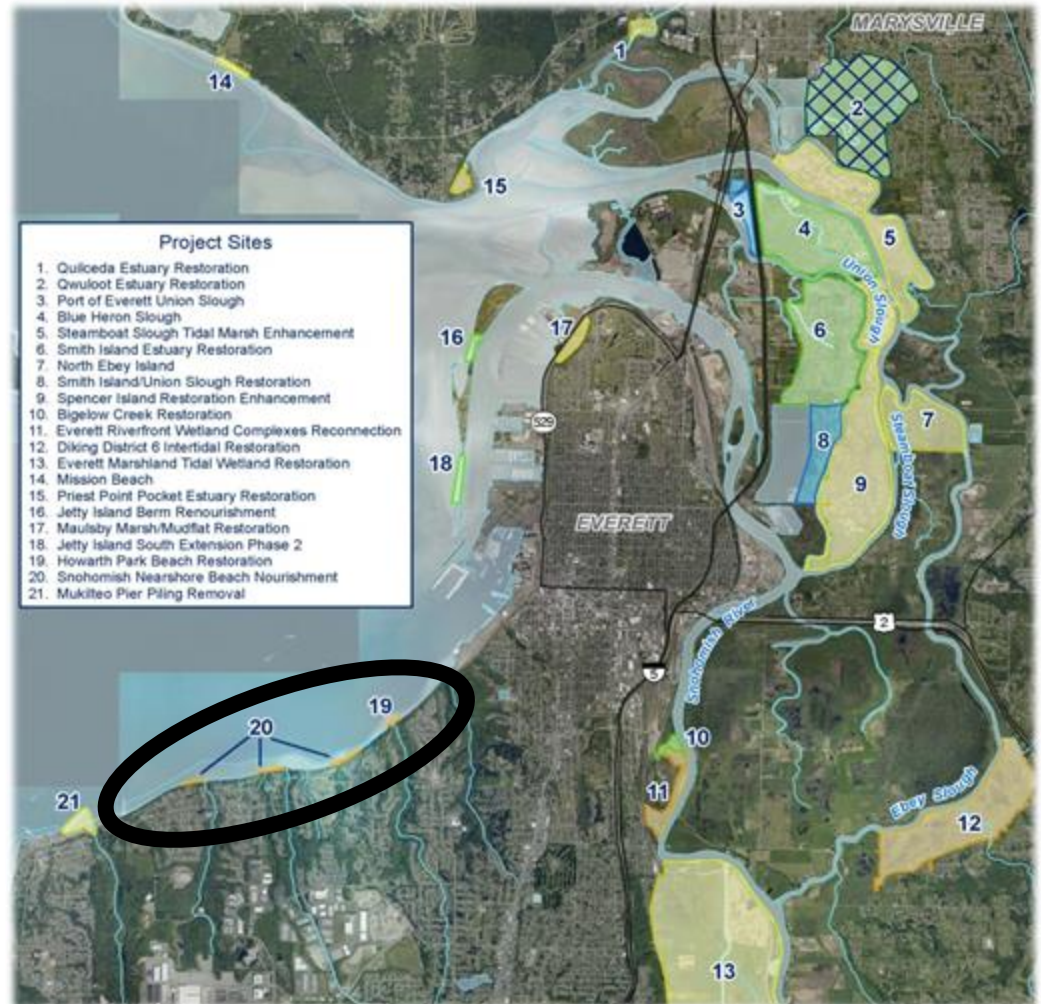


Snohomish County Nearshore Restoration Project Report



Snohomish Nearshore Project

Idea: Beach Nourishment of sites along 4.5 miles of shoreline



Why address shoreline armor?

Studies have found armored sites have:

- Narrower, less shady beaches
- Slight trend towards steeper beaches with fewer fine sediments, especially in heavily-armored drift cells
- Less organic debris and fewer logs
- Fewer wrackline invertebrates overall
- Fewer talitrid amphipods
- Fewer insects in fallout traps
- Less forage fish habitat



General Restoration Techniques

- Marine Shoreline Design Guidelines: (1) Removal, (2) Nourishment, (3) Logs, and (4) Vegetation.

How effective, solo vs combined? And for different beach functions?

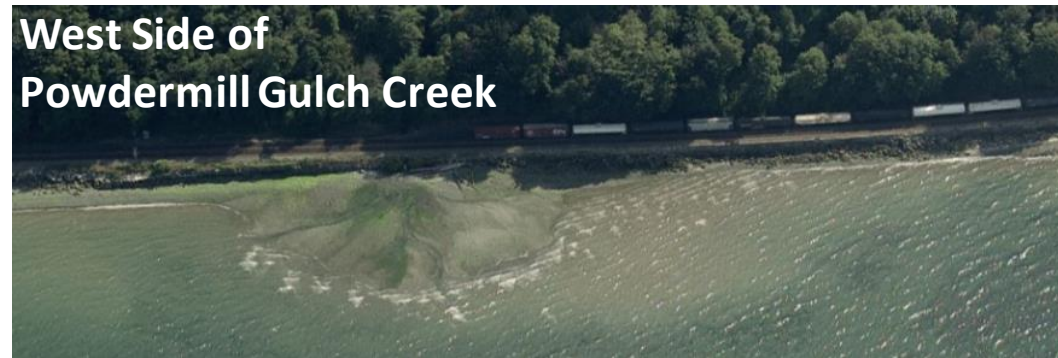
We chose 2 approaches;

1. Larger footprint, mixed substrate, designed
(slope/fill depth/finished surface elevations/construction limits/stabilizing features – buried rock and gabions)
2. Smaller footprint, dredged material, variable placement – energy environments, not designed (as in the sense of #1)

Project experiment to better understand nourishment for gravelly inland seas like the Salish Sea



Beach Nourishment



- 5 nourishment sites
- Improve habitat along drift cell
- Pre-construction beach monitoring



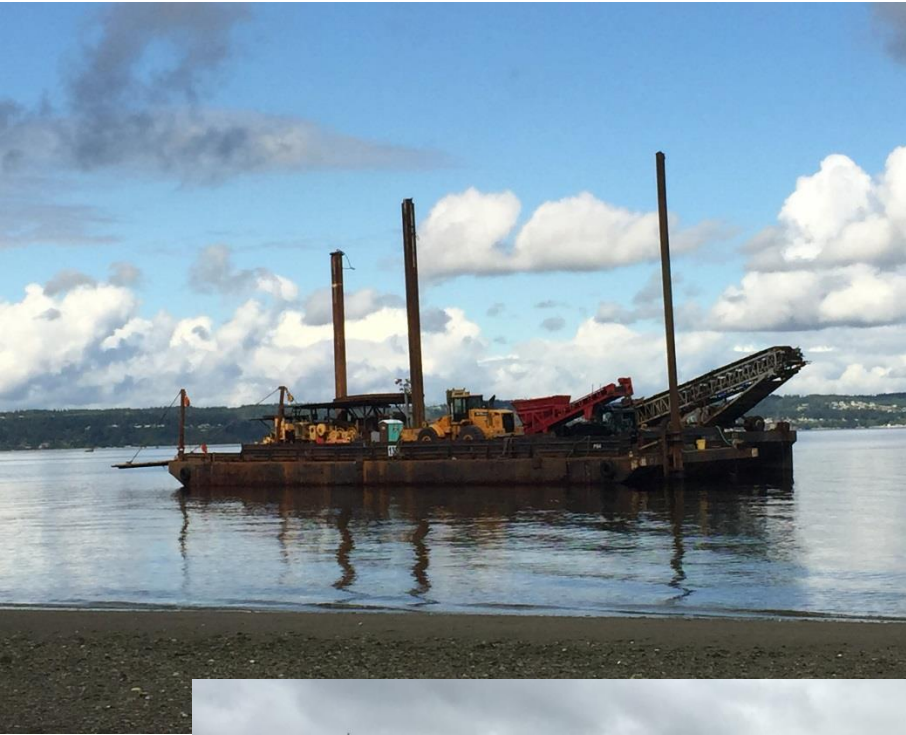
Howarth Park Bulkhead Removal



Snohomish River Sand Loading



Beach Restoration and Nourishment



Ecological Aspects

- Longevity of design on shoreline
- Biological effectiveness

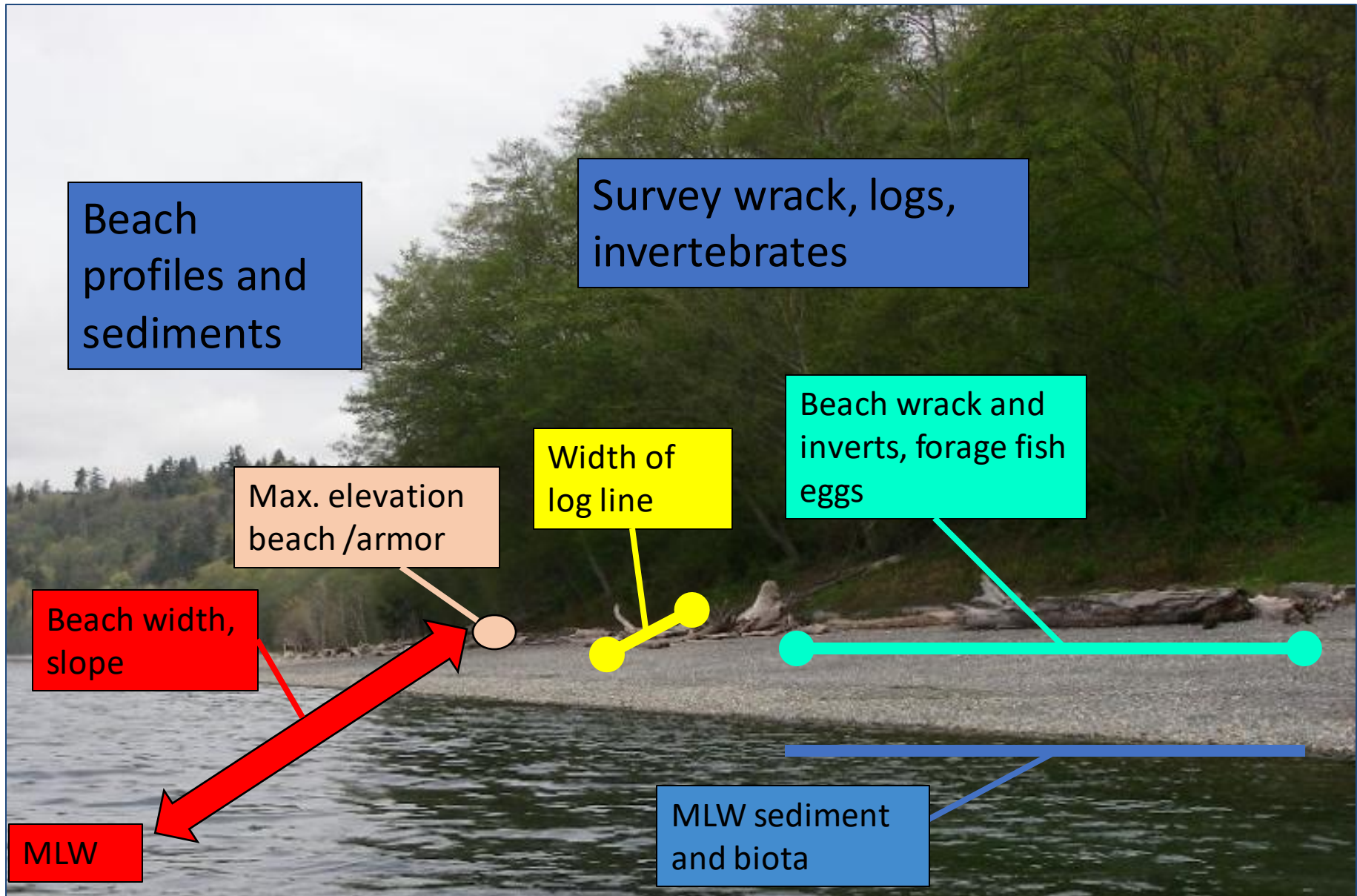


Partnership Building

- Snohomish County
- City of Everett
- Port of Everett
- US Army Corps of Engineers
- NOAA



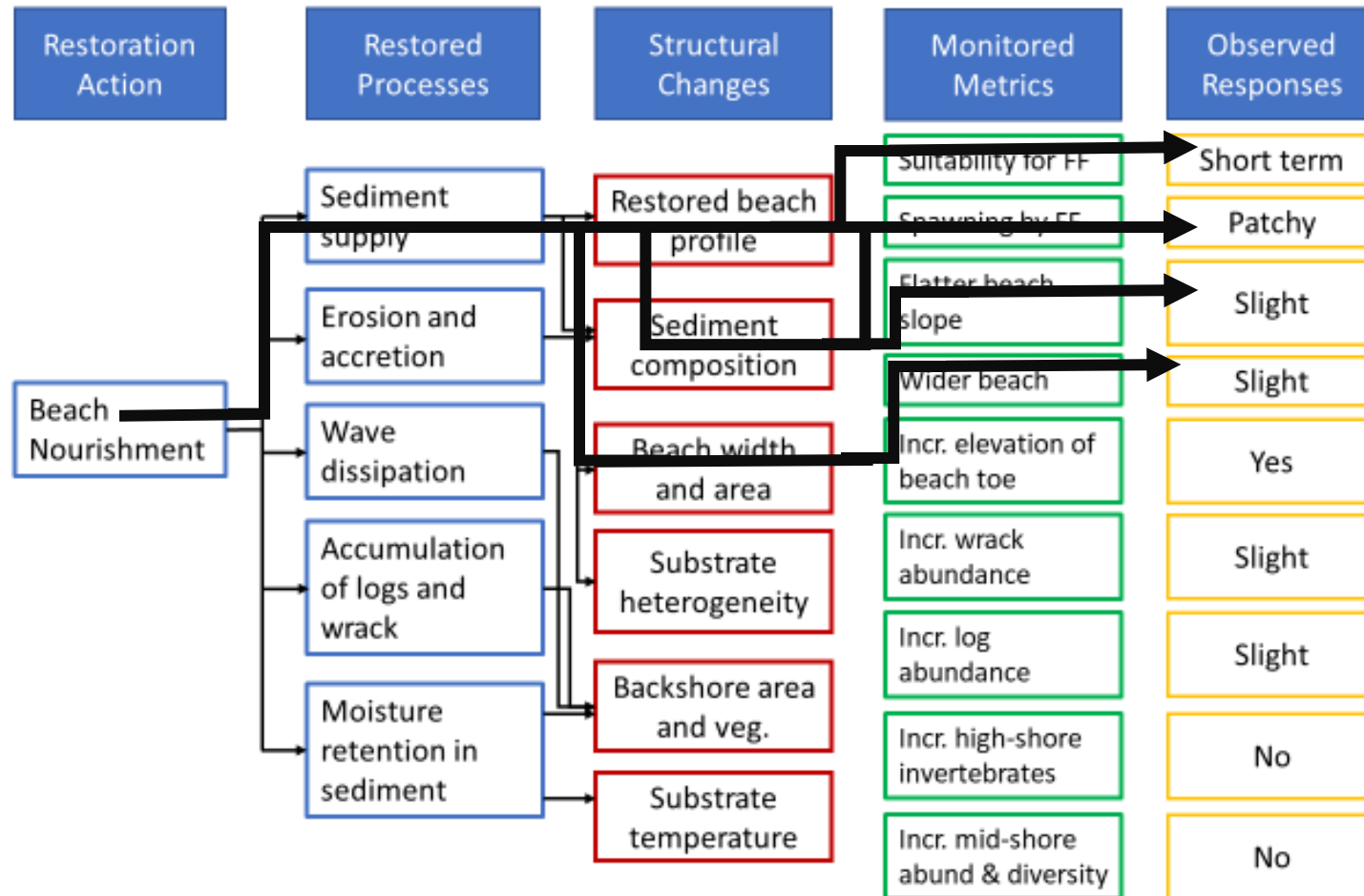
Overall Ecological Monitoring Methods



Results and Considerations



Ecological effectiveness



Sediment supply – beach change - responses

Site 6 –
Armored/
Pre-
project



Site 6 –
As-built



Downdrift
Sample Site

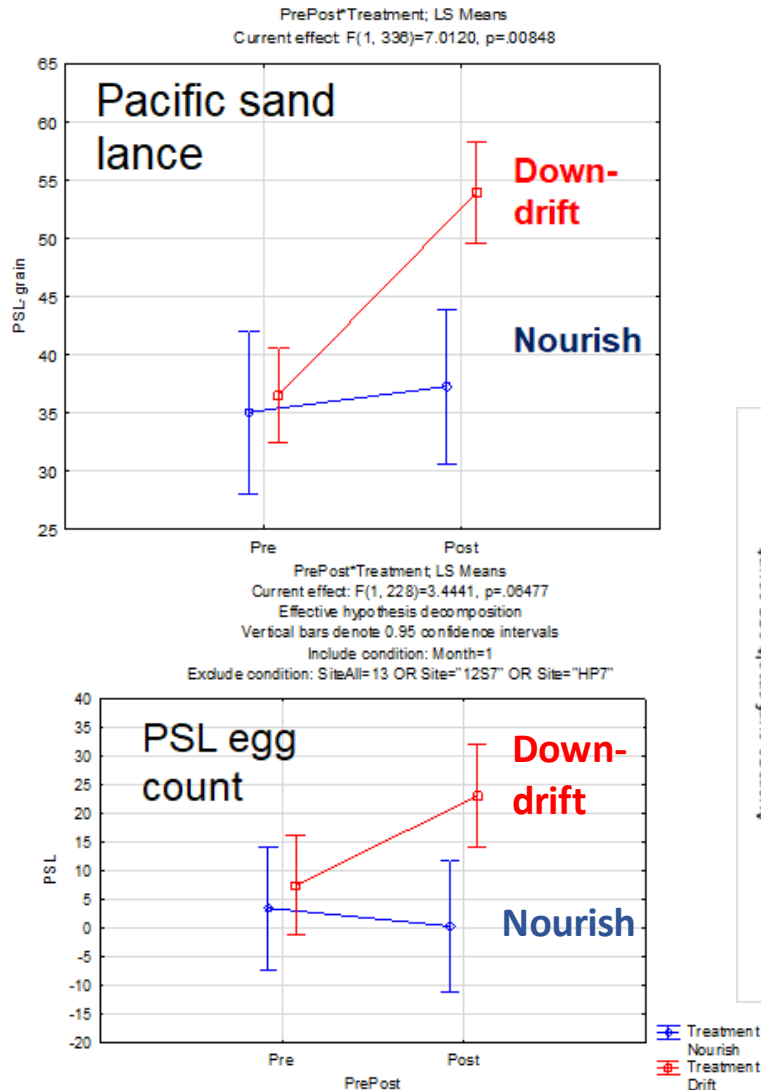


Ecological effectiveness -Pictorial highlight

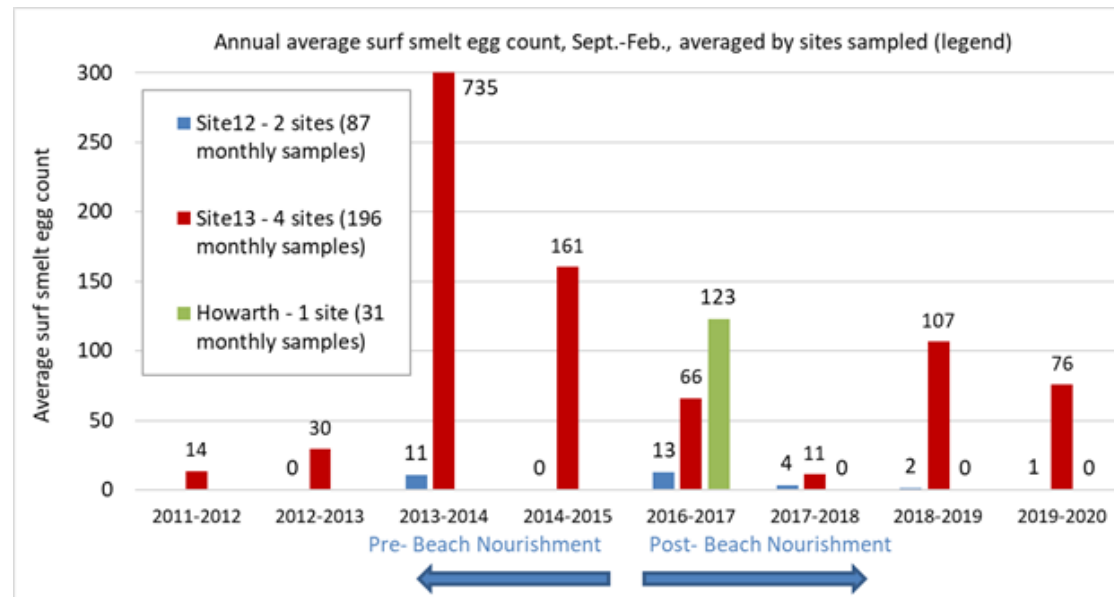
Site 6 – This “downdrift” site has retained beach nourishment longer with new spawning use by pacific sand lance.



Pacific Sand Lance – Post- project, improved sediment and spawning



Surf Smelt – less suitable sediment – except at Howarth;
short negative spawning effect?
Except Howarth



Long Term Maintenance

Challenges

- Expensive – mixed results
- Permitting requirements are burdensome at times
- Ownership – priv/public
- Not much nourishment done in PNW at higher energy locations
- Public support for options like a beach management district

Opportunities

- Create institutional/operational framework for re-nourishment in region
- Increase usable beach area
- 18 miles Snohomish County shoreline to enhance
- Many agency partners in support of this

Sediment nourishment on its own may have mixed results:

A recent study from southern California found that at beaches with intense maintenance regimes of sediment filling and grooming (done to create wider beaches for human recreation), invertebrates are negatively impacted especially in the upper intertidal wrack zone (Schooler et al. 2019).

Possibility moving forward...

Alternatives Matrix	Stabilized (designed)	Drifting
Large	Long lasting, higher cost, more fill impacts, more benefits – drift, riparian, back beach, logs, wrack, forage, less maint.	Medium lasting, med cost, fill impacts, med benefits - drift
Small	Medium lasting, medium cost, fewer fill impacts – med/few benefits - drift	Short duration, lower cost, fewer impacts, few benefits – no back beach – focused on drift functions only

larger nourishment at one location.

Jim J. at CGS: Using the info from the monitoring, such as focusing on one much longer and larger nourishment area, perhaps NE of Mukilteo, would almost certainly provide more sustained benefits. Other project experience from other sites has shown a multi decade longevity at armored sites.



Snohomish County
Marine Resources
Committee

Questions?