

Olympic Sculpture Park: Biological Monitoring of the Shoreline

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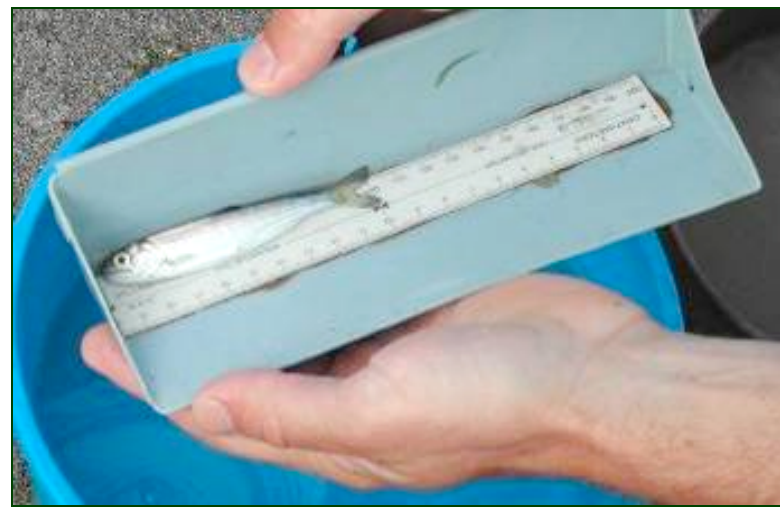




Lots of support and funding: City of Seattle, Seattle Art Museum, Green-Duwamish Watershed (WRIA 9), King Conservation District, Washington Department of Fish and Wildlife, Salmon Recovery Funding Board.

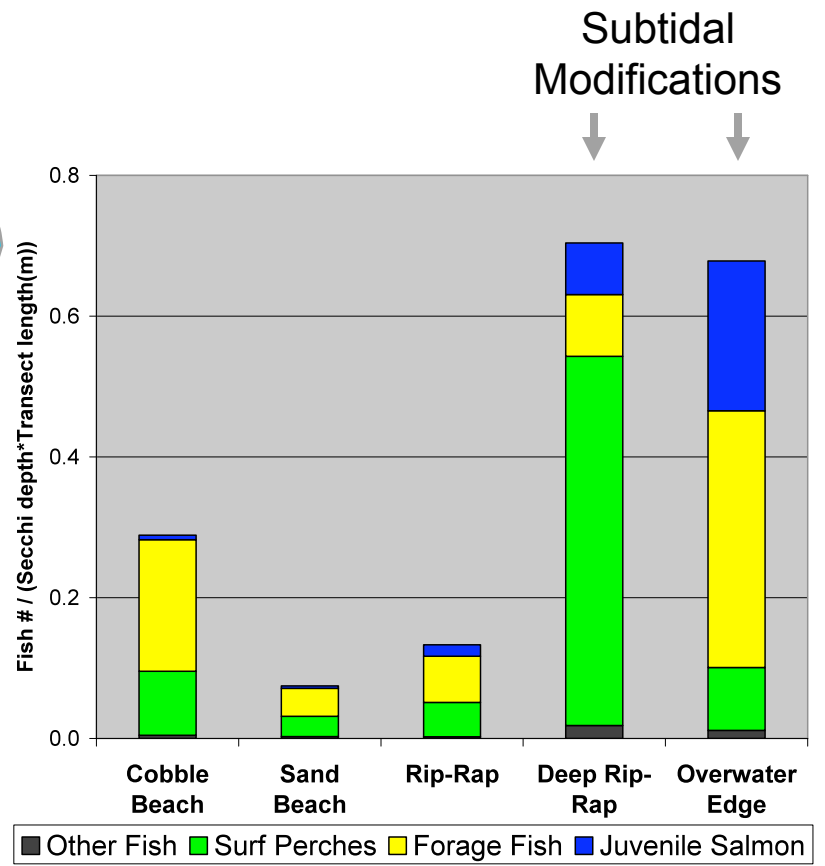
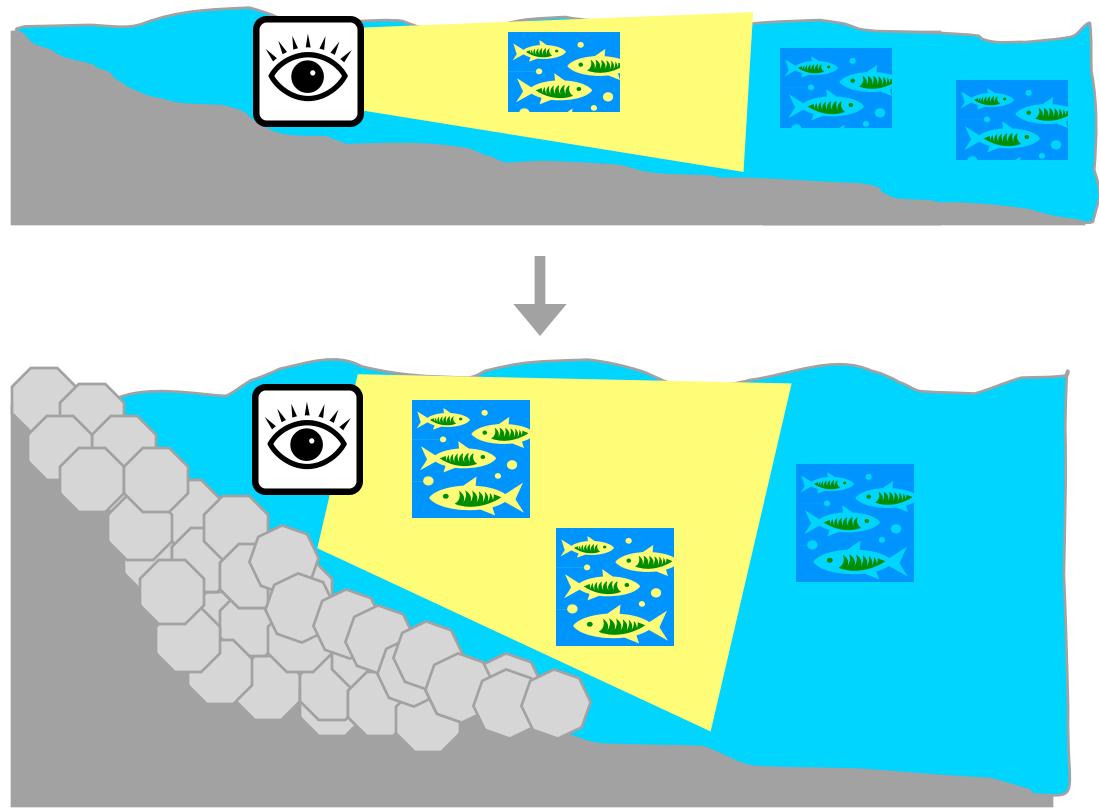
What we do: SCIENCE

- Juvenile salmon use of estuaries and nearshore.
- Function of restoring and natural habitats.
- Ecological effects of shoreline modifications.



Habitat Measurements:

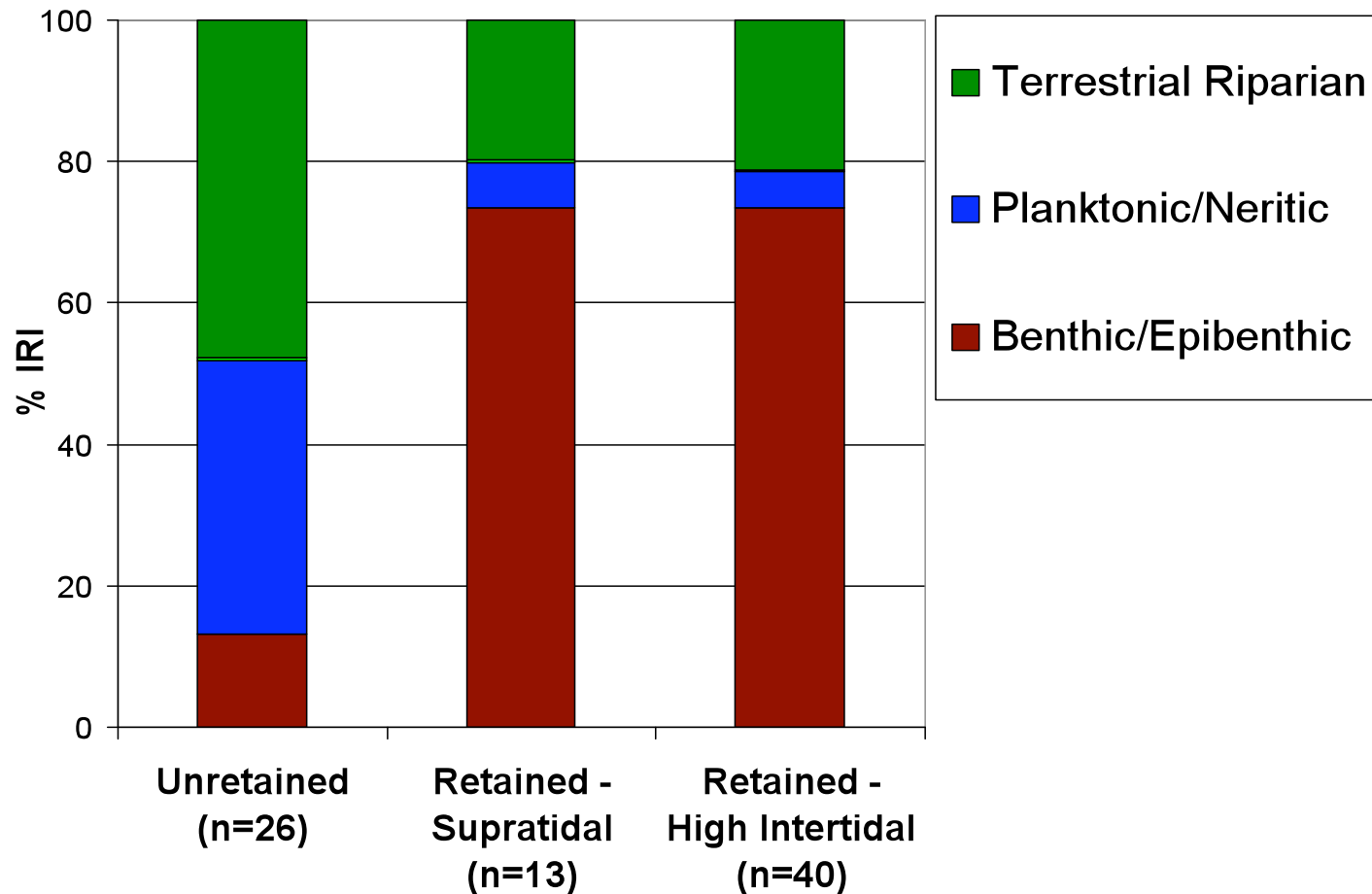
Shoreline modifications truncate the shallow water zone, gradual slope is lost. Pelagic fish that are typically spread-out along a large intertidal area must inhabit deep water directly along shore.



Toft et al. 2007. Fish distribution, abundance, and behavior along city shoreline types in Puget Sound. *North American Journal of Fisheries Management* 27:465-480.

Diet Analysis:

Gastric lavage of juvenile Chinook shows less terrestrial/riparian input (insects) at sites with retaining structures at intertidal or supratidal.



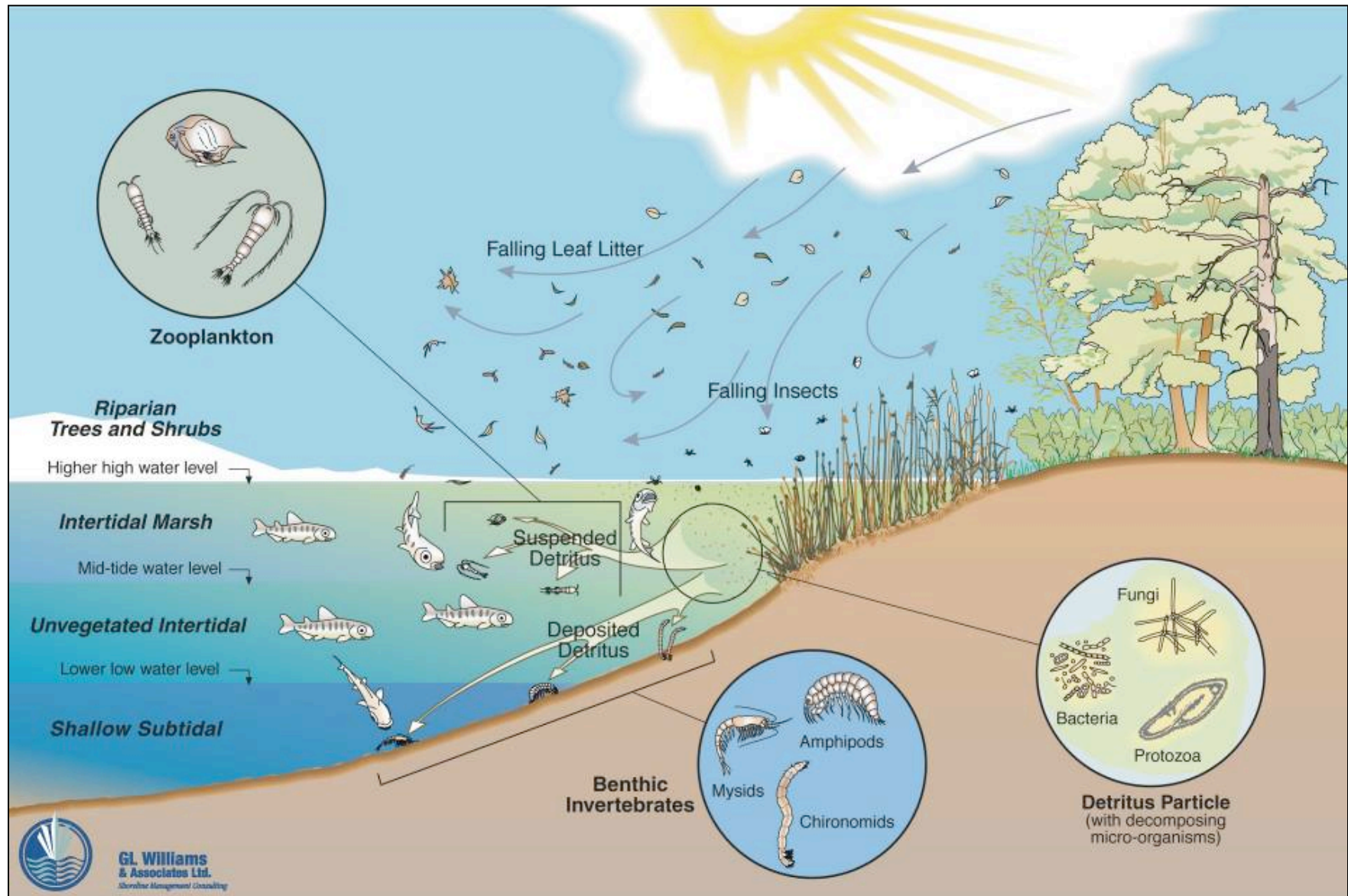
Historical Perspective

- Increased urban development leading to the degradation of natural habitats.
- 84-97% of the current Seattle shoreline is modified by retaining structures.
- Chinook Salmon threatened under the Endangered Species Act.
- Nearshore important to juvenile salmon as a rearing and migration corridor.



Natural Shoreline

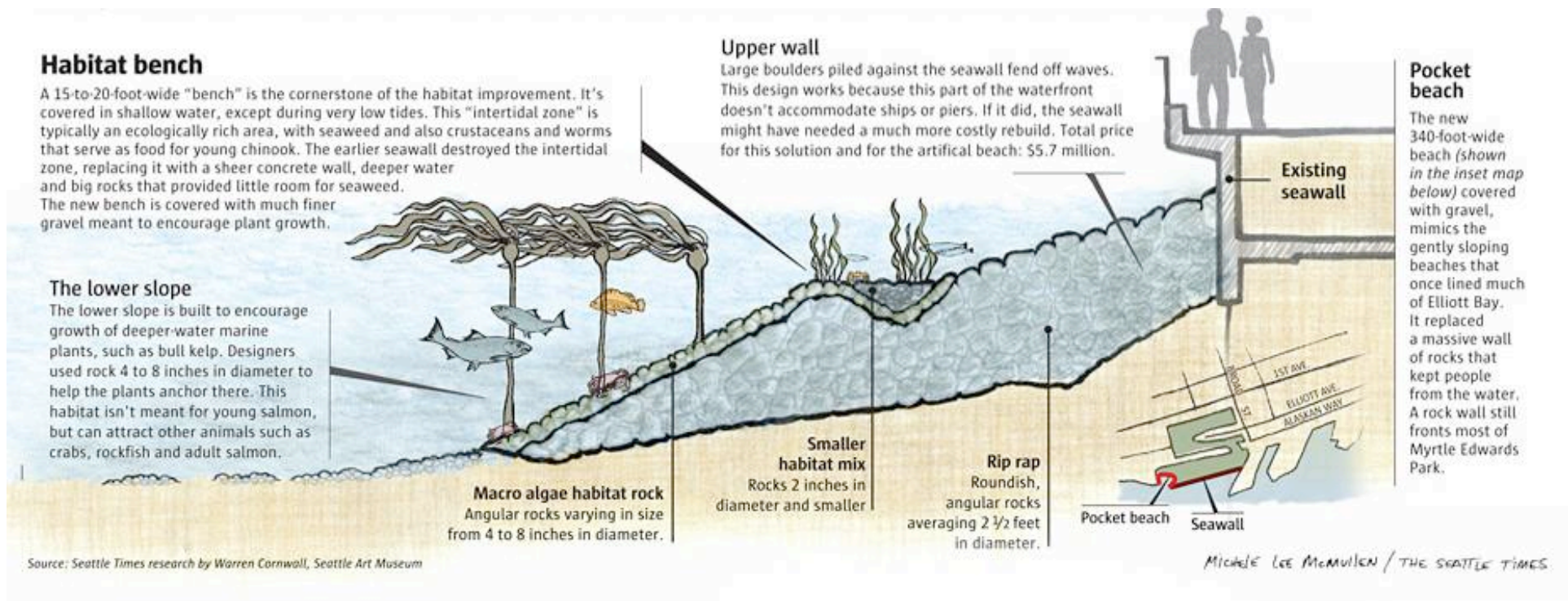
In altered landscapes, goal is to restore or “enhance” back towards original conditions.



Seattle trying to woo salmon back downtown with park's seawall makeover

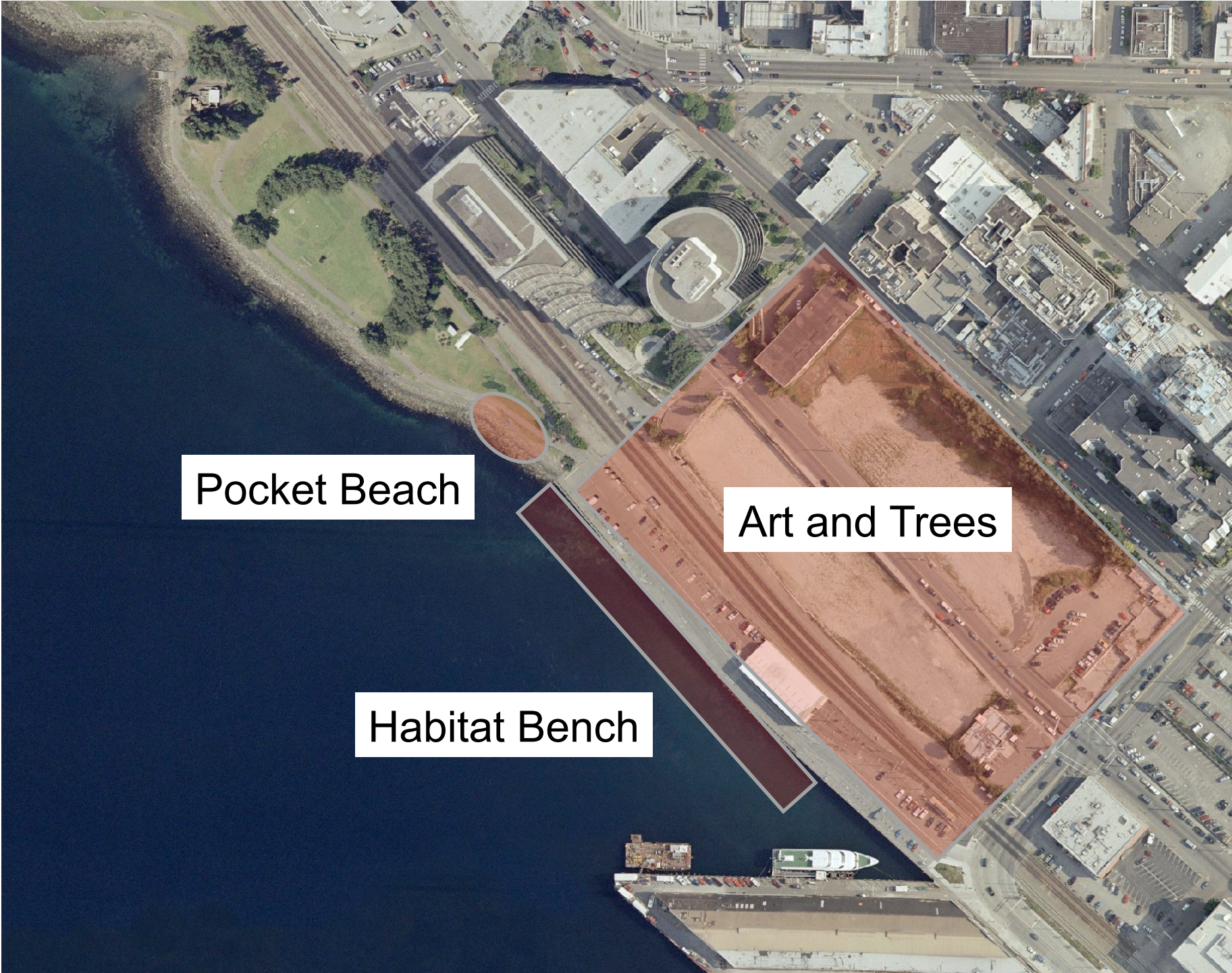
By Warren Cornwall
Seattle Times staff reporter

“...spark public interest in ecological revitalization of the downtown waterfront, and to serve as a test case for future work on the rest of the seawall.”



Olympic Sculpture Park
2005: Pre-Construction

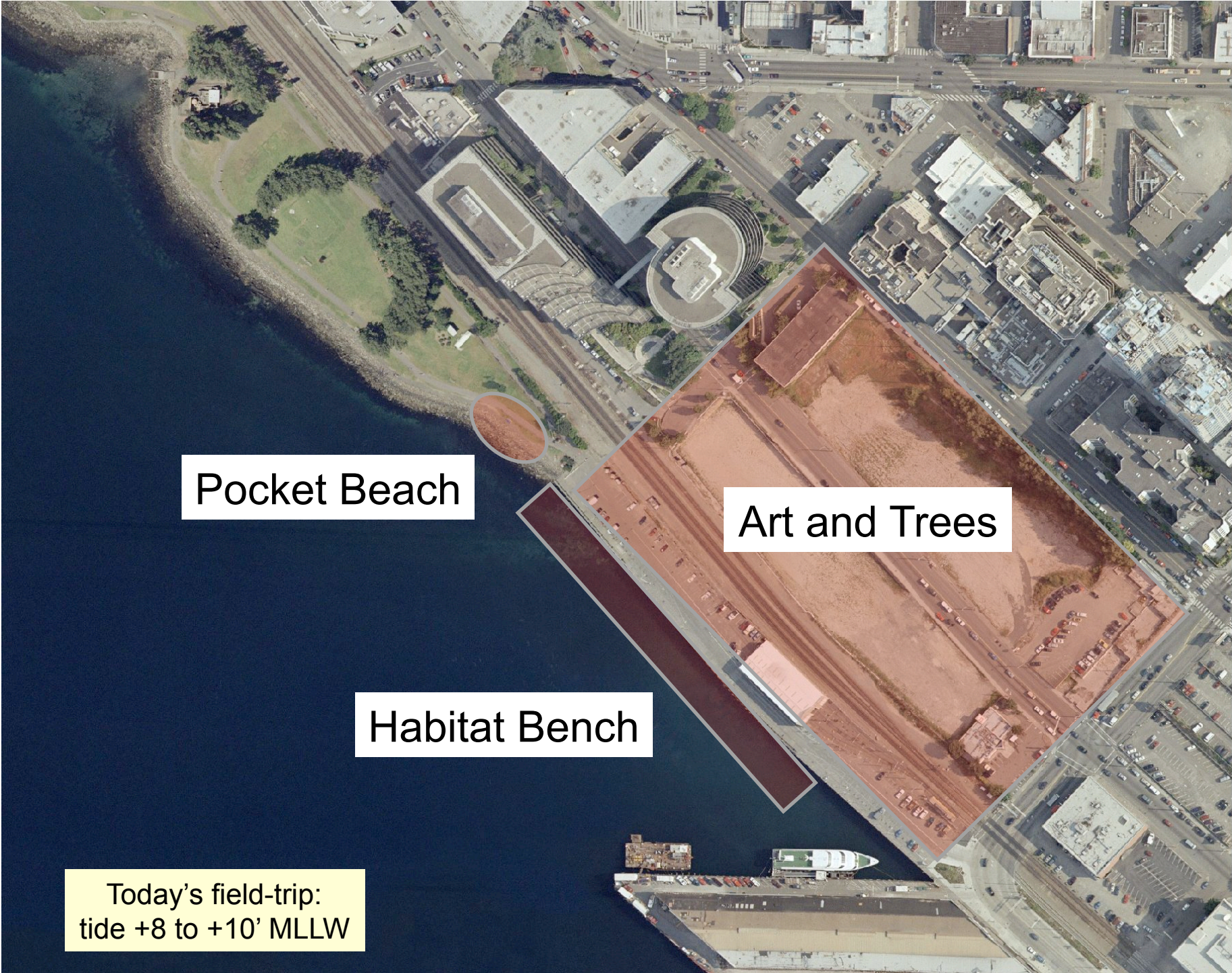




Pocket Beach

Art and Trees

Habitat Bench



Pocket Beach

Art and Trees

Habitat Bench

Today's field-trip:
tide +8 to +10' MLLW

Olympic Sculpture Park

Removal of shoreline modifications and enhancement of intertidal zone, with linkages to riparian habitat.



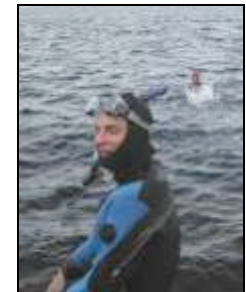
Before – 2005



After – 2007

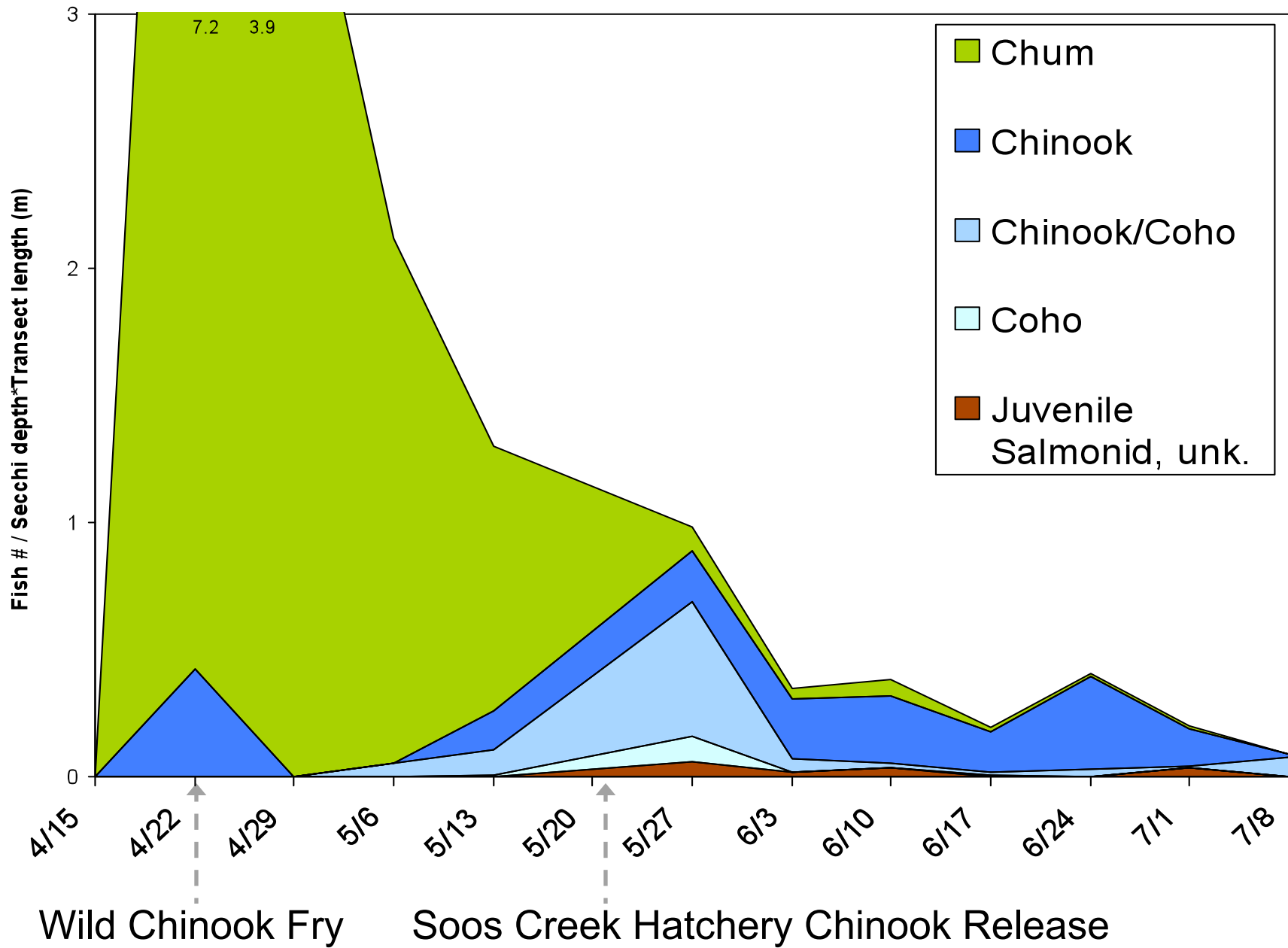
Pre and Post-Construction Monitoring:

1. Fish sampling with snorkel surveys.
2. Aquatic invertebrates.
3. Terrestrial insects.
4. Added in 2007: Vegetation, Fish netting, Beach.

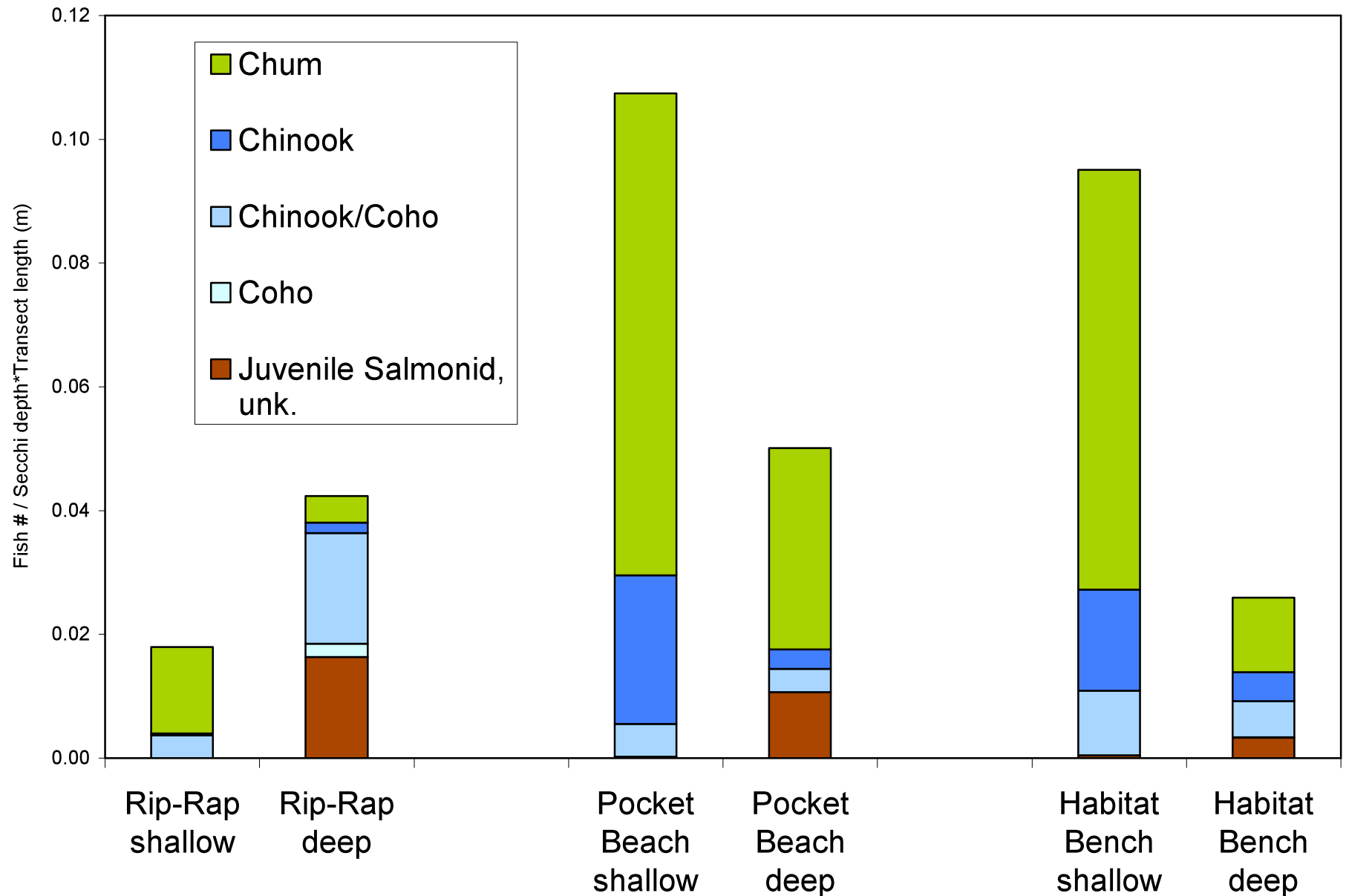


Toft, J., J. Cordell, S. Heerhartz, E. Armbrust, A. Ogston, and E. Flemer. 2008. Olympic Sculpture Park: Results from Year 1 Post-construction Monitoring of Shoreline Habitats. Technical Report SAFS-UW-0801.

Juvenile Salmon Densities: Time

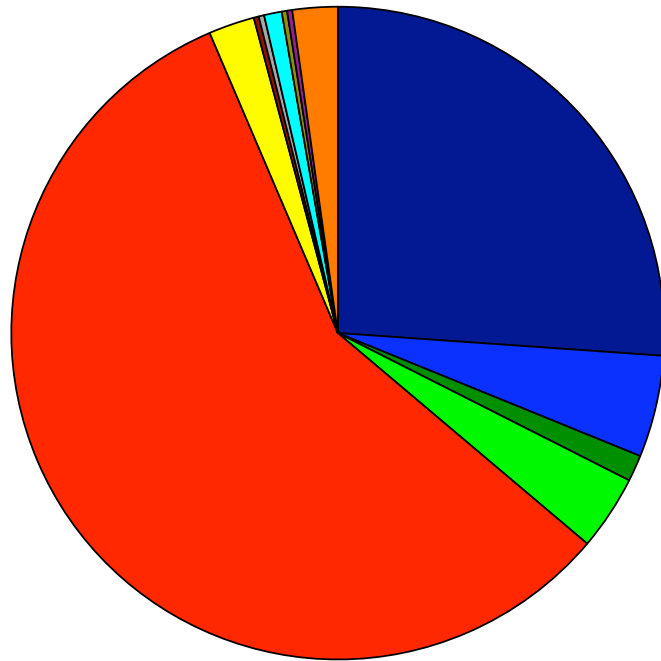


Juvenile Salmon 2007: More abundant in shallow water depths at Pocket Beach and Habitat Bench.



2007 net data:

2007 Olympic Sculpture Park: Fish % Composition at Pocket Beach (n = 5; average 53 juvenile salmon)



Note: In 2008 during juvenile pink salmon outmigration,
1,228 juvenile pinks netted on 4/25/08

Juvenile Chinook, schooling and feeding



Juvenile Chum, schooling and feeding

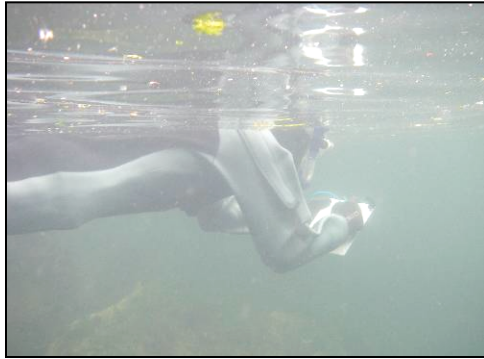


Herring, schooling and feeding



Sampling: More diversity, greater densities, available habitat?

Fish



Aquatic Invertebrates living on bottom substrates and algae



Invertebrates living within beach gravel



Sampling: Beach and vegetation development.

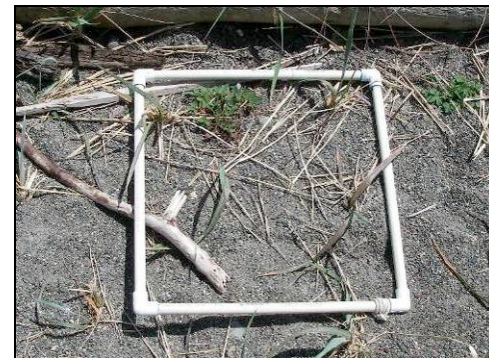
Terrestrial Insects



Aquatic Algae



Vegetation

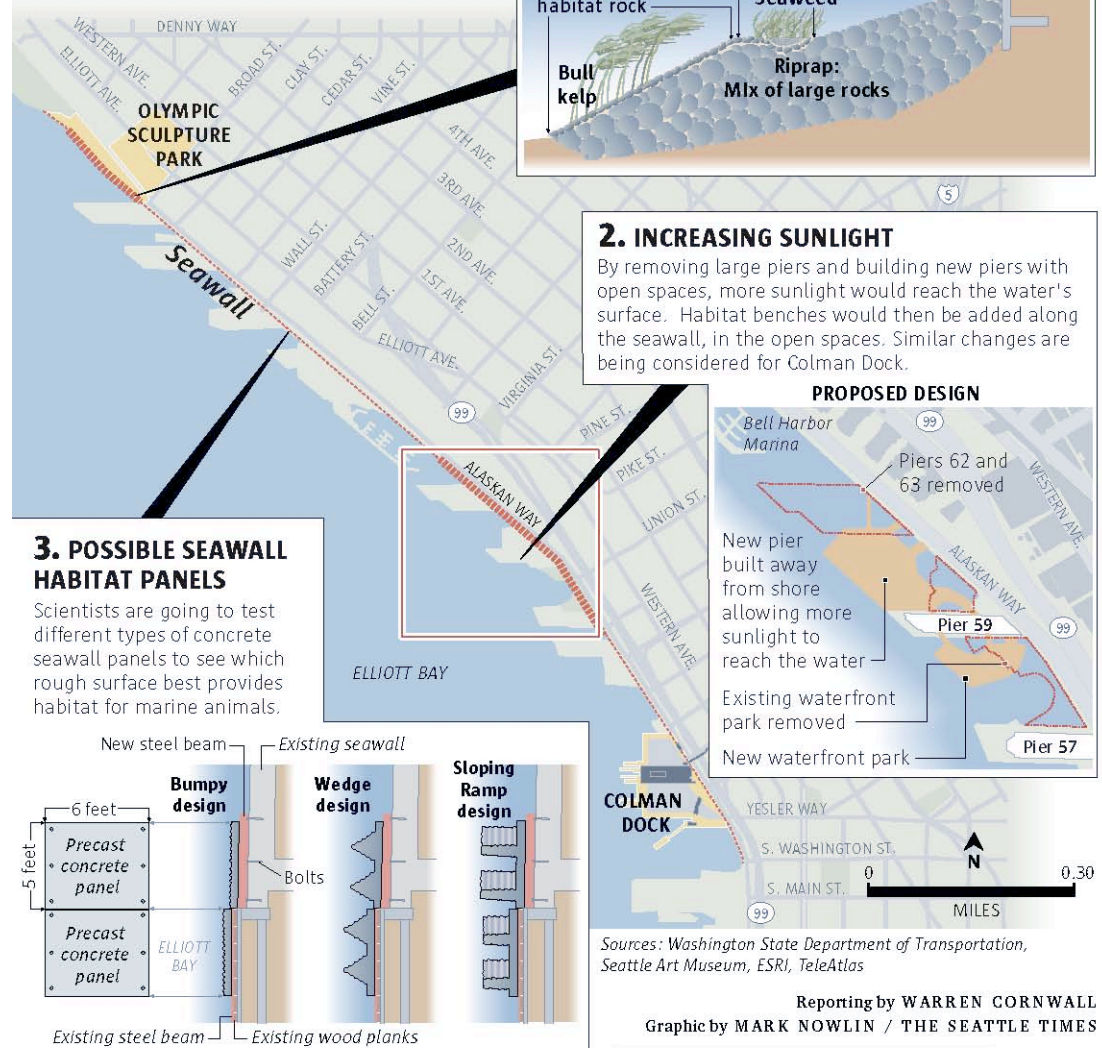


The Future

- **Monitoring is important!** Potential benefits to juvenile salmonids not known until post-monitoring occurs; help guide future efforts.
- **Is it making a difference?** High costs for limited space along urban corridor; public areas put it in the spotlight; education opportunities – thousands of visitors at Olympic Sculpture Park.
- **Benefits of multiple sites?** Combined effects of individual sites create larger signature.

Making Seattle's waterfront more fish-friendly

The Seattle Art Museum's Olympic Sculpture Park is the first of several projects that could give the city's waterfront an ecological makeover. The city and state are studying options for other parts of the waterfront. At the sculpture park, the first project is an artificial beach followed by a rock habitat bench built along the start of the seawall.

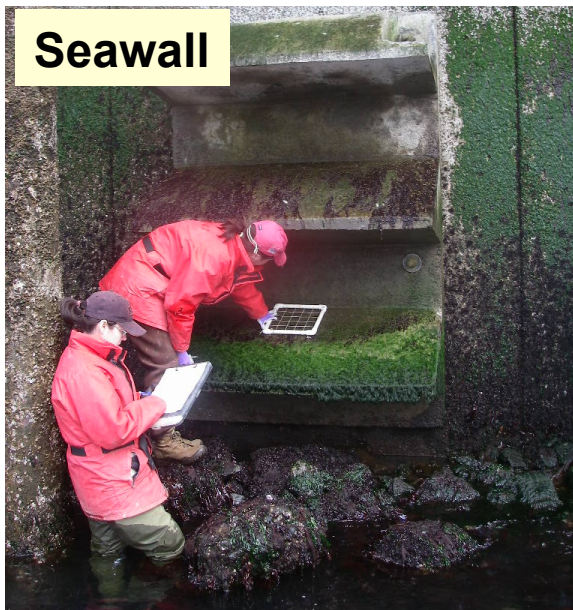
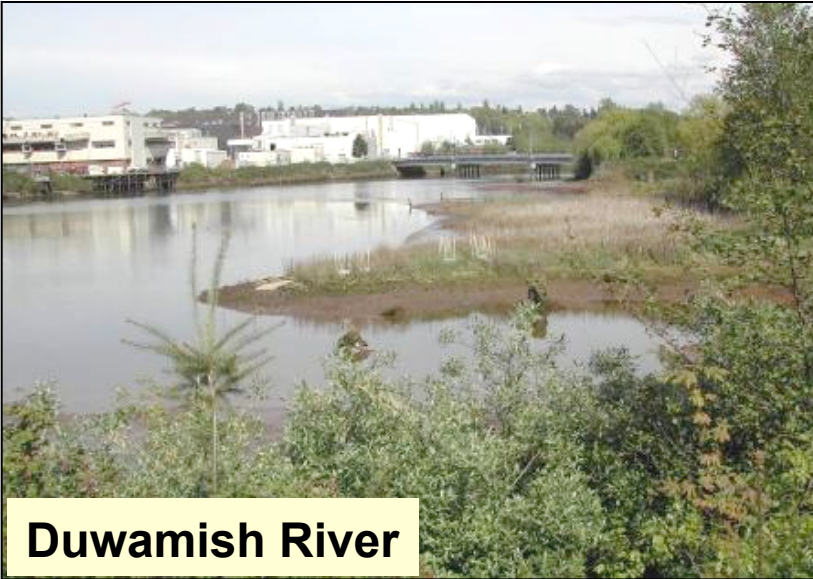


Seawall: Habitat Panels, Troughs



Connectivity

Watershed-scale, balance of restoration sites across continuum.





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Technical Reports: www.fish.washington.edu

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