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This presentation not peer reviewed.

The Ecology of Puget Sound Beaches

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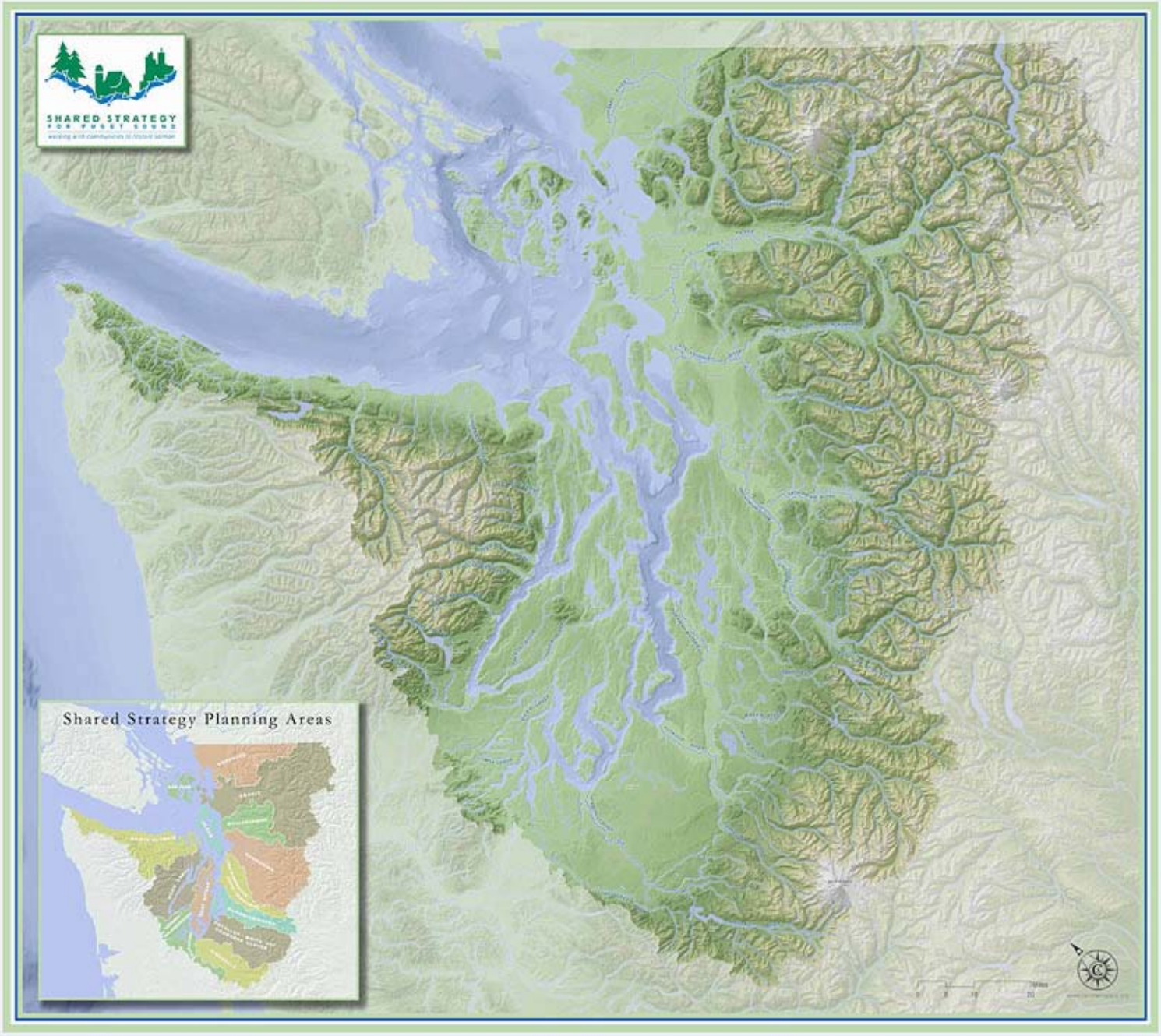
Puget Sound Watershed



Diverse Shoreline Types

Linear…

Eroding bluffs and sand-gravel beaches

Low-bank shores with armoring

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

Broad sandy beaches

High-current rocky areas

And less-linear…

Big deltas with marsh

Quiet muddy bays

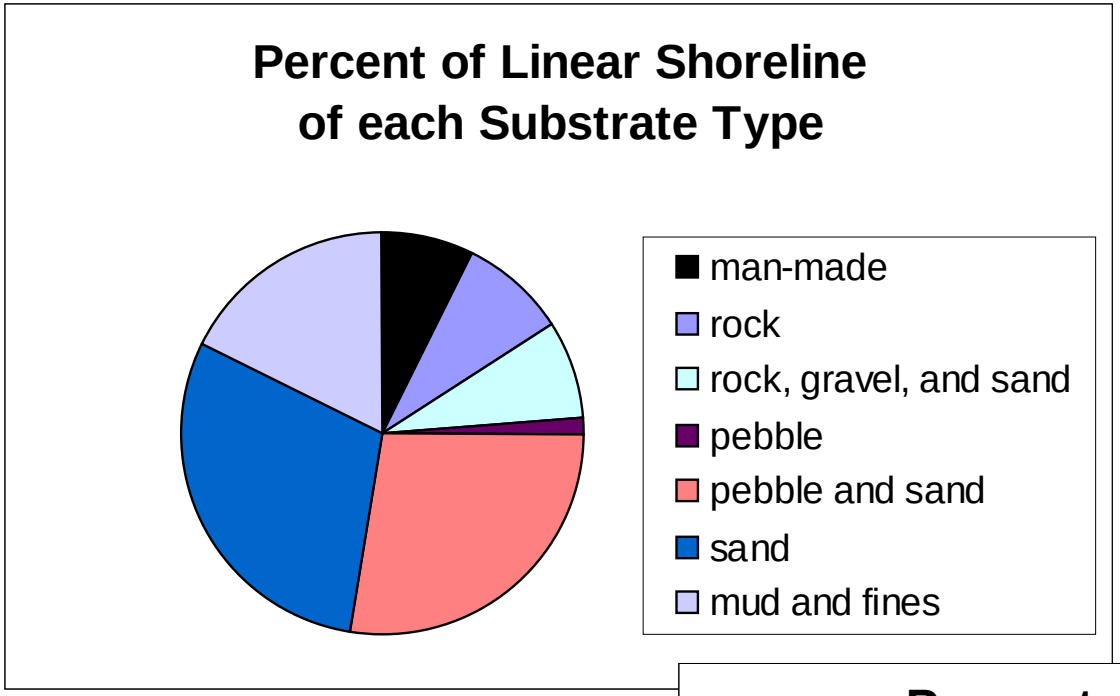
Lagoons with marshes

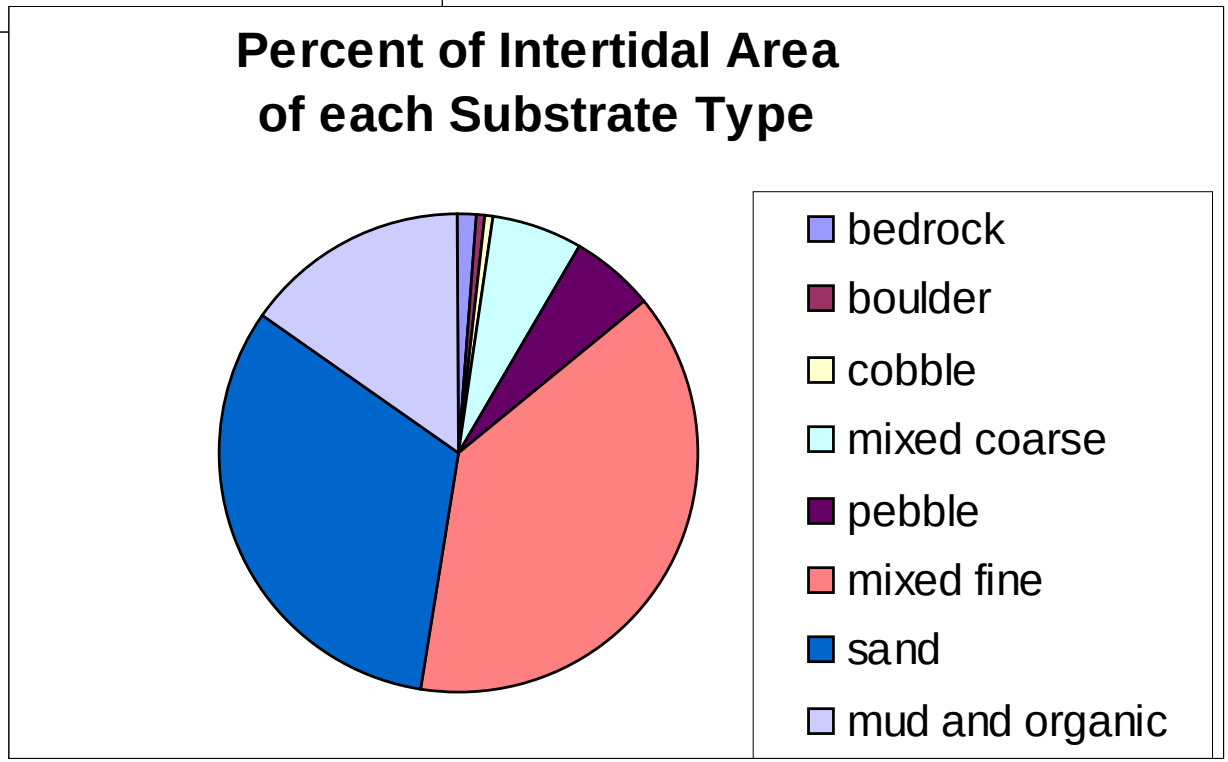
Broad sand-mud deltas

Not much rock!

Washington Shorezone Data

Puget Sound Beach Types





Bailey et al.
DNR Probabilistic Survey

Diverse Beach-Substrate Types,

even just on the linear shorelines

"Suck-mud"

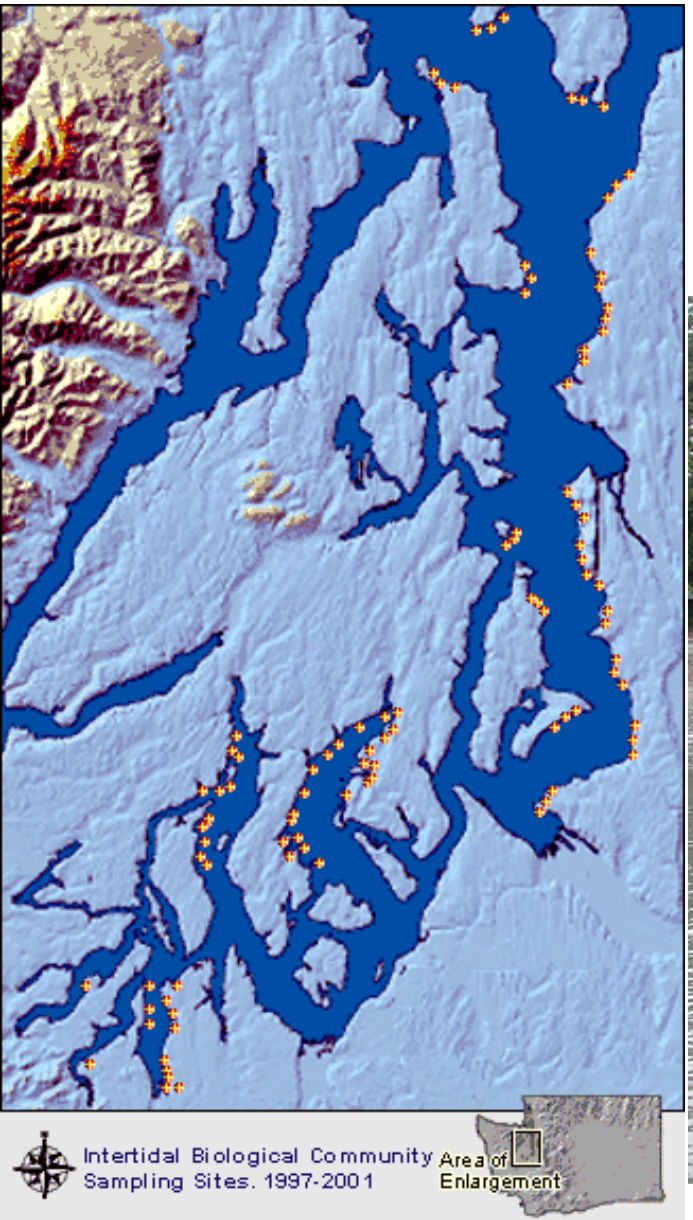
Muddy sand

Clean sand

Coarse pebble-sand

Substrate type + Energy Level + Elevation/Depth = Marine Community

[salinity, some other factors]



Communities in Soft, Uniform Mud

- Relatively depauperate
- Largely anaerobic
- Productivity from diatoms
- Ghost shrimp
- Deposit-feeding clams
- A few worms and amphipods
- In the past… oysters

Beachwatchers.wsu.edu

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
- Generally low primary productivity
- Relatively sparse clams and worms
- In some places:
  - Geoduck clams
  - Eelgrass beds
  - Sand dollar beds

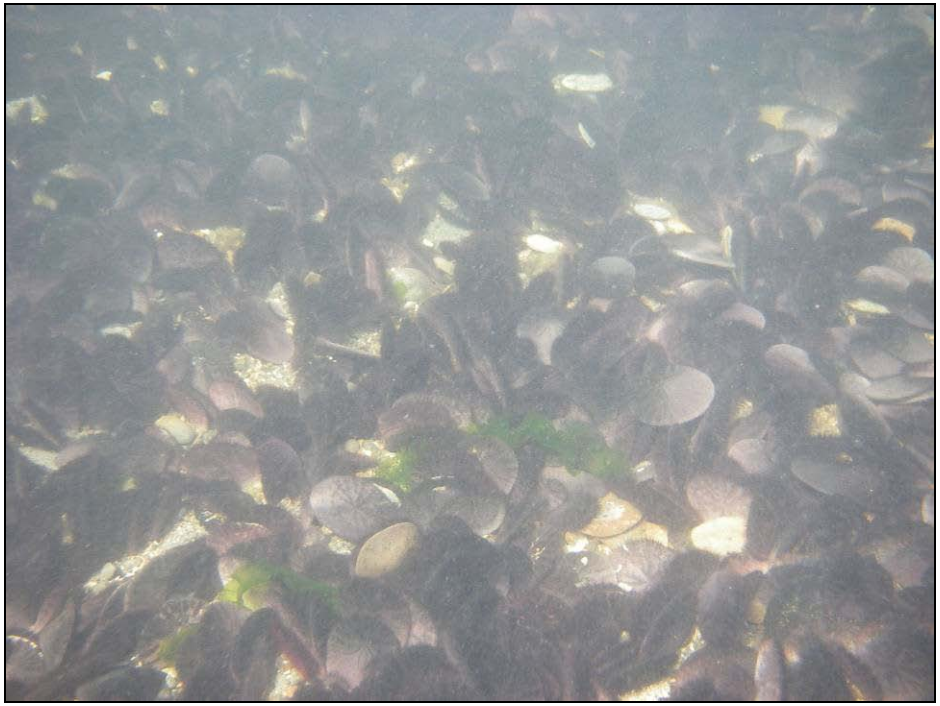
Intertidal eelgrass beds

- Intertidal = fringe habitat for this species
- Added productivity and 3-D cover
- Stabilize sediment, may have richer infauna
- Harbor juvenile crabs, shrimp, fishes…
- Used as feeding and nursery grounds by outmigrating juvenile salmon

Nancy Sefton image

Intertidal sand dollar beds

•Intertidal = also fringe habitat
•Dense aggregations; tend to exclude other species, disturb the sand



bss.sfsu.edu/holzman

Cobble-Pebble-Sand Beaches

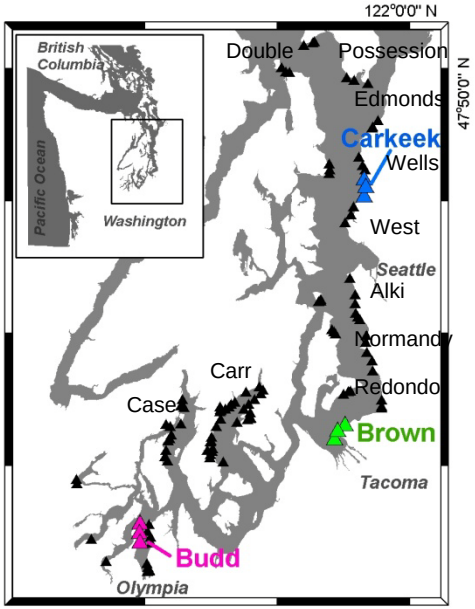
- High shore often finer gravel and sand, unstable
- Low-shore cobbles often ‘armor’ the substrate
- Substrate thus stabilized and biota are rich.
- Higher primary productivity – macro and microalgae

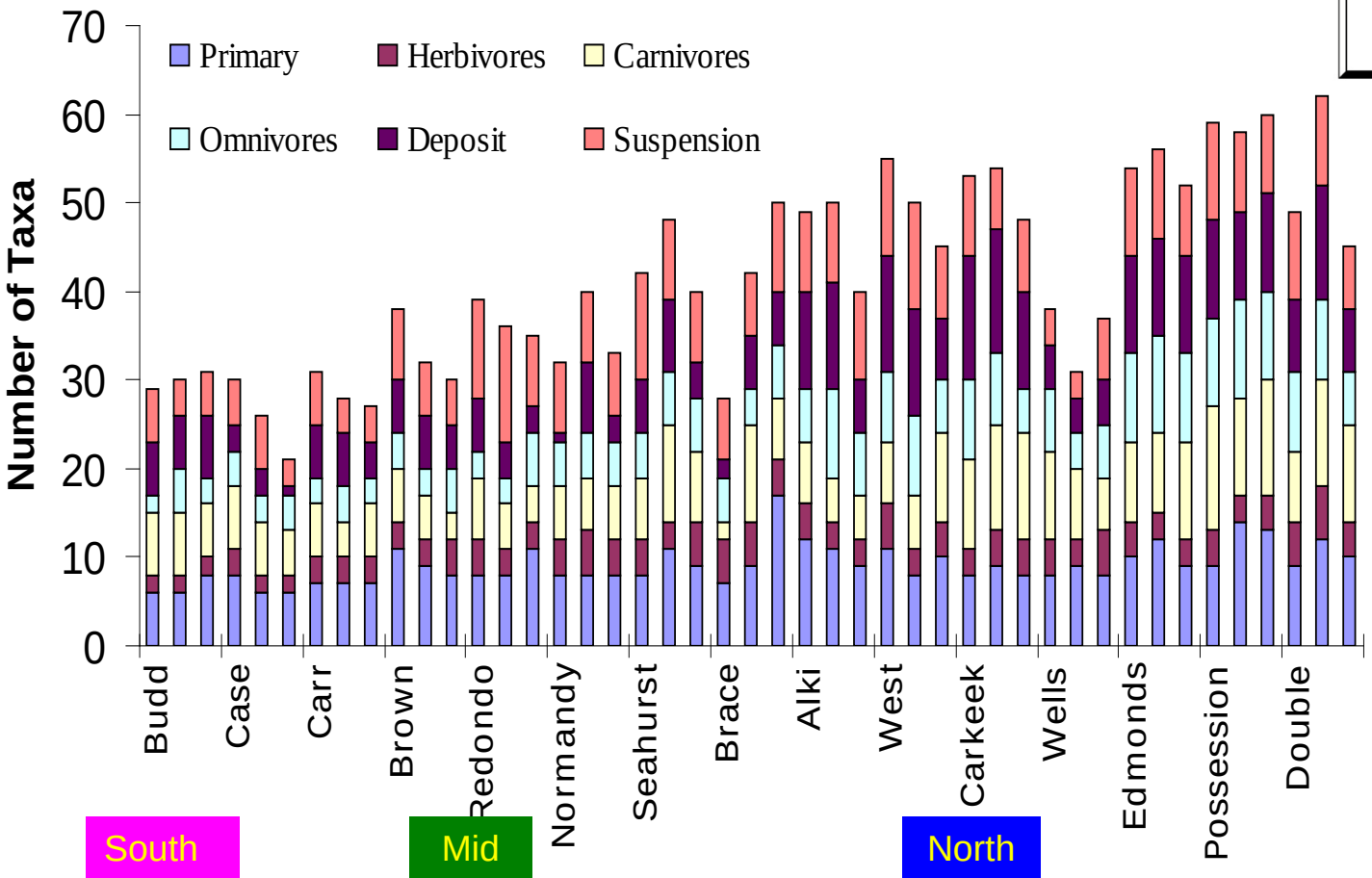
Clams!

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

And many other species live in or on these pebble beaches

Species richness increases strikingly from South to North





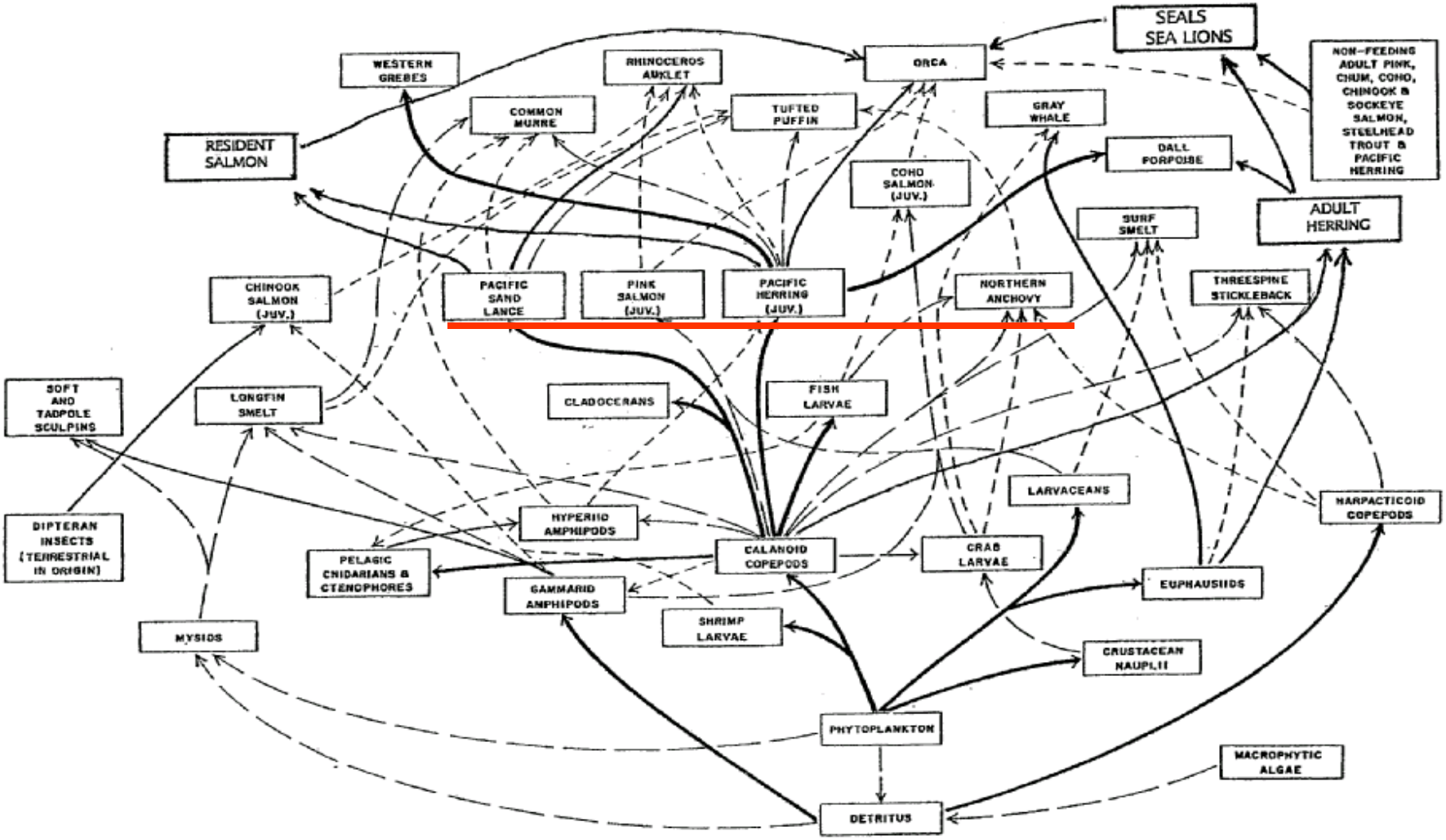
High-Shore Habitats: Often Fine Sand-Gravel Mix

Critical spawning habitat for ‘forage fish’:
•surf smelt (sand-gravel)
•sand lance (finer sands)

Rick Dinicola photo

Marty Liedtke photo

Central placement of forage fish in Puget Sound foodwebs



Beaches in general are ecologically ‘in the middle’ – connecting food webs from land to sea

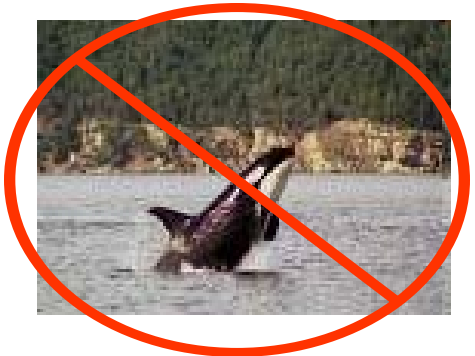
- Insects and organic matter drop from riparian vegetation onto shore and sea
- Beach biota may be key to decomposition and ‘recycling’ of organic matter
- Land birds, shorebirds, and some mammals feed on the beach
- Fishes feed over the shore at high tide
- Other marine predators similarly move up from the subtidal zone
- Nearshore waters bring food (plankton), spores, seeds, and larvae to the shore

Other organisms that use beaches…

www.kingcounty.gov

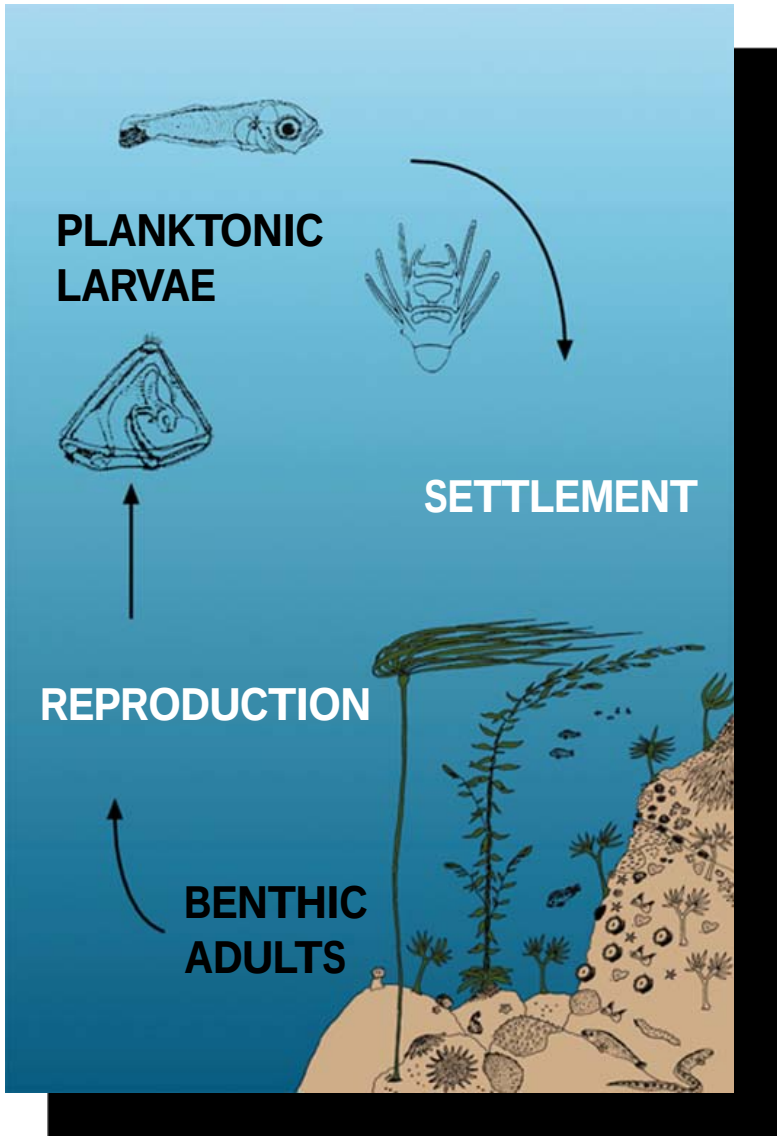
Photos.igougo.com

Randy Shuman



www.gpnc.org

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

And how do we study this problem?

Studying recruitment into gravel beaches: a way to investigate armoring effects?