Marine Nearshore Ecology at the Restored Seahurst Park

Presented by

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Confluence Environmental Company

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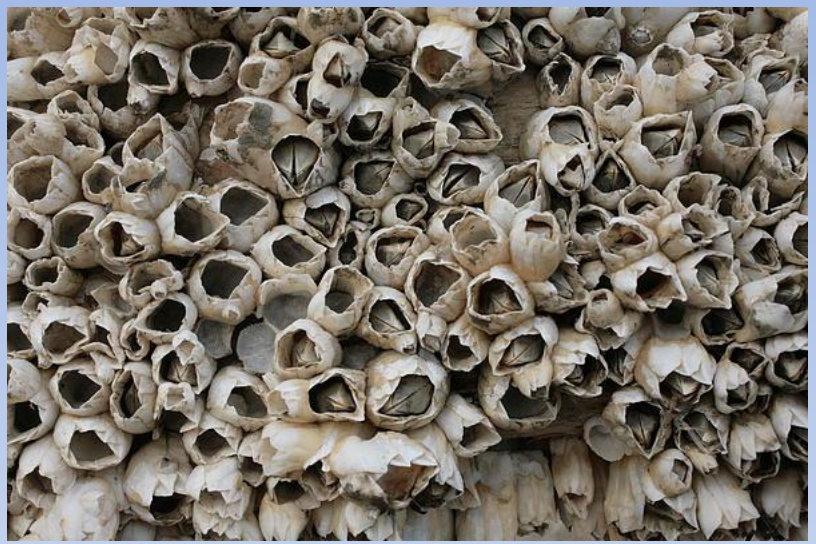
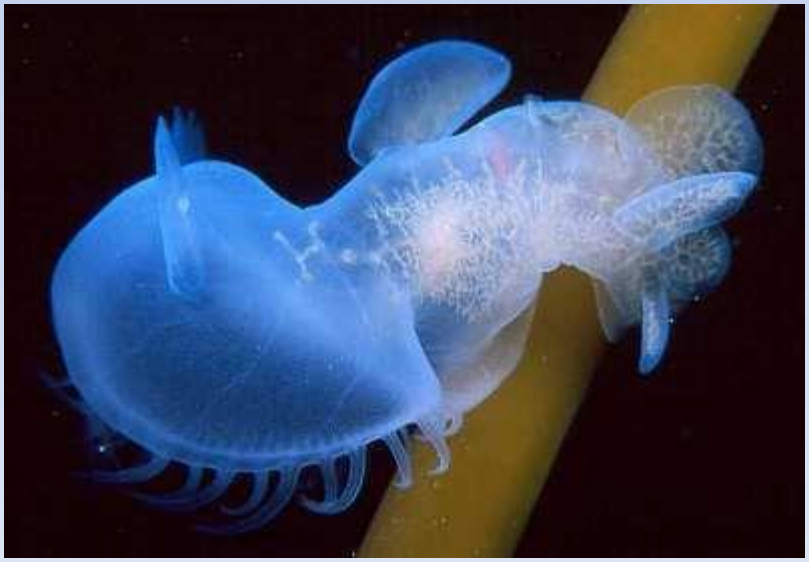
Environmental Science Center Public Education Series

Postcards from Puget Sound


olympia oysters
4 months old
9/24/06


Jason Warshawsky 2004
Photo by Peter J. Bryant
Photo by Todd Warshaw



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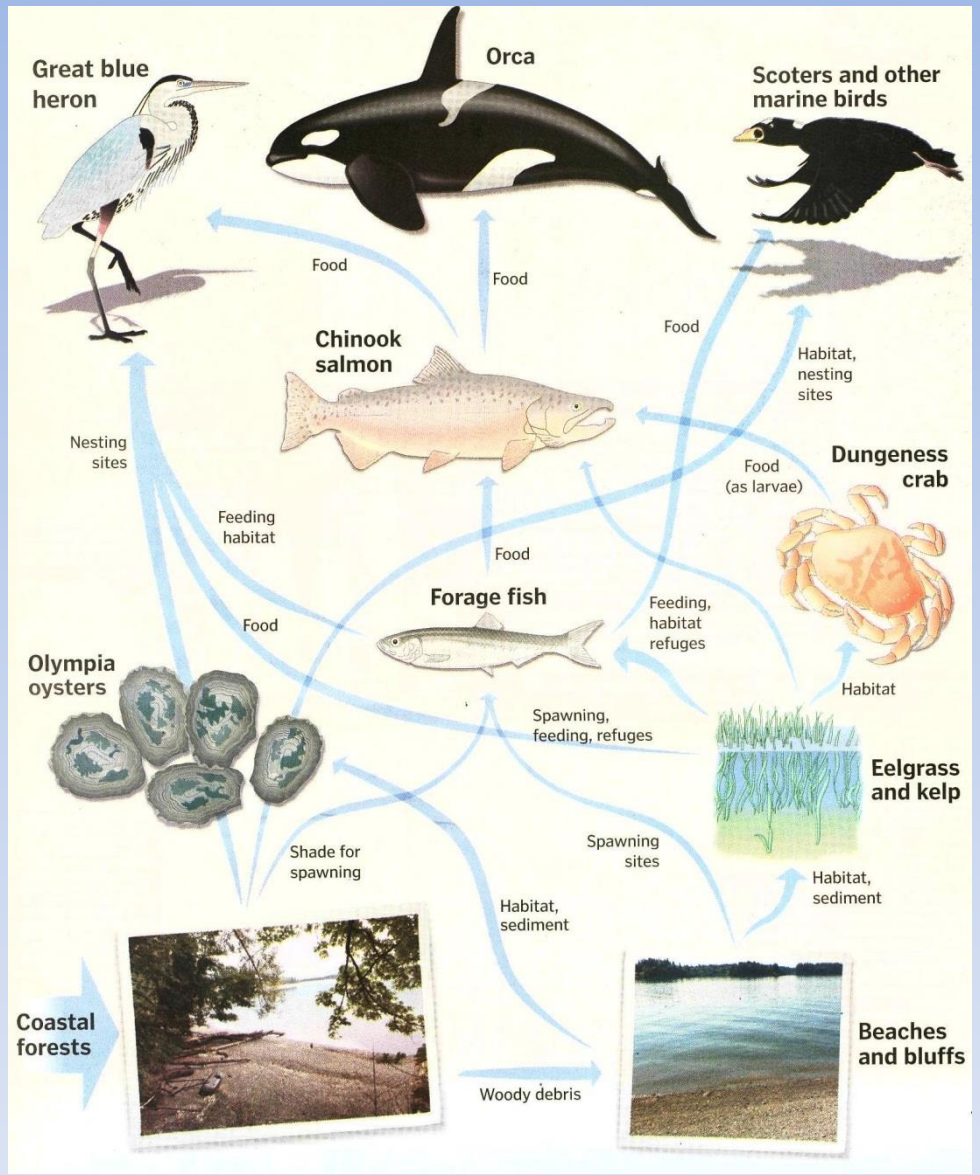
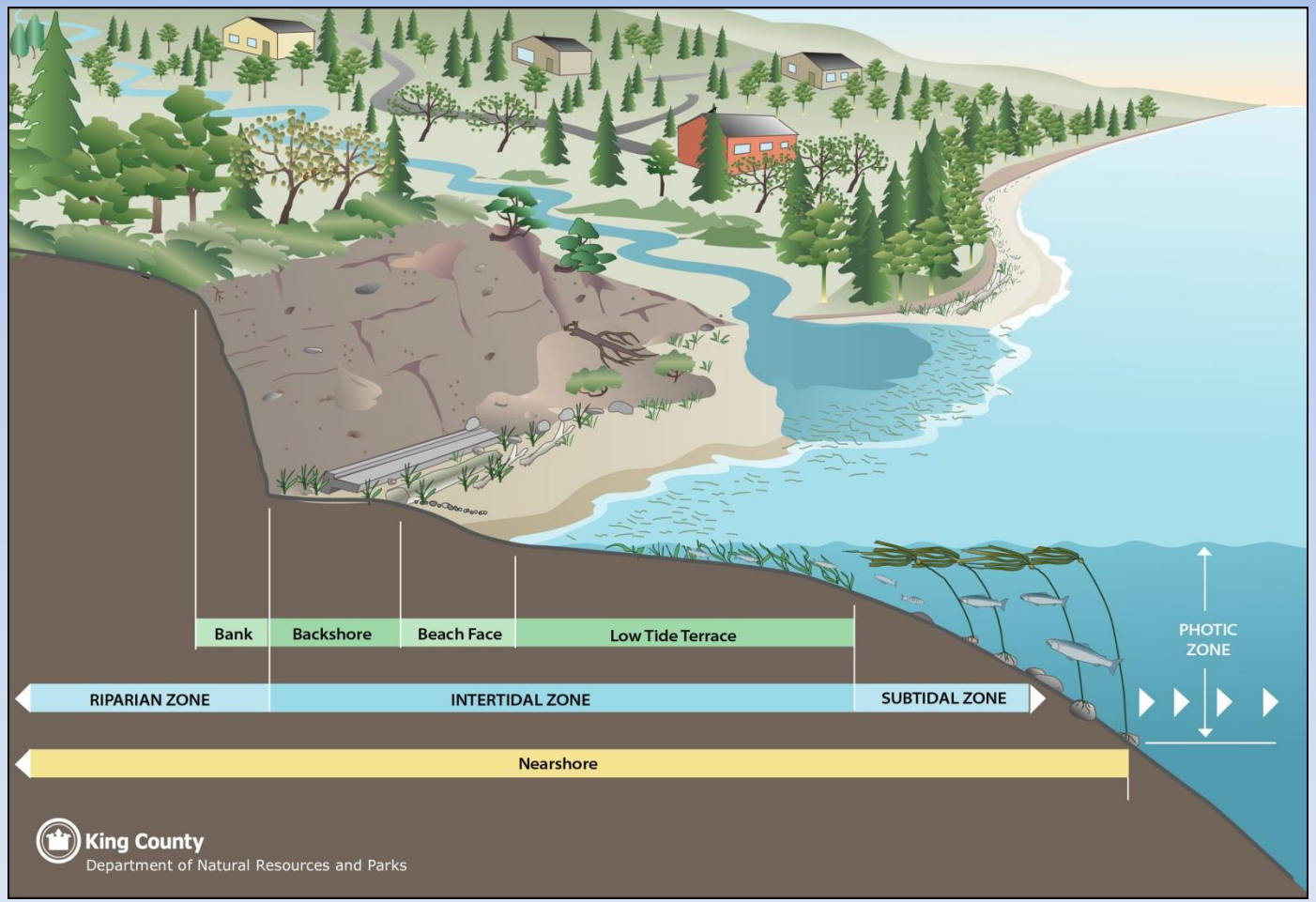
They're All Connected!

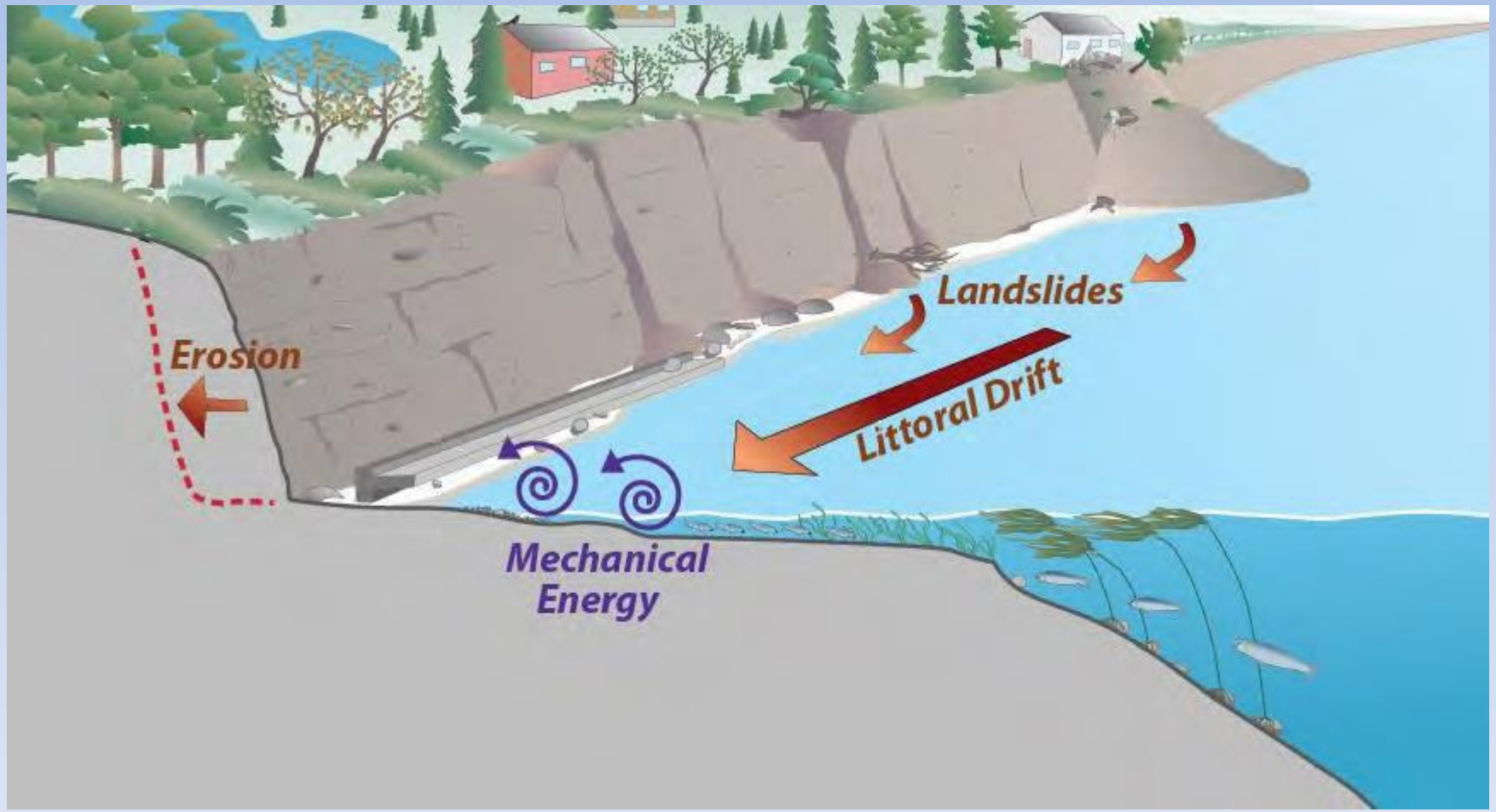


Nearshore Connections



Nearshore Connections

Nearshore Connections: Sediment Input, Transport, and Deposition



Sediment Drift Cell – 10 miles to Duwamish Head in Seattle

Key Species Targeted in Restoration

Juvenile Chinook Salmon

Juvenile Chinook salmon

- Puget Sound populations of Chinook salmon federally listed as threatened under the Endangered Species Act
- Among most dependent on estuaries and marine nearshore
- Use areas for foraging, refuge from predators, physiological transition, and migratory corridors

Juvenile Chinook salmon (cont.)

- Tend to stay close to shoreline during early marine stage, then move offshore as they grow
- Feed on amphipods, copepods, terrestrial-origin insects

Juvenile Chinook salmon (cont.)

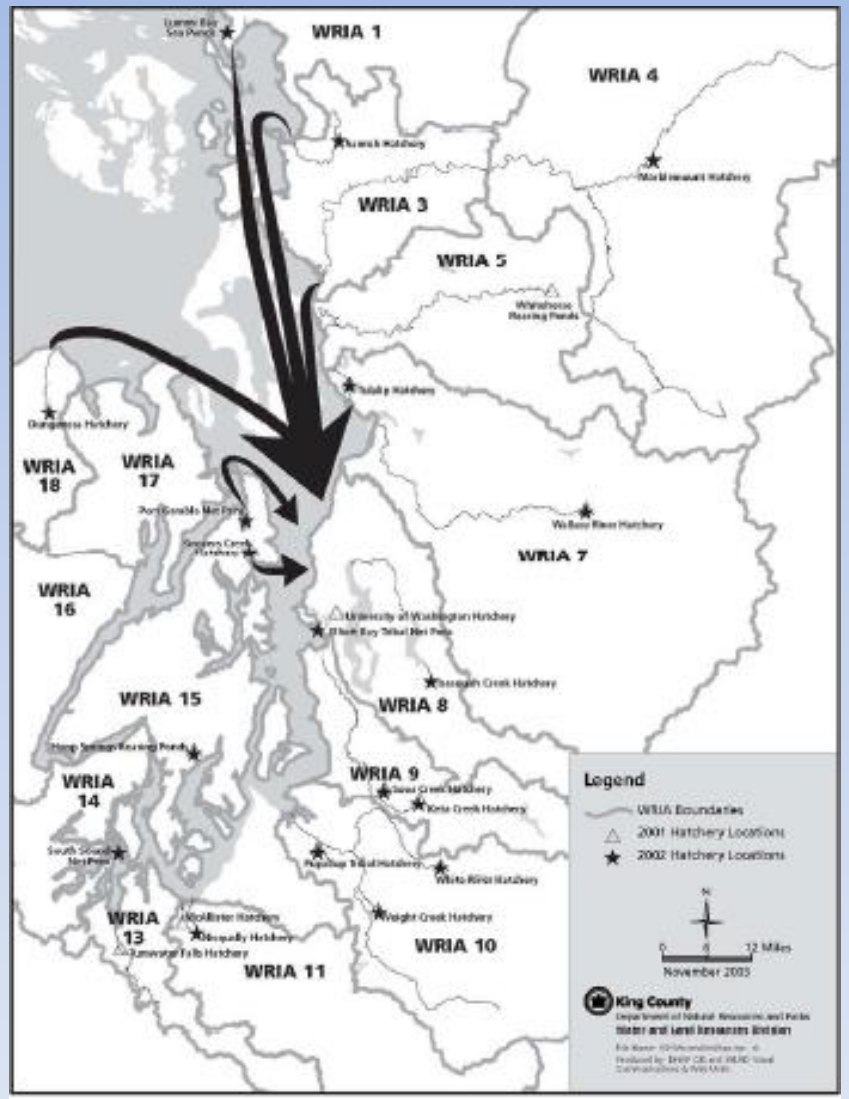


Figure 3.25. Unexpected movement patterns of North and western hatchery Chinook.

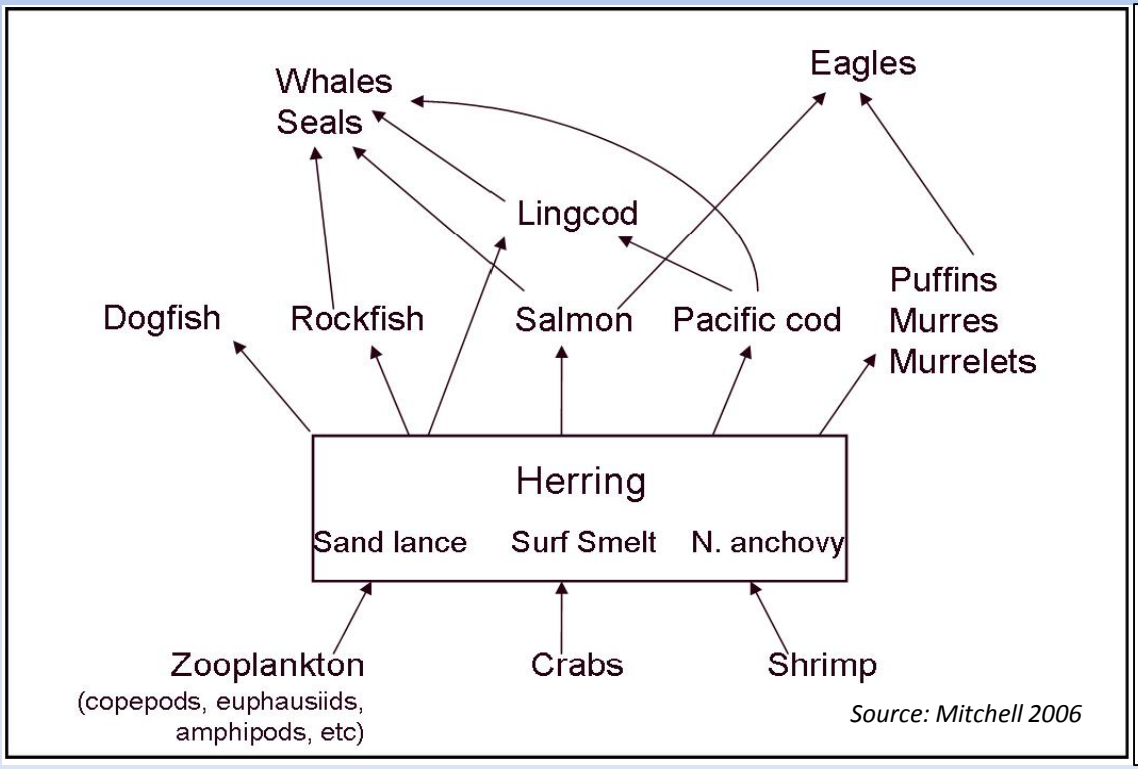
- Source: Brennan et al. 2004

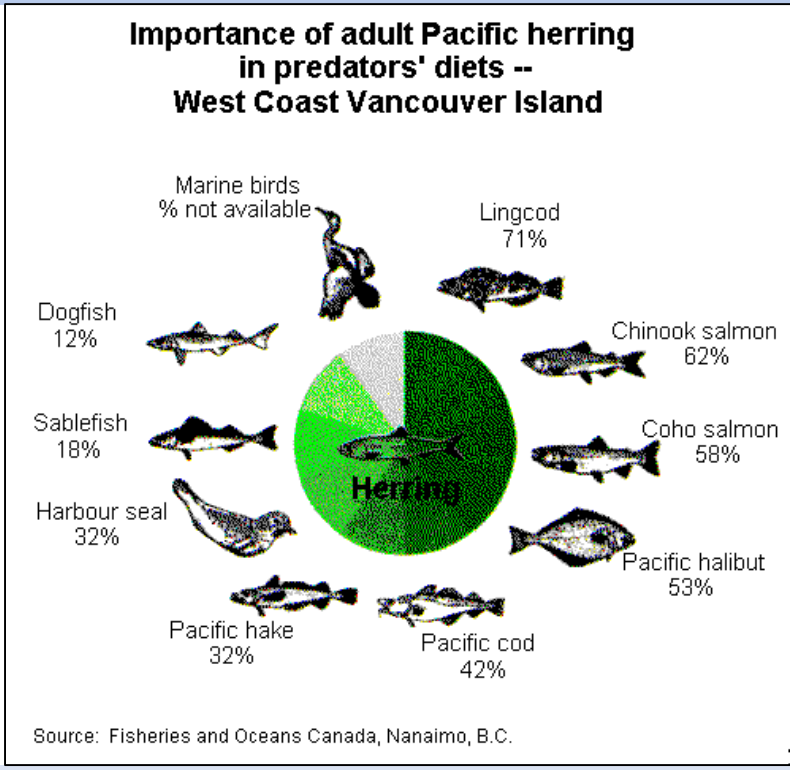
Forage Fish

- Sand lance
- Surf smelt

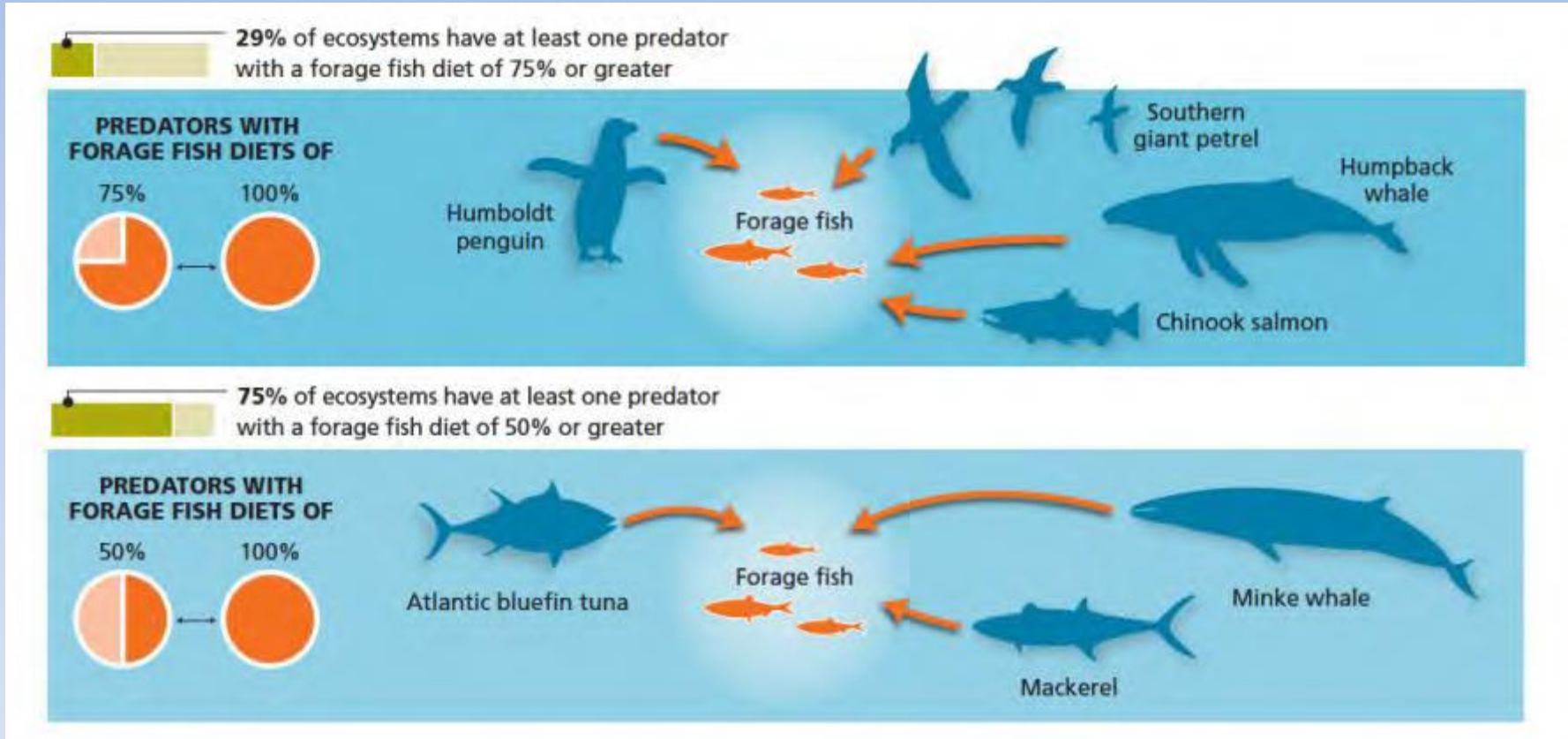
Forage Fish (cont.)

- Forage fish occupy mid-trophic level of food web





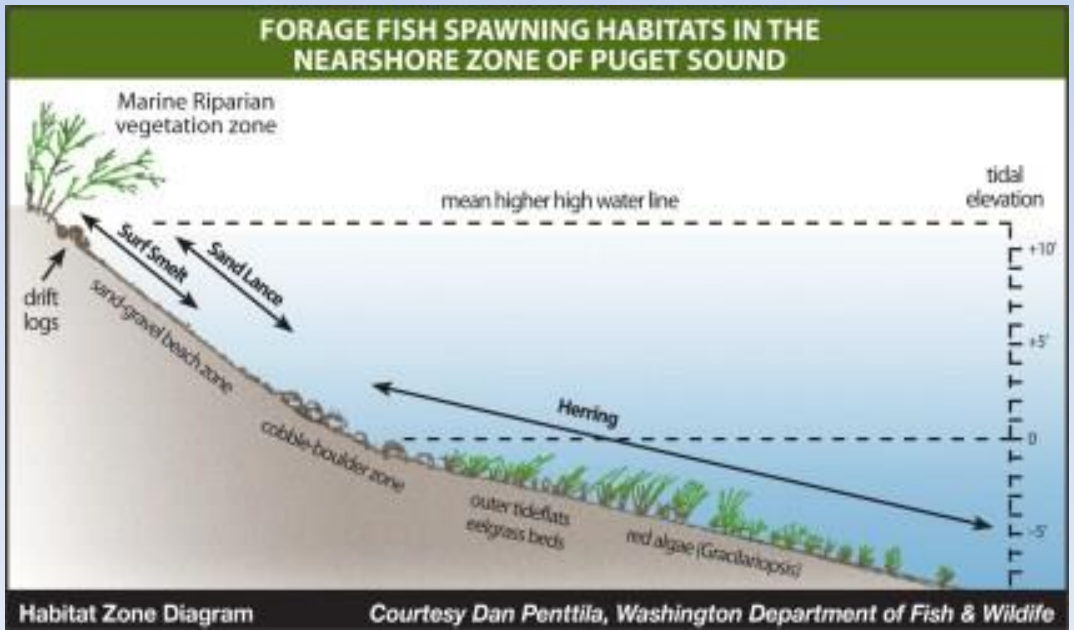
Global study found that 75% of ecosystems studied have at least one highly/extremely dependent predator



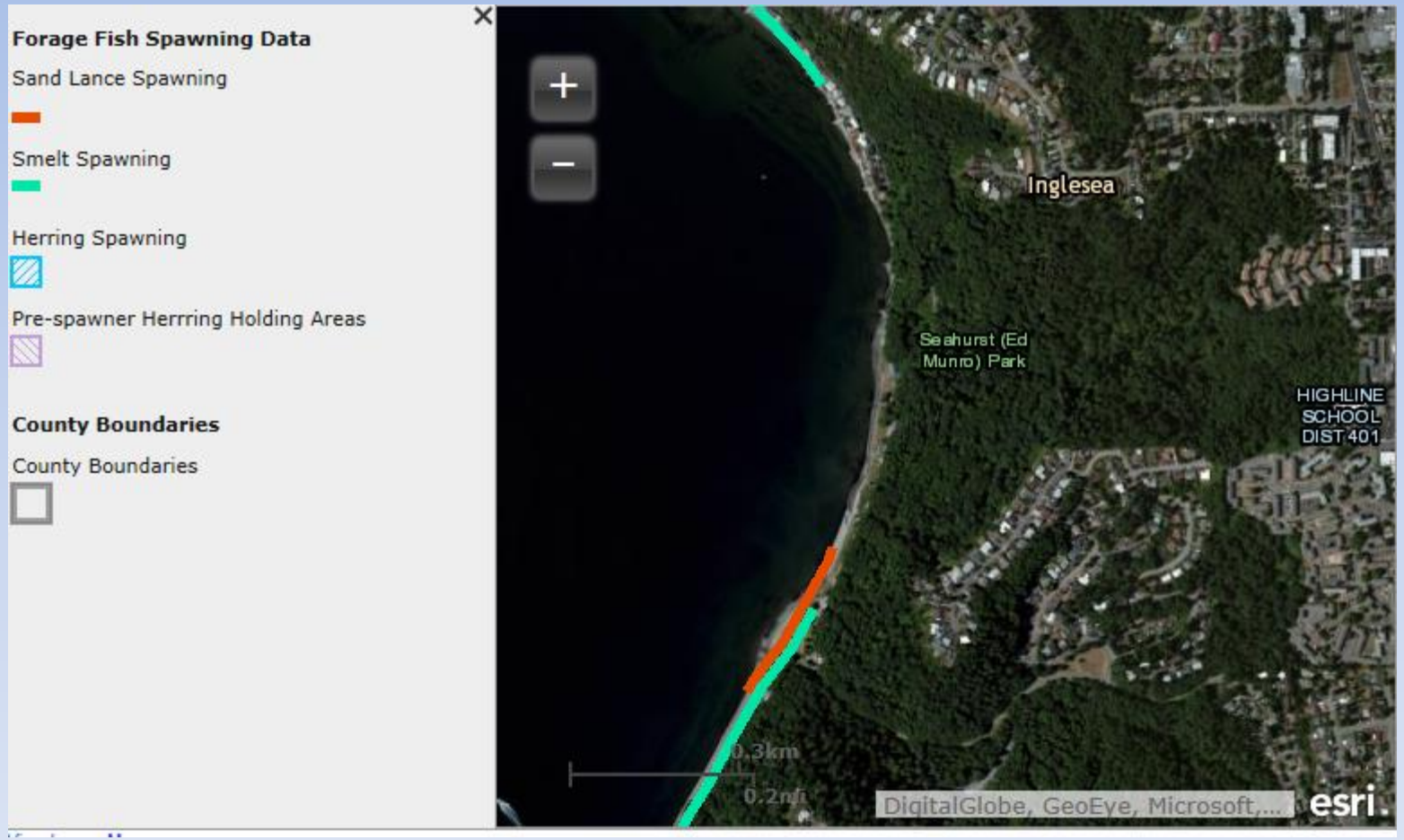
- Source: Lenfest Forage Fish Task Force 2012

Forage Fish

- Intertidal spawning by surf smelt and sand lance
  - Mid to upper intertidal
  - Sand lance typically spawn in sand
  - Surf smelt typically spawn in sand and gravel



Forage Fish (cont.)



- WDFW data (http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/)

Forage Fish (cont.)

- http://www.youtube.com/watch?feature=player_detailpage&v=p46xlsh5snQ

Native Eelgrass

Native Eelgrass

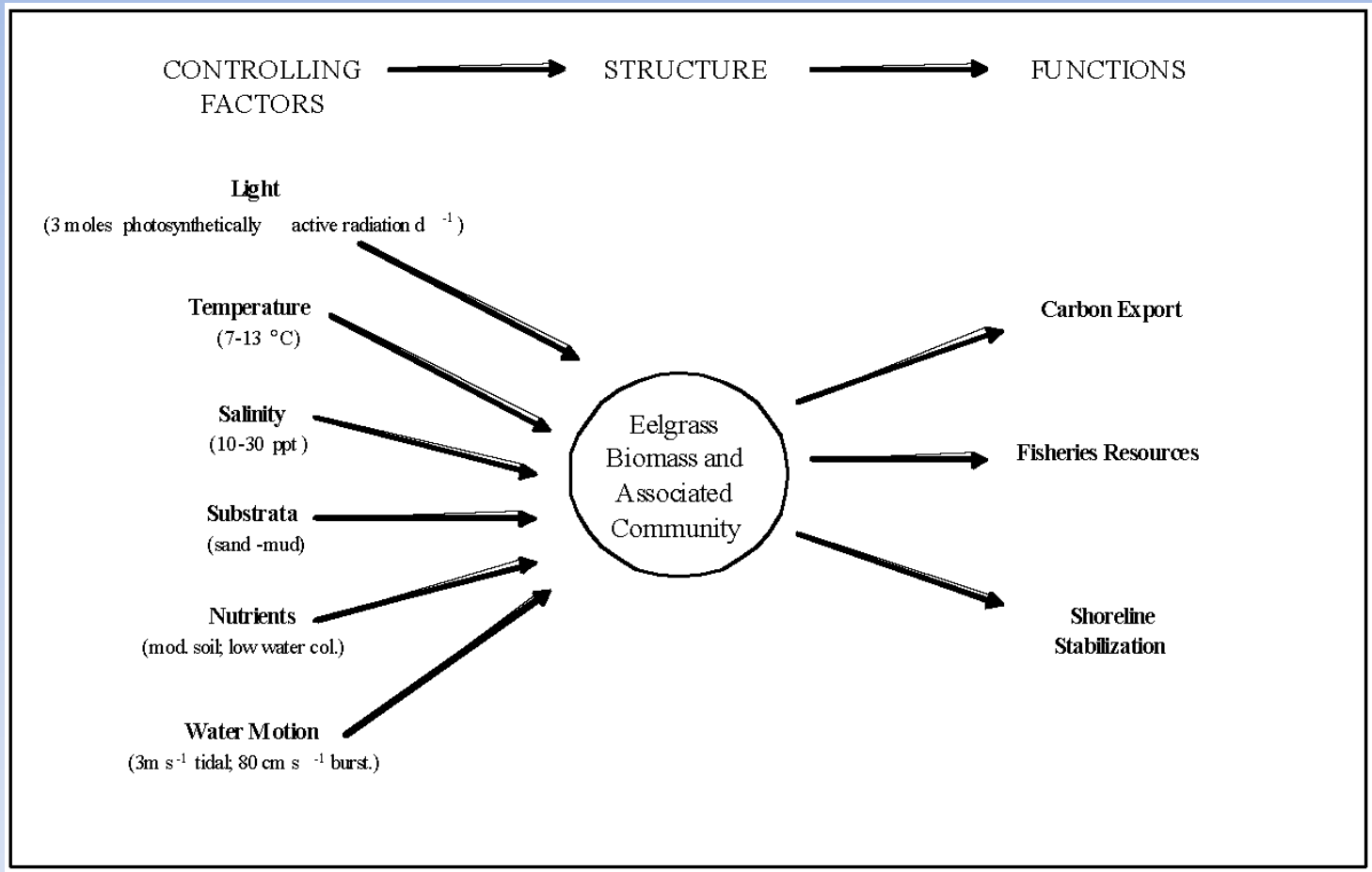
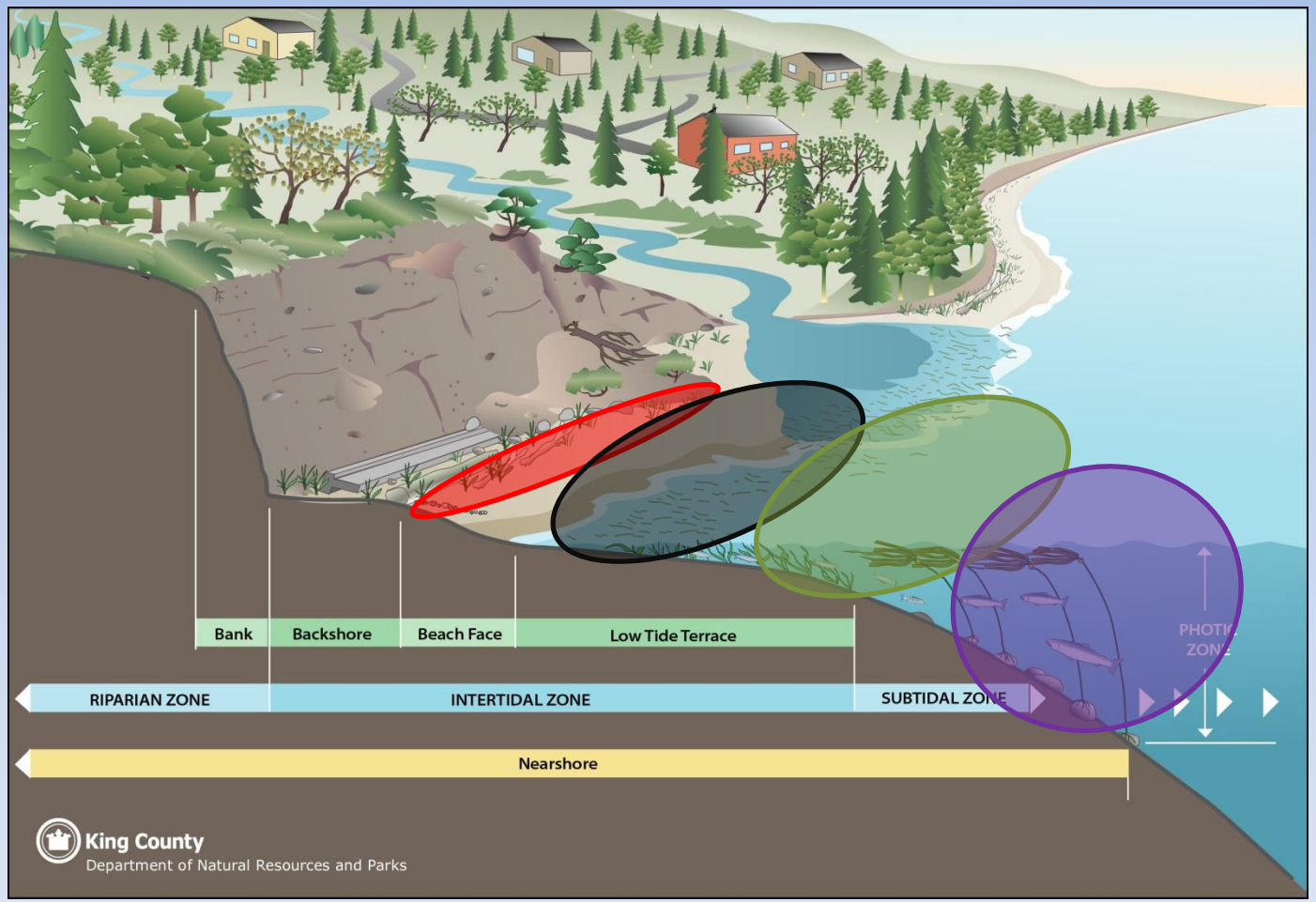


Figure 2. General eelgrass conceptual model (from Thom et al. 2005).

The Habitats Occupied



Restoration Elements at Seahurst Park

- Photos courtesy of Peter Hummel, Anchor QEA

Process Based Restoration Approach

Wave energy
Sediment delivery
Sediment transport

Conceptual Model:
The role of Puget Sound nearshore beaches in sustaining forage fish

Beach profile
Sediment grain size
Beach temperature

Forage fish spawning
and production
Food web support

Source, Conceptual Model: PSNERP and Simenstad et al. 2006; Penttila 2007

Restoration Elements at Seahurst Park

Before

After

Restoration Elements at Seahurst Park

Before

After

Restoration Elements at Seahurst Park

Before

After

Restoration Elements at Seahurst Park

After - NEW

After - Established

Restoration Elements at Seahurst Park

Restoration Elements at Seahurst Park

Monitoring

- Pre- and post-construction monitoring (Jason Toft, UW)

talitrid amphipod *Traskorchestia traskiana*

glycerid polychaete worm *Hemipodia simplex*

Invertebrate Densities

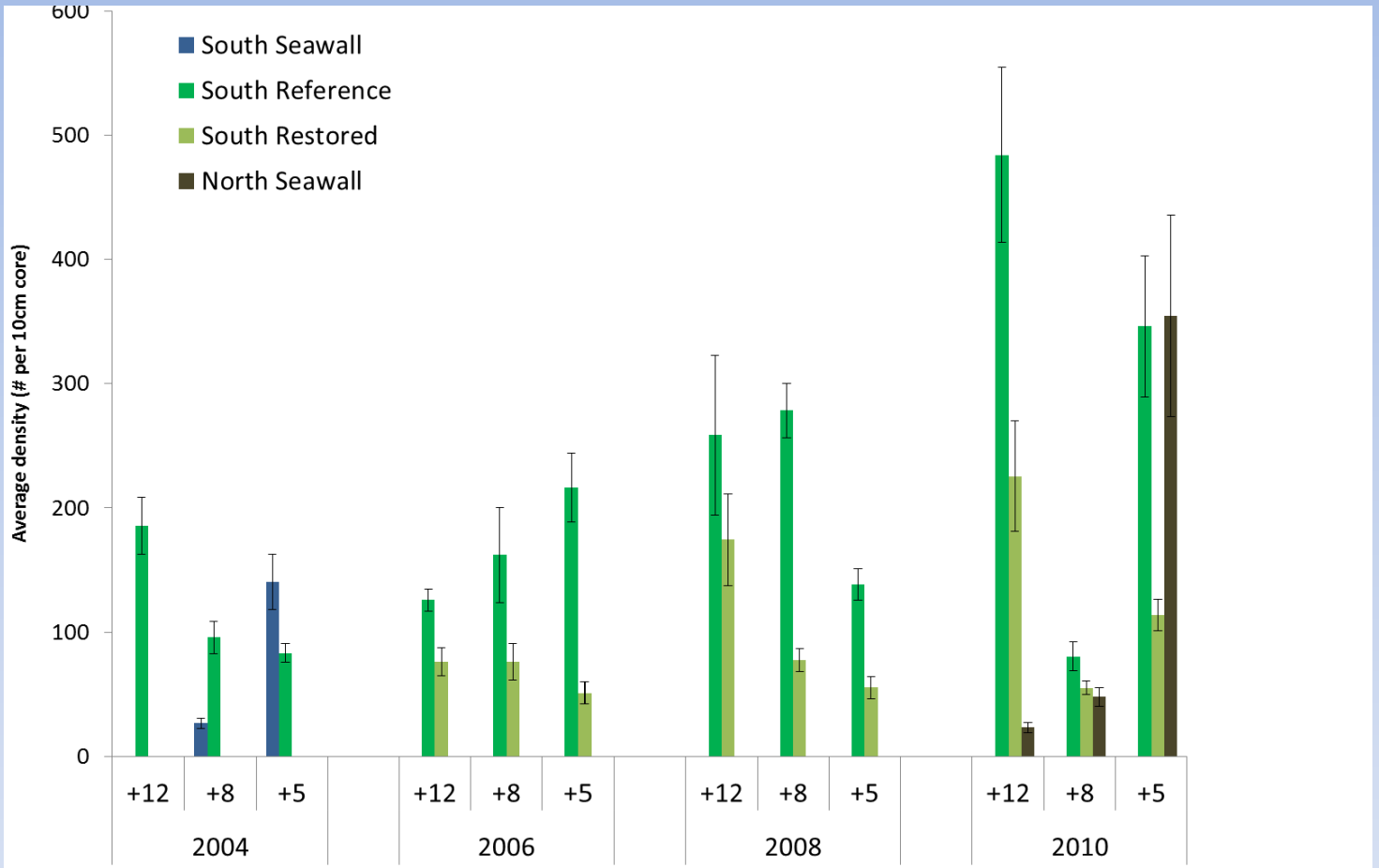
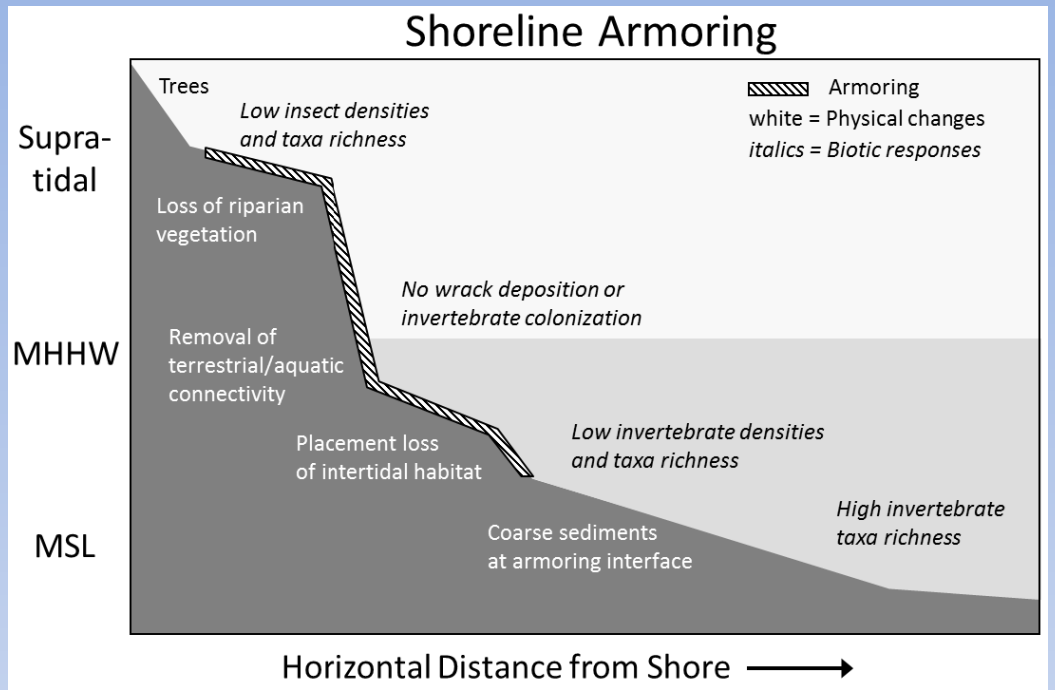
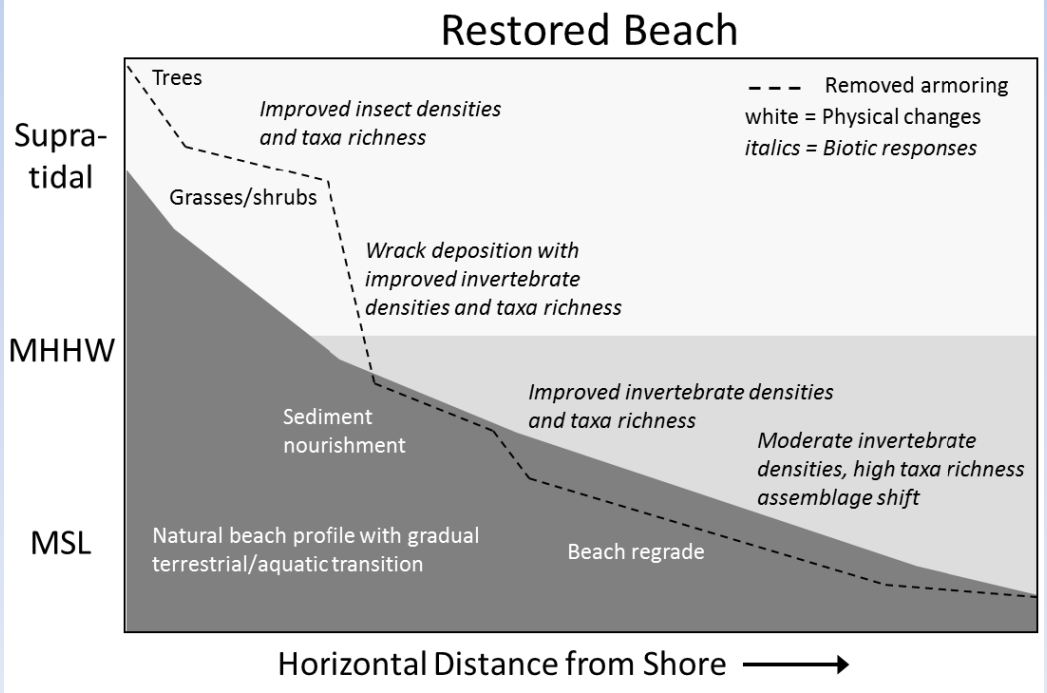


Figure 5. Total average invertebrate densities for all sites and years. Error bars represent Standard Error.

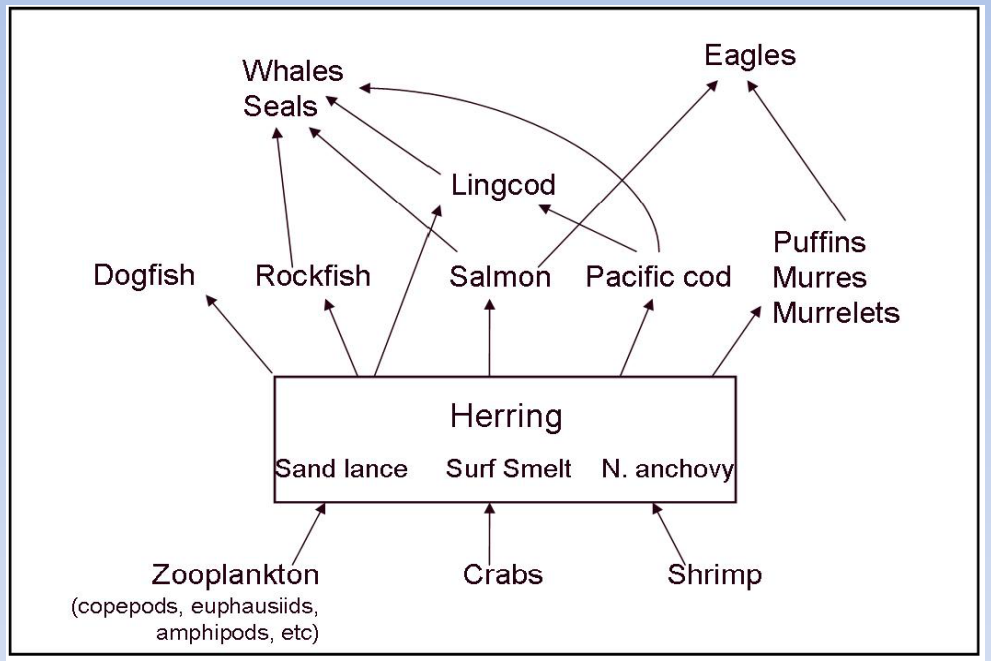
- Toft 2011

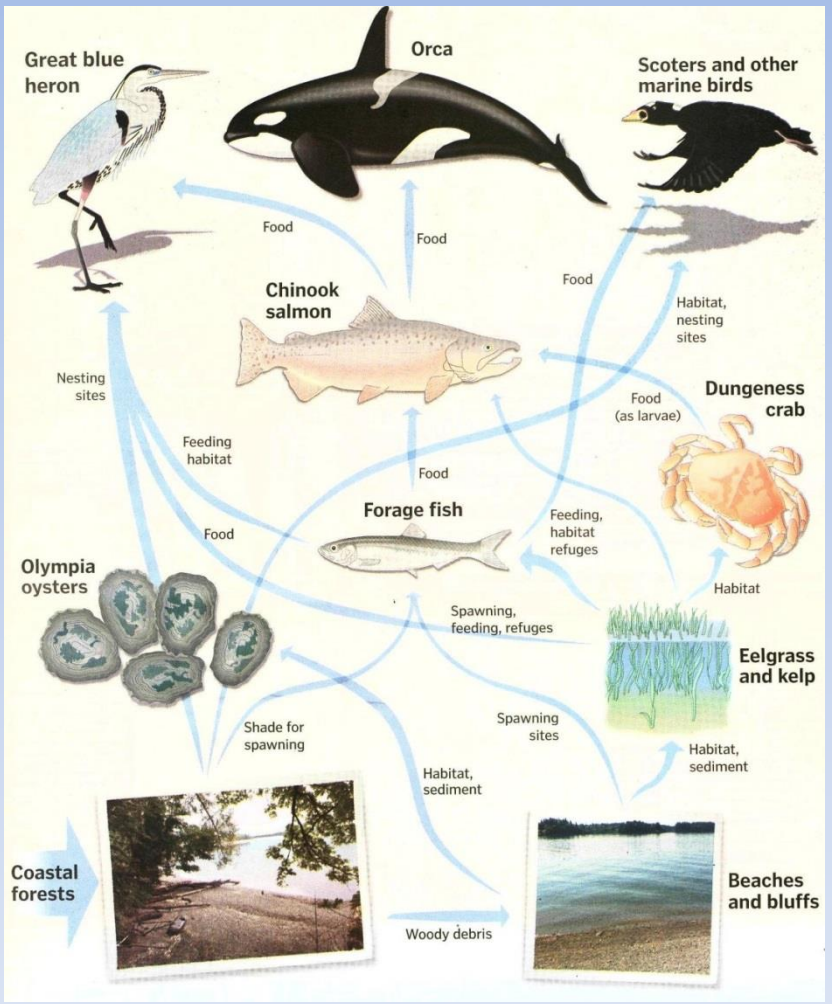

Shoreline Armoring
Supra-tidal
MHHW
MSL
Trees
Low insect densities and taxa richness
Armoring
white = Physical changes
italics = Biotic responses
Loss of riparian vegetation
No wrack deposition or invertebrate colonization
Removal of terrestrial/aquatic connectivity
Placement loss of intertidal habitat
Low invertebrate densities and taxa richness
High invertebrate taxa richness
Coarse sediments at armoring interface
Horizontal Distance from Shore


Restored Beach
Supra-tidal
MHHW
MSL
Trees
Improved insect densities and taxa richness
Removed armoring
white = Physical changes
italics = Biotic responses
Grasses/shrubs
Wrack deposition with improved invertebrate densities and taxa richness
Improved invertebrate densities and taxa richness
Sediment nourishment
Moderate invertebrate densities, high taxa richness assemblage shift
Natural beach profile with gradual terrestrial/aquatic transition
Beach regrade
Horizontal Distance from Shore

- Toft 2011

It’s All Connected!





Upcoming Presentations and Site Walks

- **Nearshore/Riparian and Wetland Habitat Lecture**
  - Tuesday, Sept. 30, 6:30 pm by John Small

- **Hillside Geology Guided Tour**
  - Saturday, Oct. 4, 10:00 am by Bill Laprade

Thanks!

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