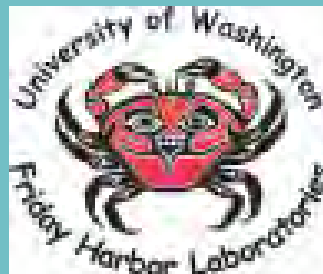


Nearshore Habitats in the Salish Sea

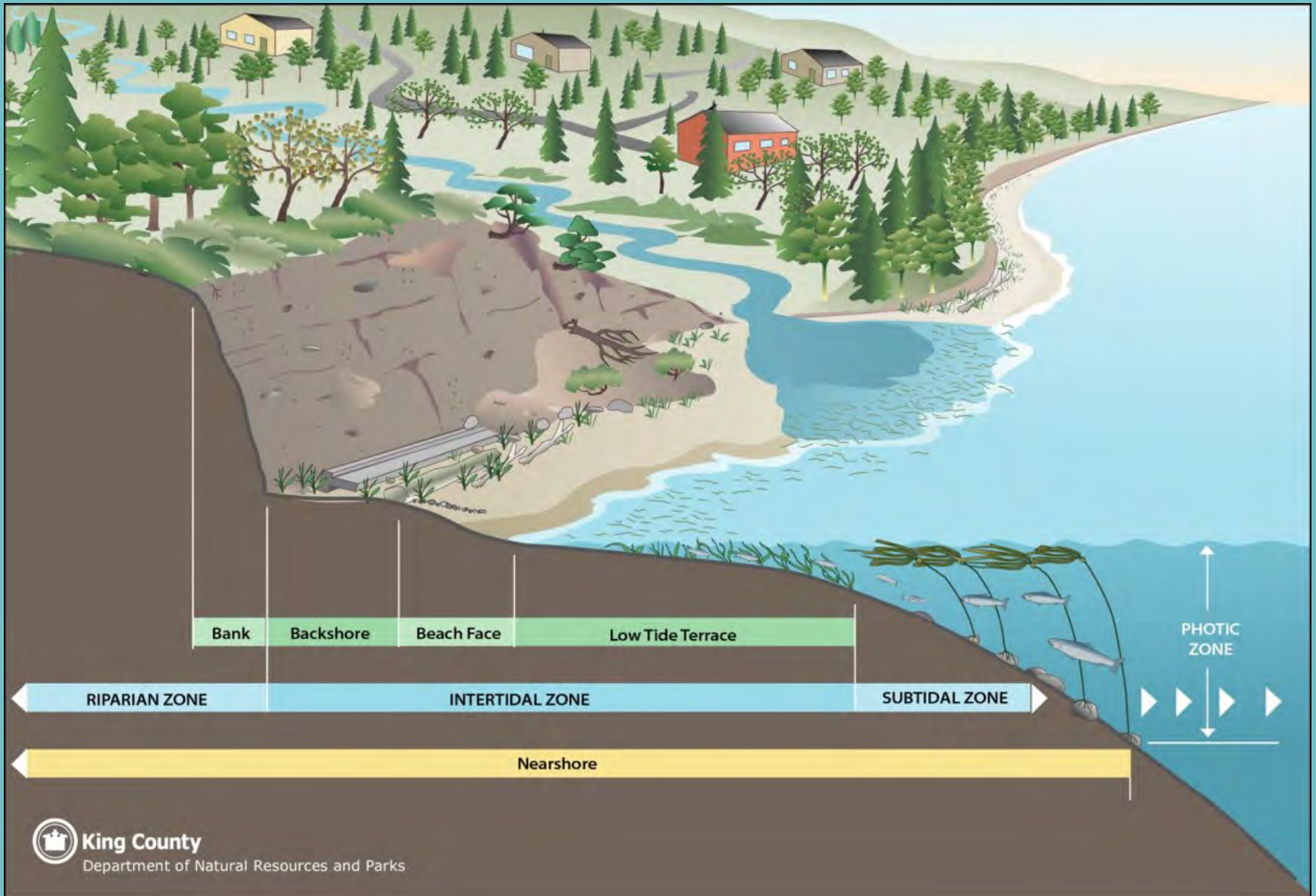
Megan Dethier

University of Washington

Friday Harbor Laboratories



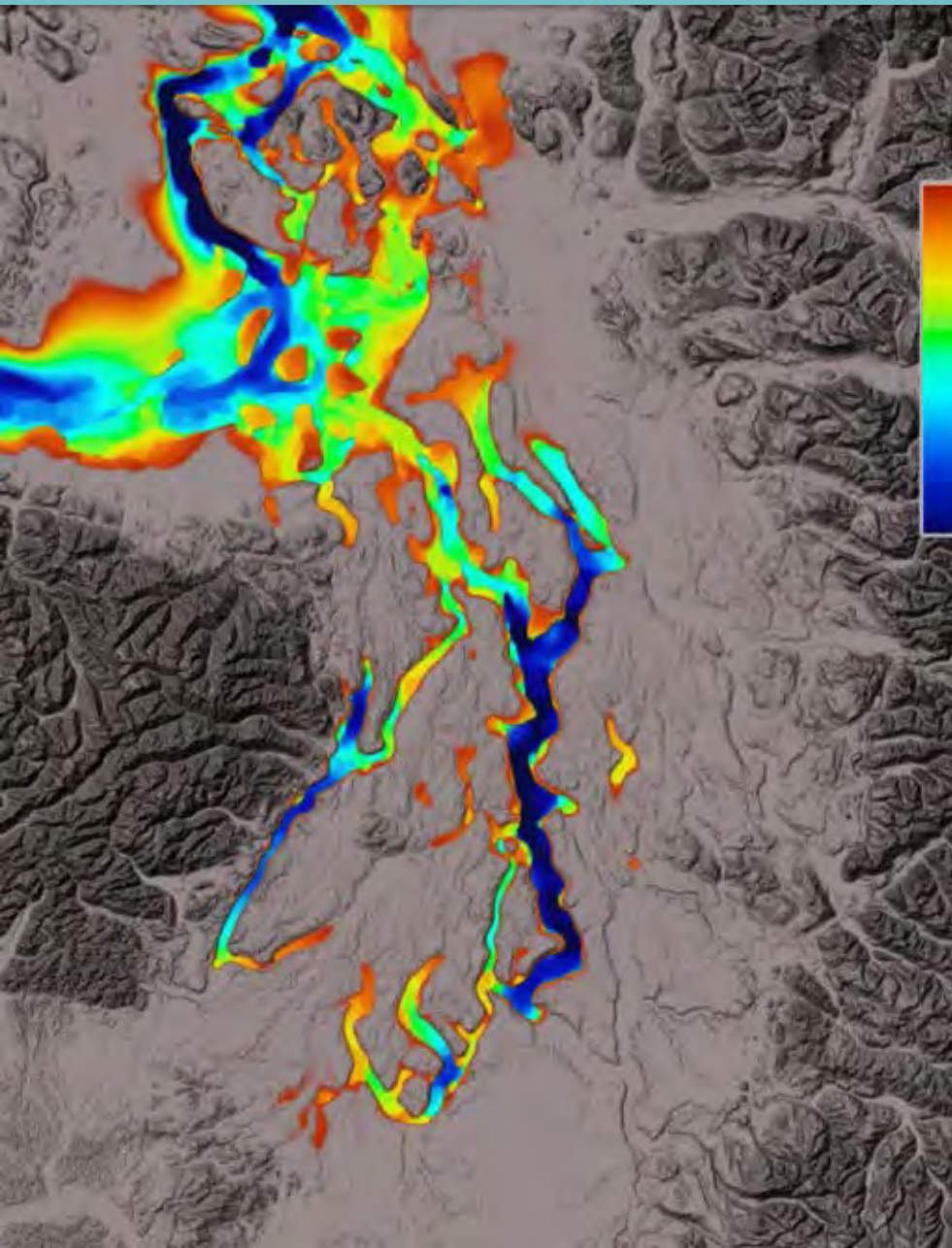
What is the Nearshore?



King County

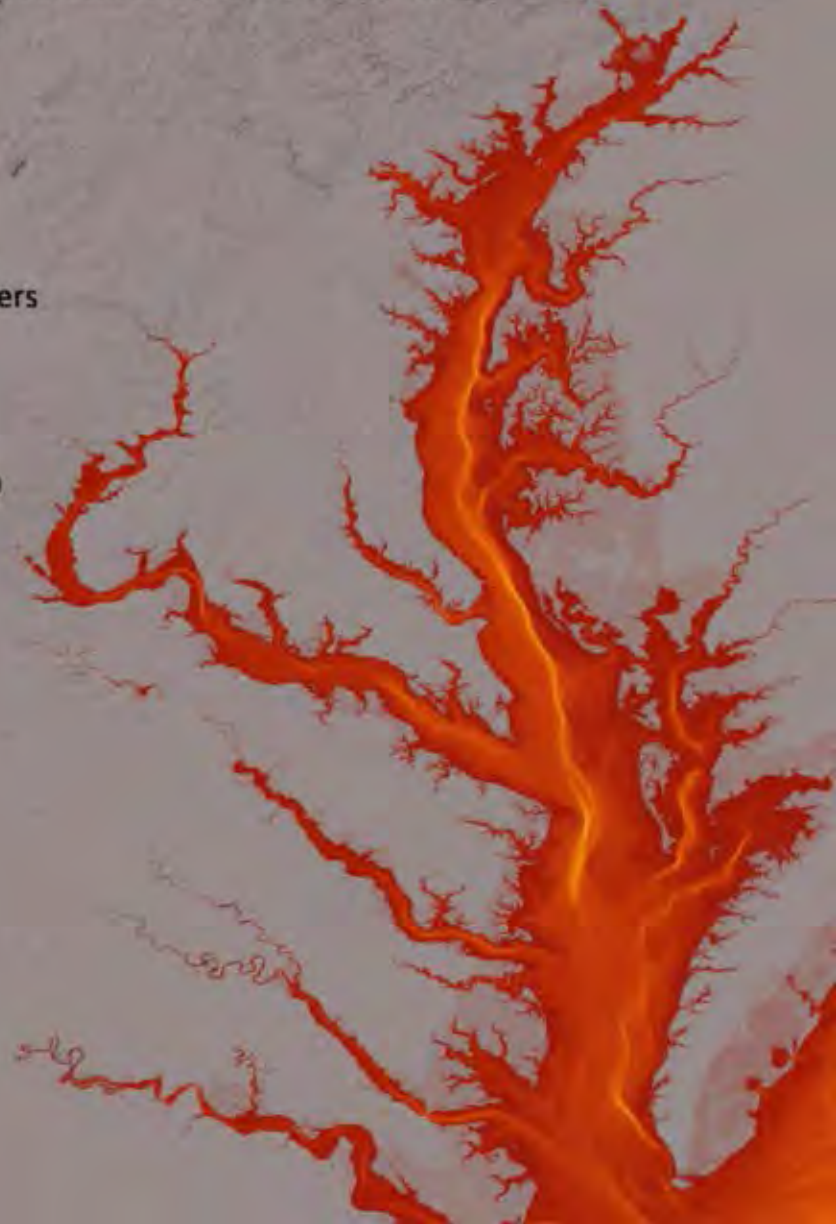
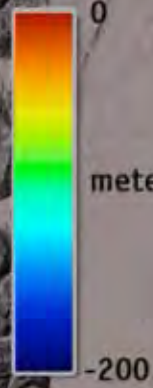
Department of Natural Resources and Parks

Puget Sound



Chesapeake Bay

Data Source: NGDC Coastal Relief Model



Coastal Landforms



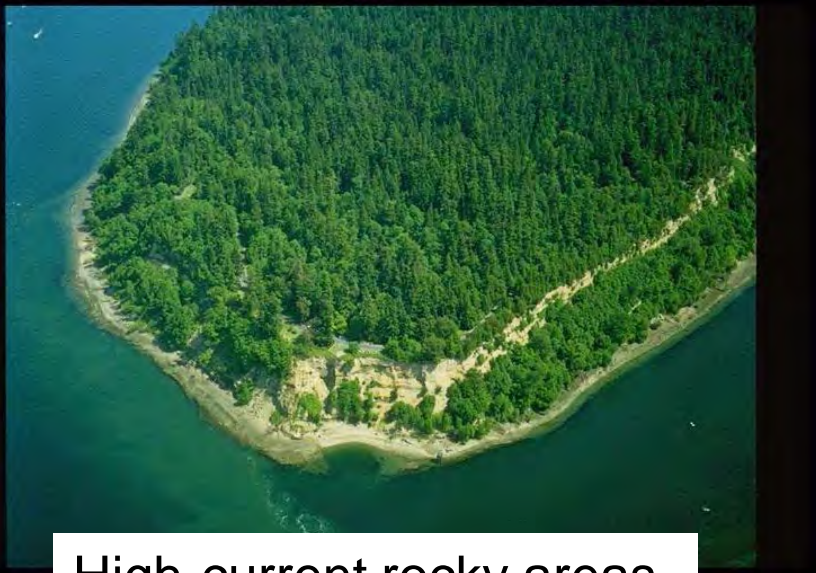
Diverse Shoreline Types - Linear...



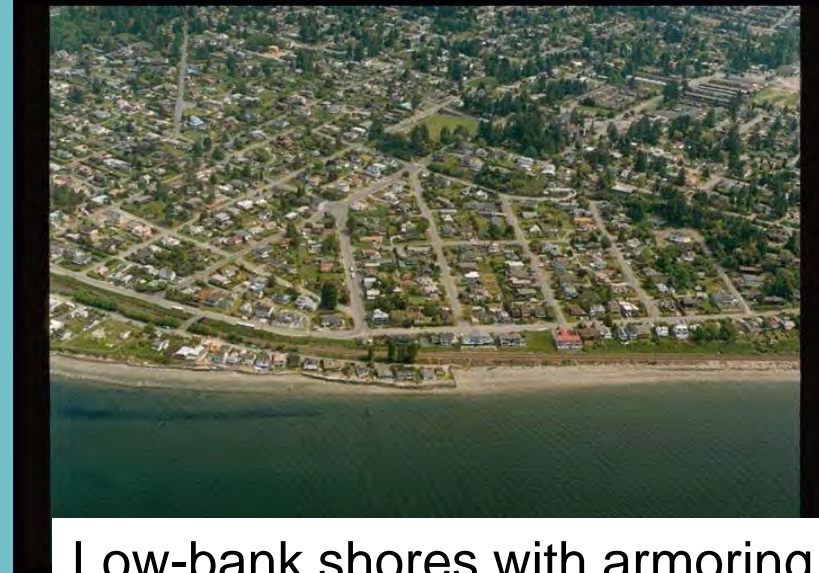
Eroding bluffs and sand-gravel beaches, narrow or broad



<http://apps.ecy.wa.gov/shorephotos>



High-current rocky areas



Low-bank shores with armoring



Big deltas with marsh



Quiet muddy bays

And less-linear...



Lagoons with marshes



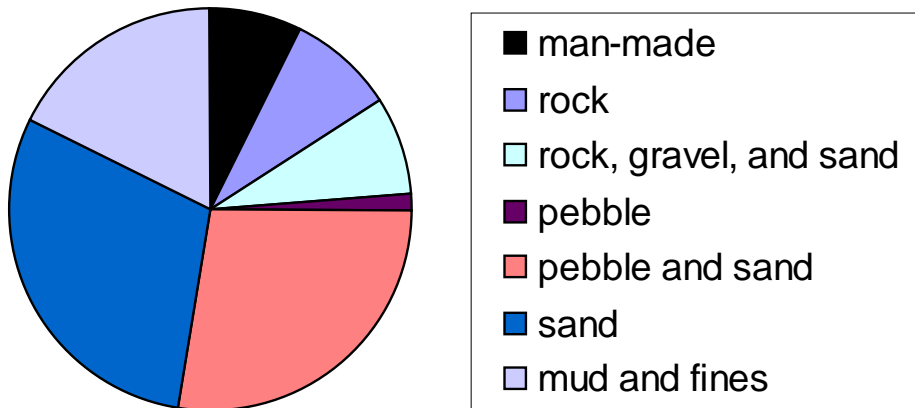
Broad sand-mud deltas



Not much rock!



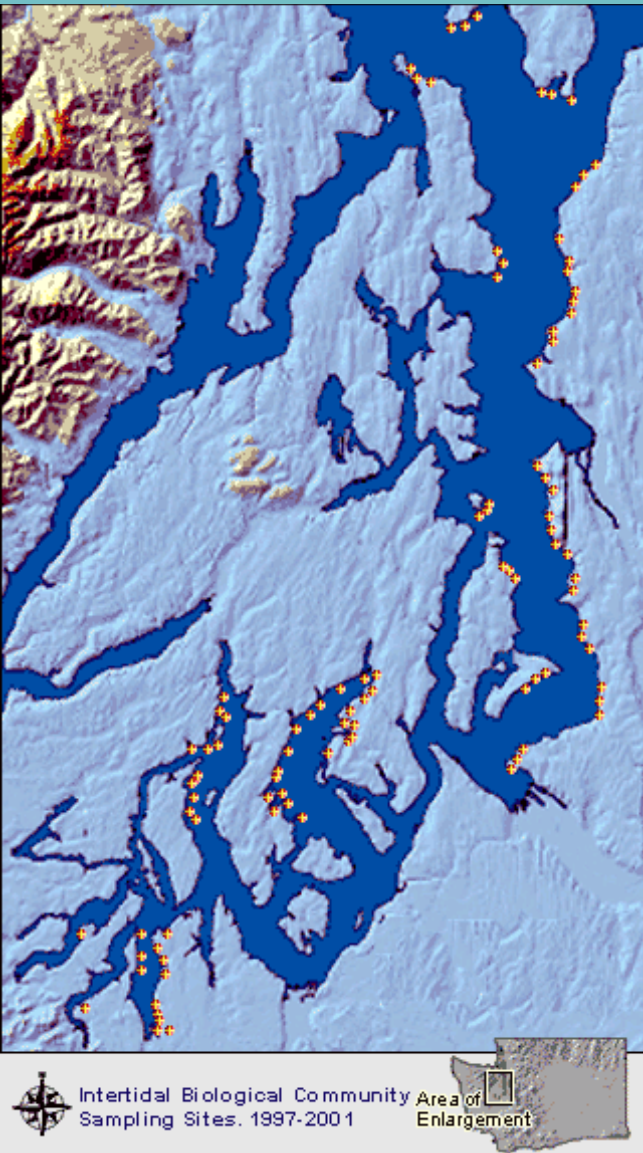
**Percent of Linear Shoreline
of each Substrate Type**



Washington Shorezone Data

Substrate type + Energy Level =
Marine Community

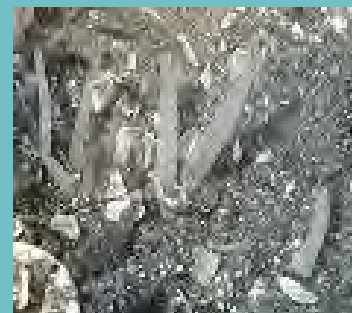
↑
[salinity, some other factors]



Shoreline monitoring sites

Communities in Soft, Uniform Mud

- Relatively depauperate
- Largely anaerobic
- Tube-building amphipods
- Ghost shrimp
- Deposit-feeding clams
- A few worms
- In the past... oysters



Olympia Oysters

- Once dominant in South-Sound bays with mud or gravelly mud
- Now rare, being restored
- Some dense populations in remote BC areas



Clean Sand to Somewhat Muddy Sand

- In the intertidal, often depauperate, unstable
- Relatively sparse clams and worms, sometimes abundant amphipods
- In some places:
 Geoduck clams



Also:
Eelgrass beds
Sand dollar beds

Eelgrass beds

- Most in the shallow subtidal zone
- Added productivity and 3-D cover
- Harbor juvenile crabs, fishes, shrimp...
- Used as feeding and nursery grounds by outmigrating juvenile salmon
- Stabilize sediment, may have richer infauna than plain sand



Nancy Sefton image

Sand dollar beds

- Intertidal and shallow subtidal
- Dense aggregations; tend to exclude other species, disturb the sand



Cobble-Pebble-Sand Beaches

- High shore often finer gravel and sand, unstable
- Low-shore cobbles often 'armor' the substrate
- Substrate thus stabilized and biota are **rich**.

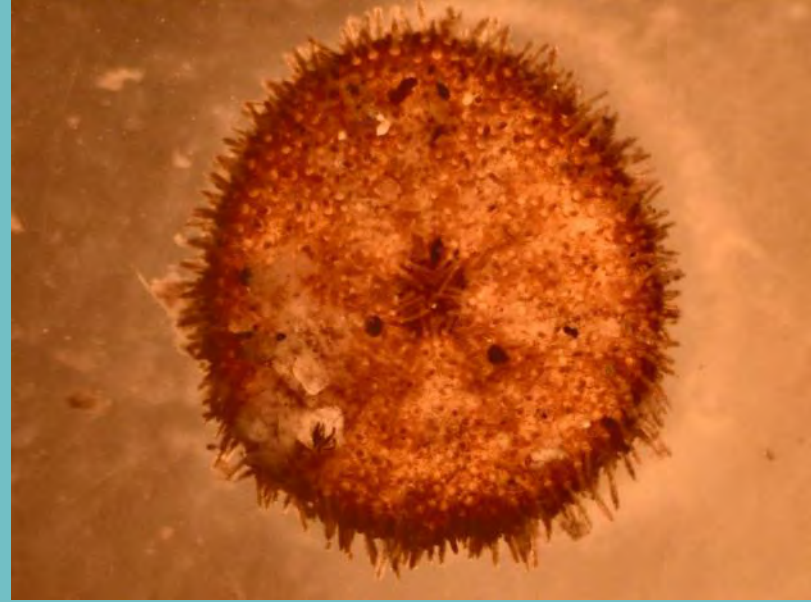


Clams!

Many species and a lot of them...

Predators have a hard time digging in this coarse and mixed substrate... unless they have shovels or clam rakes





Tiny clams, worms, and even sand dollars live in the sediment and are prey for other species





WA DOE Shore Photos

- **Patches** of sand vs. cobble are very common along even ‘uniform’ shorelines
- Cobble substrate results in much higher-diversity beaches
- complexity of the biotic community can vary enormously along one stretch of beach



Neptune N



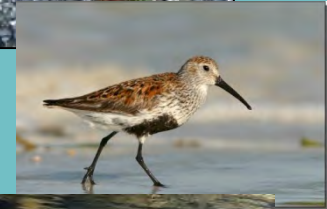
Neptune M



Neptune S

The nearshore is 'in the middle' connecting food webs from land to sea

- Insects and organic matter drop from riparian vegetation onto shore and sea
- Beach biota such as beach hoppers are key to 'recycling' of organic matter
- Land birds, shorebirds, and some mammals (bears, foxes!) feed on the beach
- Fishes feed over the shore at high tide
- Other marine predators similarly move up from the subtidal zone
- Nearshore waters bring food (plankton), spores, seeds, and larvae to the shore
- It's where most of the primary productivity is!



Other organisms that use beaches...



Photos.igougo.com



Randy Shuman



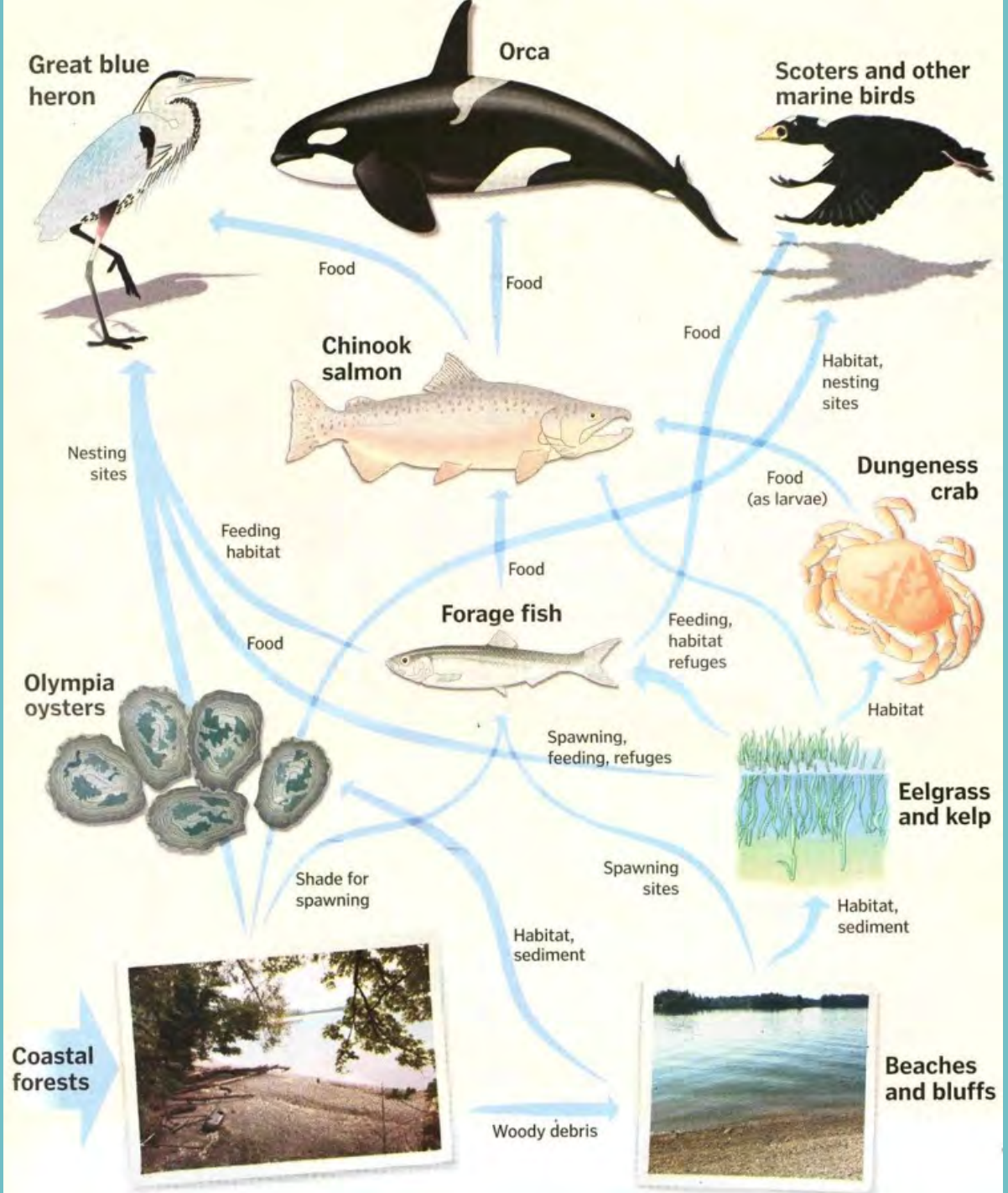
www.kingcounty.gov



www.gpnc.org

“Valued Ecosystem Components” in the nearshore

and their connections



What do we know about how shoreline armoring affects these nearshore communities?

‘SHORELINE ARMORING’ =

Erosion control practices using hard structures (e.g. concrete or wood walls, or rock riprap) that stabilize the shore and the bank or bluff behind it.



And how do we study this problem?

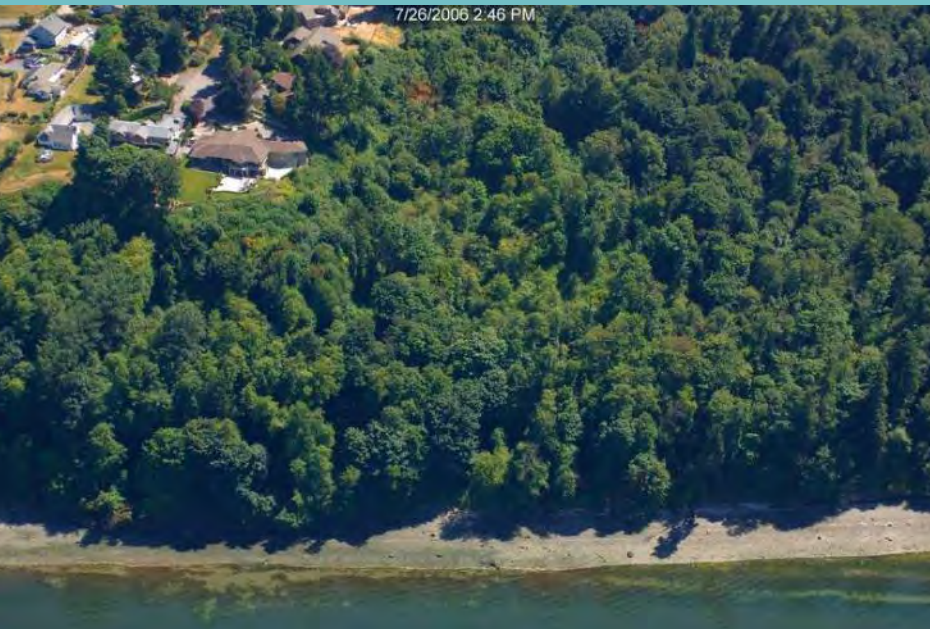
Our research method for documenting impacts of armoring on these messy shores:

*Rapid surveys of many parameters at 65 **paired** armored and unarmored sites (within a drift cell) around the Salish Sea*



Example of a Pair

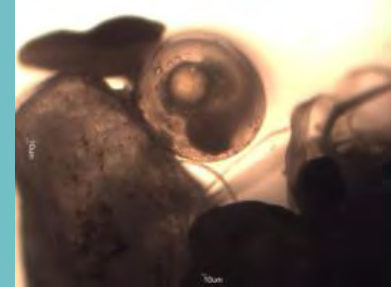
Poverty Bay, south of Redondo



Types of Impact

Armored Shoreline

Placement loss



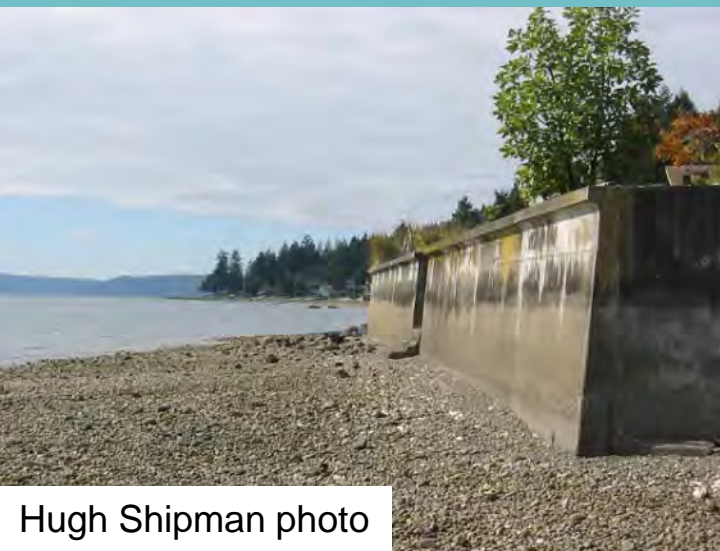
Land-Sea connectivity



Sediment processes



Hydrodynamic processes

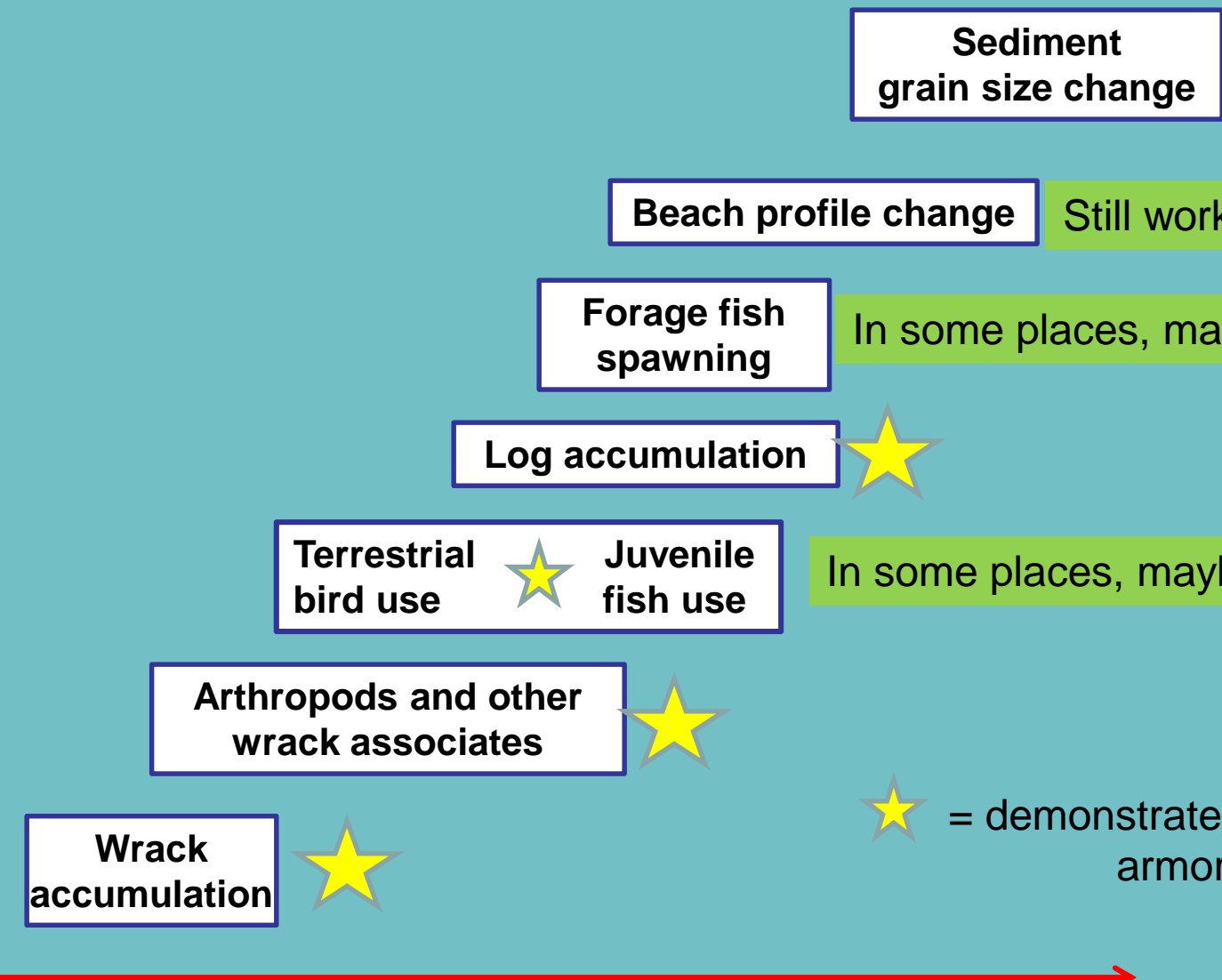


Hugh Shipman photo

Broad
(Drift cell)

Spatial Scale

Local
(m)



Fast
(Days)

Temporal Scale

Slow
(Seasons to Years)

Still working on this...

In some places, maybe broadly?

In some places, maybe broadly?

★ = demonstrated impacts of armoring