



Mussel Watch Pilot Expansion Study: toxic contaminants in nearshore biota

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2012-13 EPA/NEP Study
Washington Department of Fish and Wildlife





Puget Sound Ecosystem Monitoring Program – Toxics in Biota Unit

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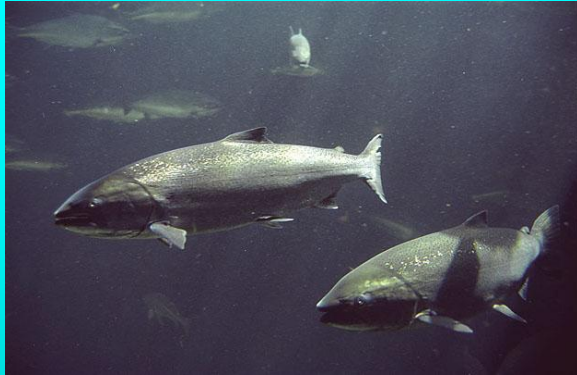


PSEMP in a Nutshell

- An extensive network of regional scientists who monitor key indicators of ecosystem health.
- Formed in 1988 to assess status and trends of Puget Sound health.
- Mostly state funds, coordinated by the Puget Sound Partnership
- Science linked to Management to support Puget Sound Recovery



PSEMP monitors toxics in sentinel species.....



Coho,
chinook



herring

3 spp of
rockfish

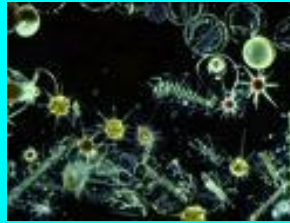


English
sole

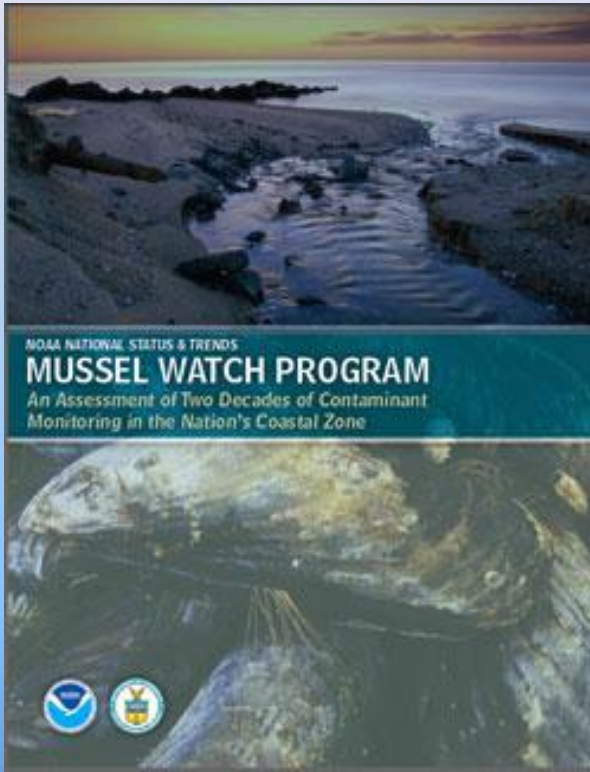


PSEMP –Toxics in Biota has also assessed:

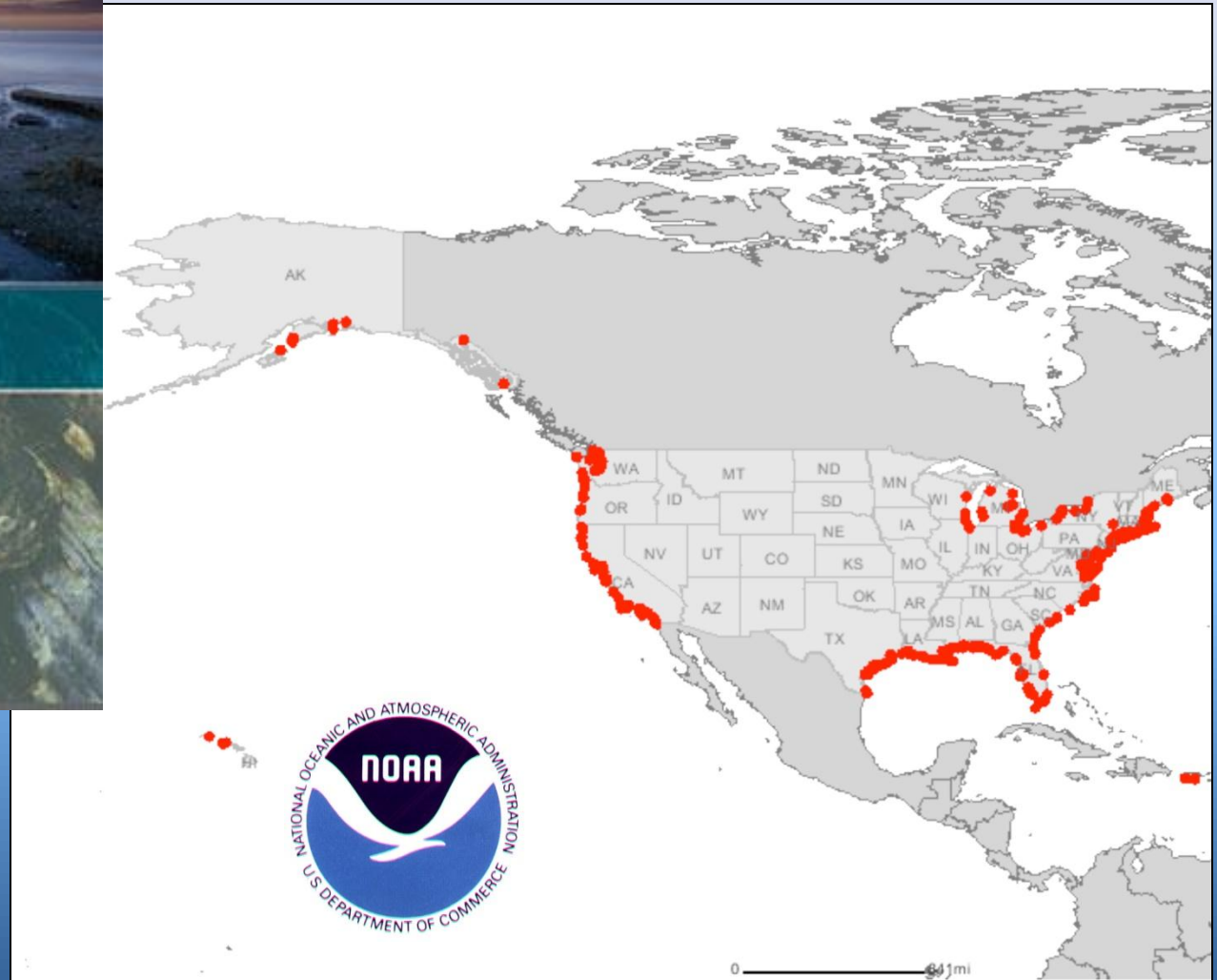
- Plankton
- Pacific cod
- Lingcod
- Sixgill shark
- Dungeness crab
- Spot prawn
- Herring eggs
-and Mussels



What is “Mussel Watch”?



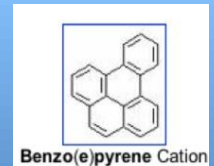
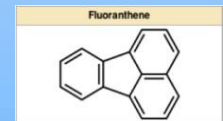
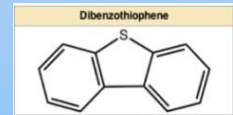
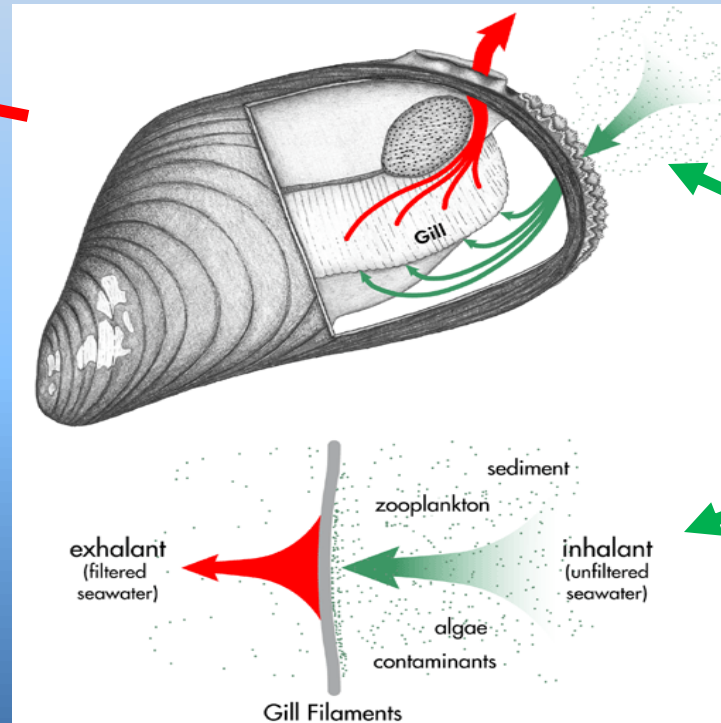
>300
national sites



Mussels are Aquatic Vacuum Cleaners

- Concentrate chemicals from water
- Do not metabolize (change) many chemicals
- Retain contaminants for 2 ~ 4 months

Clean(er)
Water



Contaminated
Seawater



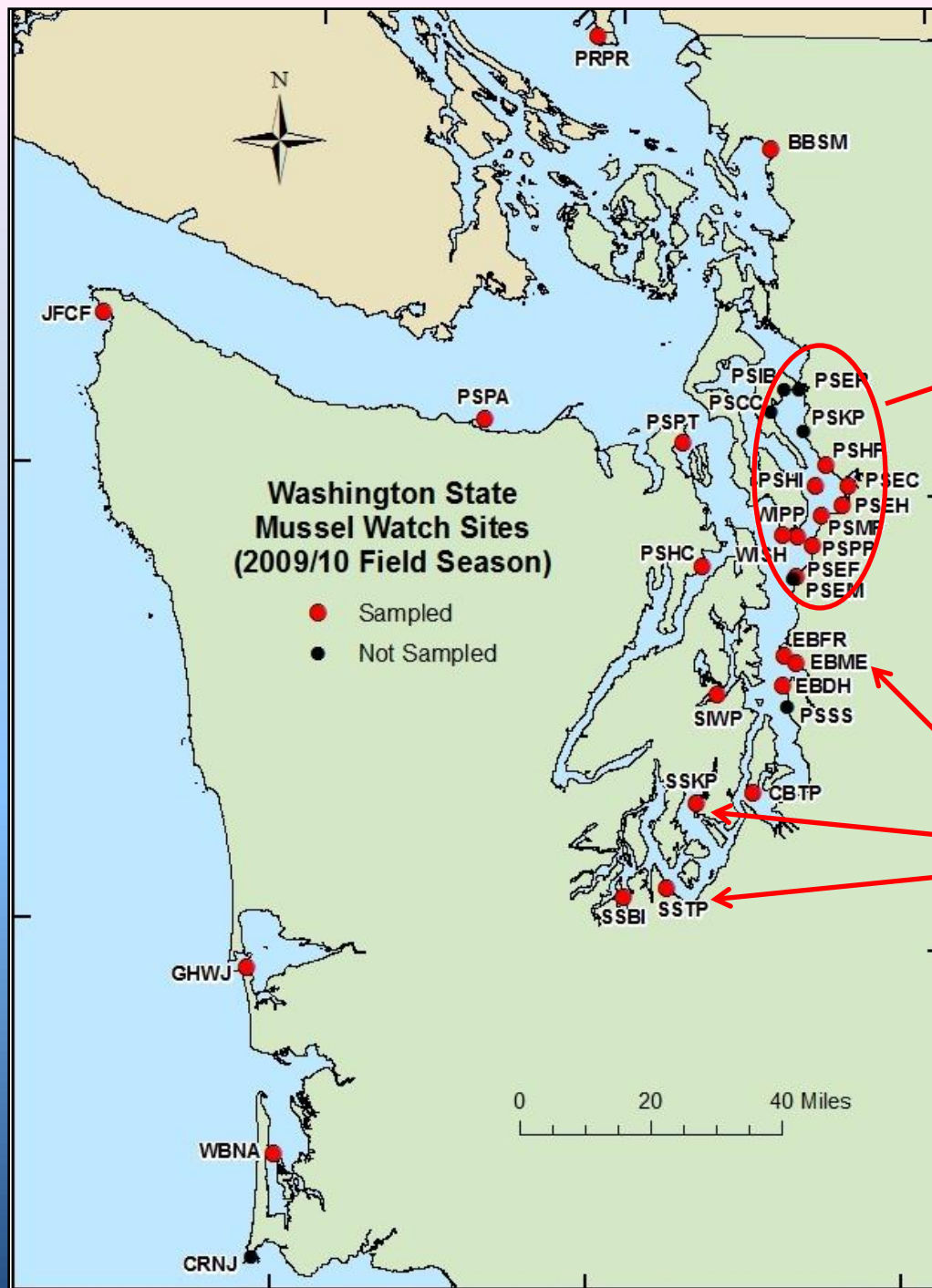
Food for wildlife
and humans

Illustration by [Ethan Nedeau](#)

Contaminants monitored by Mussel Watch

- Polycyclic Aromatic Hydrocarbons (PAHs)
- Polychlorinated Biphenyls (PCBs)
- Polybrominated Diphenyl Ethers (PBDEs)
- Organochlorine pesticides (e.g., DDT)
- Current-use pesticides
- Chlorinated benzenes
- Trace metals
- Organotins

~ 150 Separate Chemicals



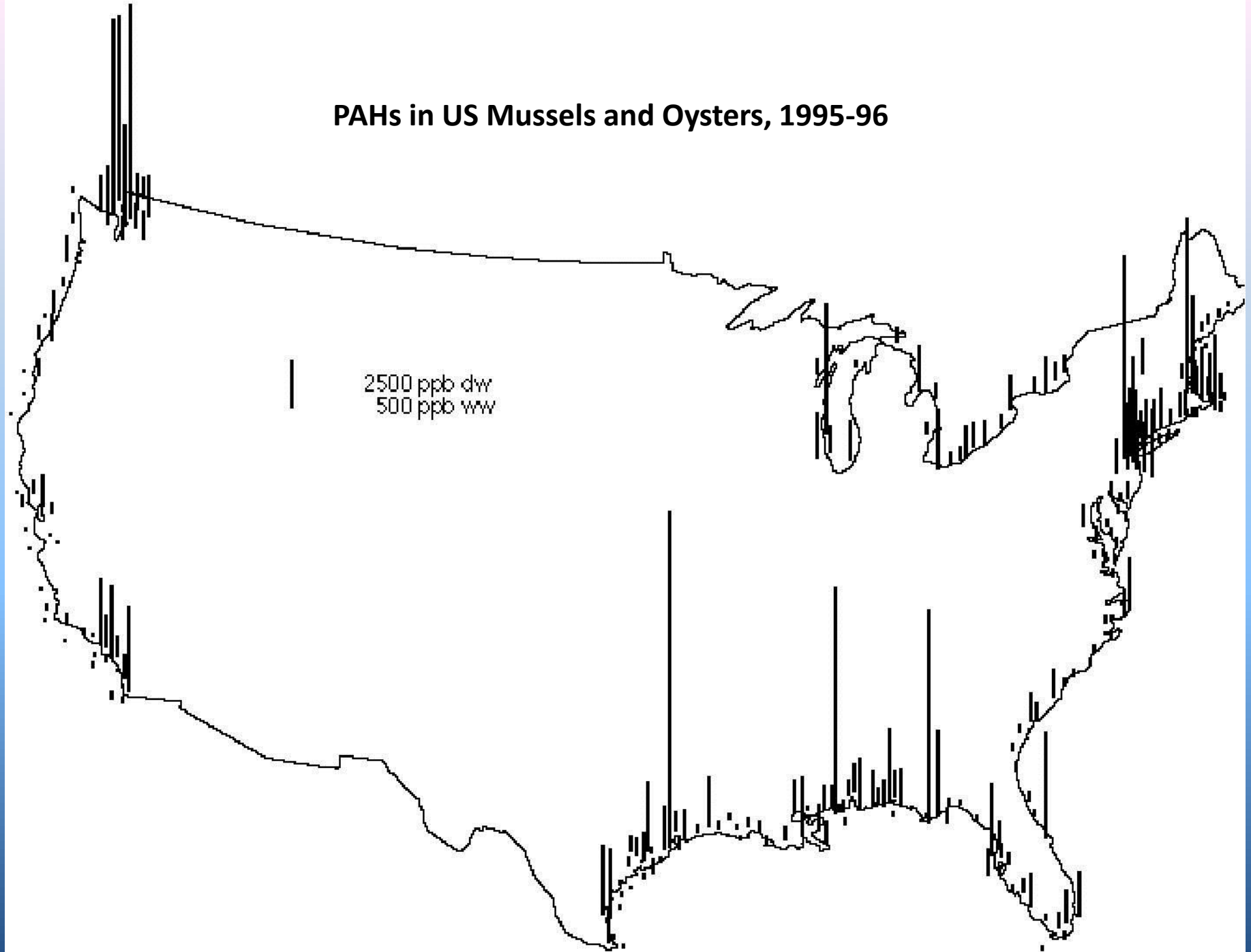
Snohomish County MW sites

WDFW MW sites

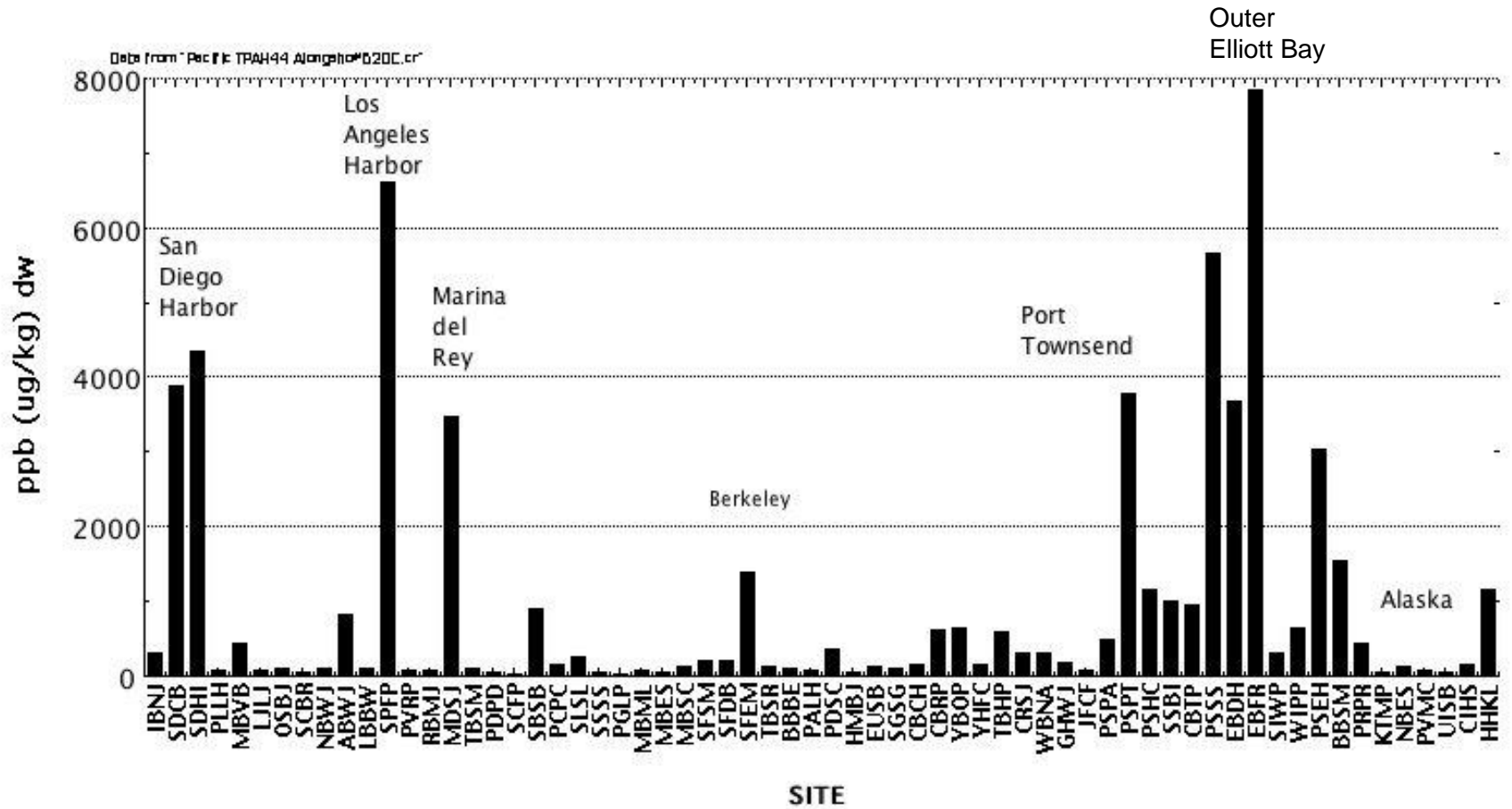
Mussel Watch sampling in Washington has become a collaboration



PAHs in US Mussels and Oysters, 1995-96



Total PAHs in 2001-02



South



Pacific Coast

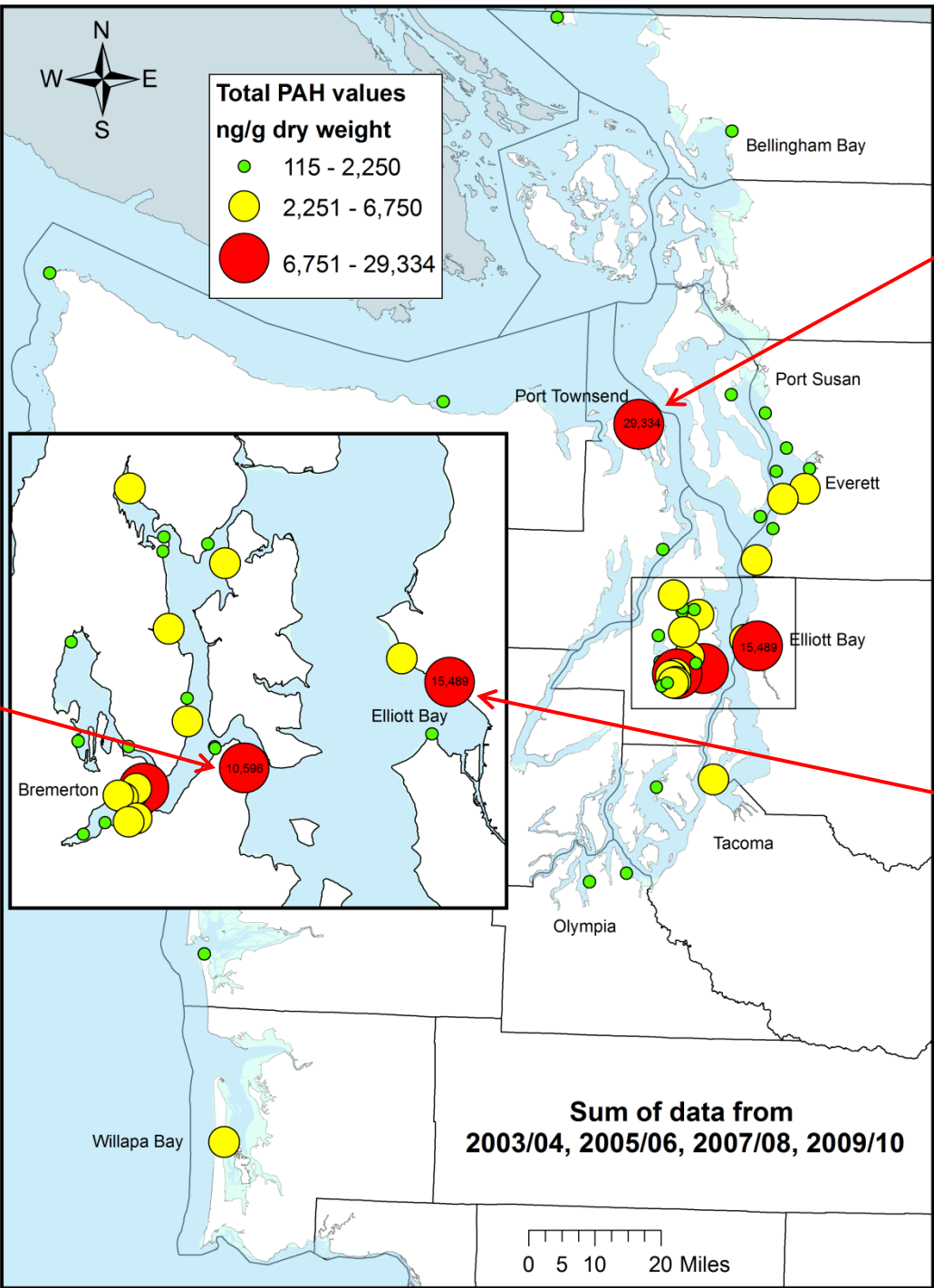


North

Mussels sampled off a creosote piling in 2009/10.

Coincident with large-scale creosote removal project.

Myrtle Edwards site first sampled in 2009/10



Why expand Mussel Watch in Puget Sound?

- Current coverage not adequate to ID regional/local sources of contamination
 - Data for adaptive mgmt at *local level*
- Need a baseline to assess impacts of oil and chemical spills
- Need to monitor long-term trends in nearshore contamination
- NPDES status and trends permit monitoring coming online soon (2015)

Mussel Watch Pilot Expansion

Funded by the EPA under National Estuary Program (NEP) for Puget Sound recovery

Grant awarded by WDFW & DNR as Lead Organizations for *Marine and Nearshore Habitat Restoration and Protection*

Companion DNR eelgrass study - “Outfall assessment and the effects on critical nearshore habitats”

Mussel Watch Pilot Expansion

Short term (project) goals:

- Evaluate the geographic extent of chemical contamination in shoreline biota
- Measure the magnitude of contamination where it occurs
- Compare contamination patterns in mussels with adjacent shorelines, covering a wide range of land-use types
- Compare contaminant uptake between mussels and plants (eelgrass)
- Provide recommendations for long-term status and trends monitoring

Mussel Watch Expansion...beyond the pilot

Long term goal: establish Puget Sound status & trends monitoring program for toxics in nearshore biota

New tool in PSEMP toolbox – fill nearshore gap

Status & trends monitoring for new NPDES permitting (2015?)

- Coordinate with sediment status & trends
- Coordinate with shellfish (seafood) safety programs

Fill specific needs -

- Oil spill baseline/NRDA
- Effectiveness monitoring
- S&T related to specific inputs (e.g. outfalls)

Continue compatibility with NOAA Mussel Watch program

Caged Mussel Design

Mytilus trossulus (Pacific blue mussel)

- Penn Cove Shellfish aquaculture farm

Age – 11 month old adults

- Standard shell length 50 - 60 mm (~2 inches)

Mussels bagged in polyethylene mesh netting

- 16 mussels per bag
- Hung at aquaculture farm for 10 days (reattach)
- Bags hung in center of wire cages (predator exclusion)
- 4 bags = 64 mussels per cage

Cages anchored in intertidal zone or tied to piling

- 0 to -1.5 ft mean lower low water (MLLW)
- Helical anchors and rebar stakes
 - No floating docks, not attached to creosote
- Deployed for 2 months (November - January)
- Retrieved, placed on ice, processed immediately in lab

Cage and bags for mussels

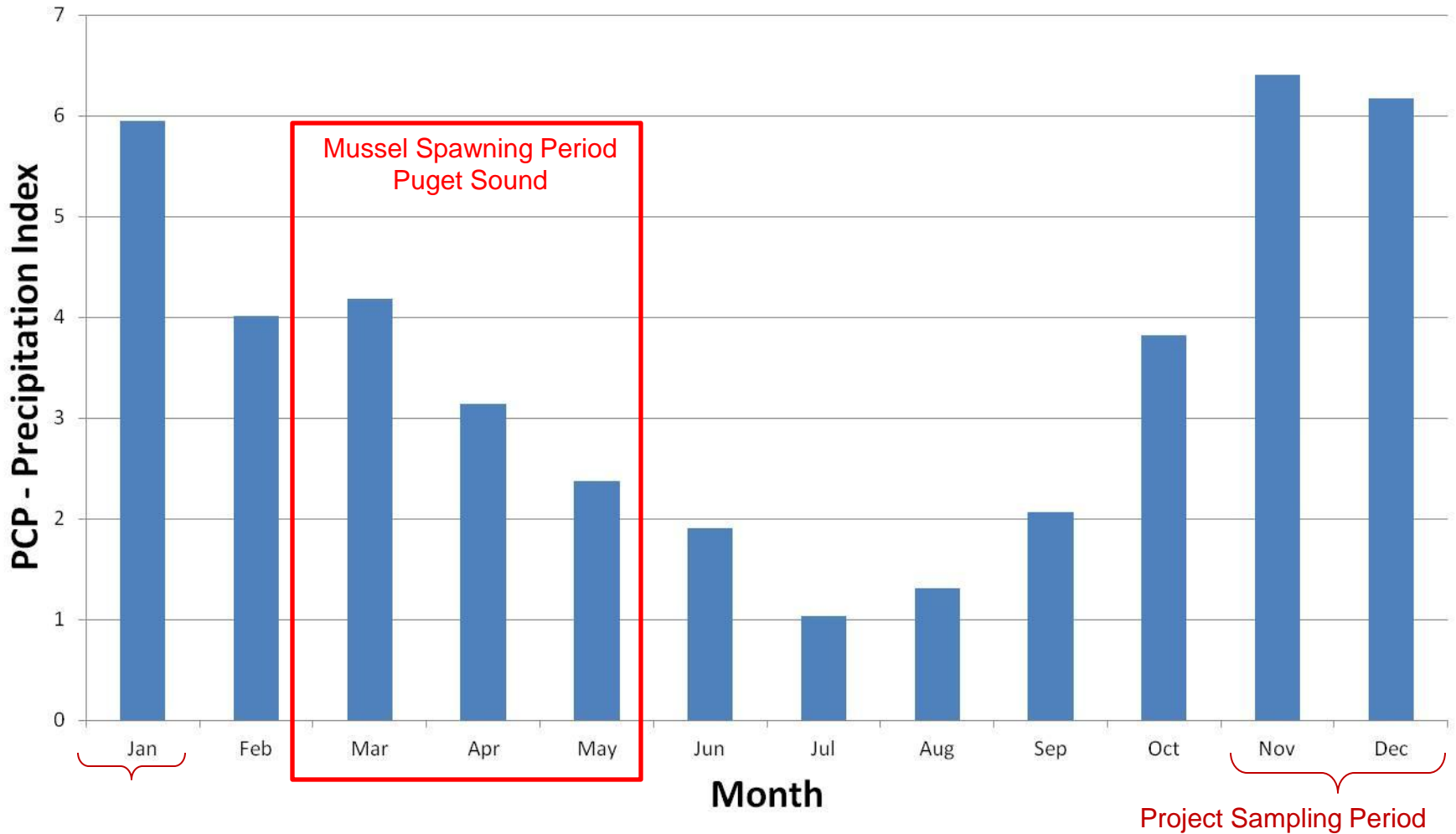


Mussel processing

- Mussels on ice to lab
- Determine % mortality
- Condition Index determined
 - Soft tissue wt. (dry) vs. total length
- Soft tissues composited into jars
- Chemical analysis at **NOAA** and **King Co.**
 - List of analytes (see handout)

National Climate Data Center

Puget Sound Lowland (1962-2012)

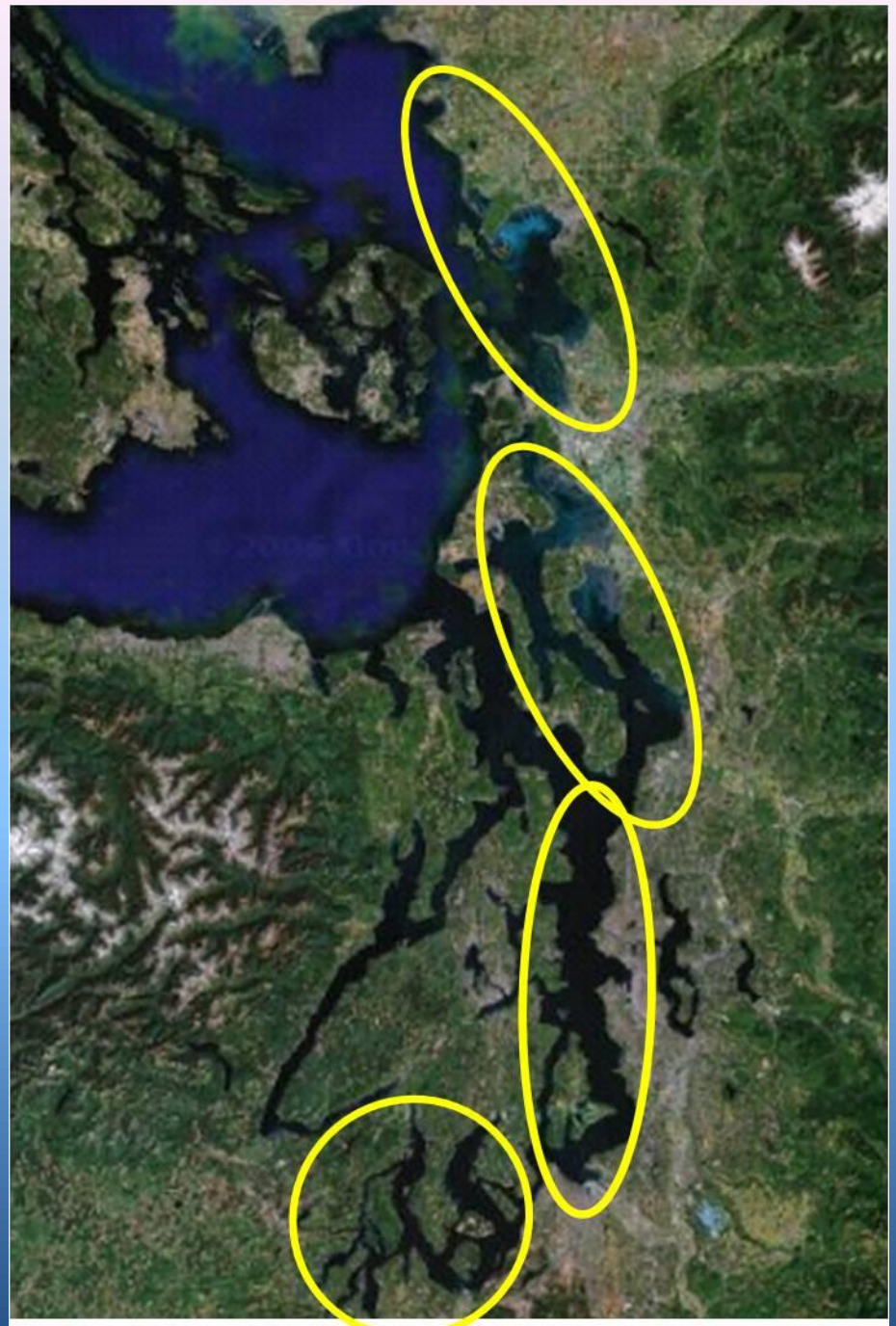


Geographic Scope of Pilot

- Southern Puget Sound
- Central Puget Sound
- Whidbey Basin
- Northern Puget Sound

Other water bodies wanted:

- Strait of Georgia
- Strait of Juan de Fuca
- Admiralty Inlet
- Hood Canal
- San Juan Archipelago



How did we select the 60 pilot stations?

Sources of contaminants

- Non-point sources
 - Impervious surface (low to high)
- Point sources
 - Petroleum refineries
 - Industrial areas
 - Ferry terminals
 - Large marinas
 - Stormwater outfalls
 - Combined Sewer Overflows (CSOs)
 - Wastewater Treatment Plants (WWTPs)
- Reference Areas

Ecological/economic significant areas

- Eelgrass beds
- Spawning habitat (e.g. herring)
- Shellfish beds

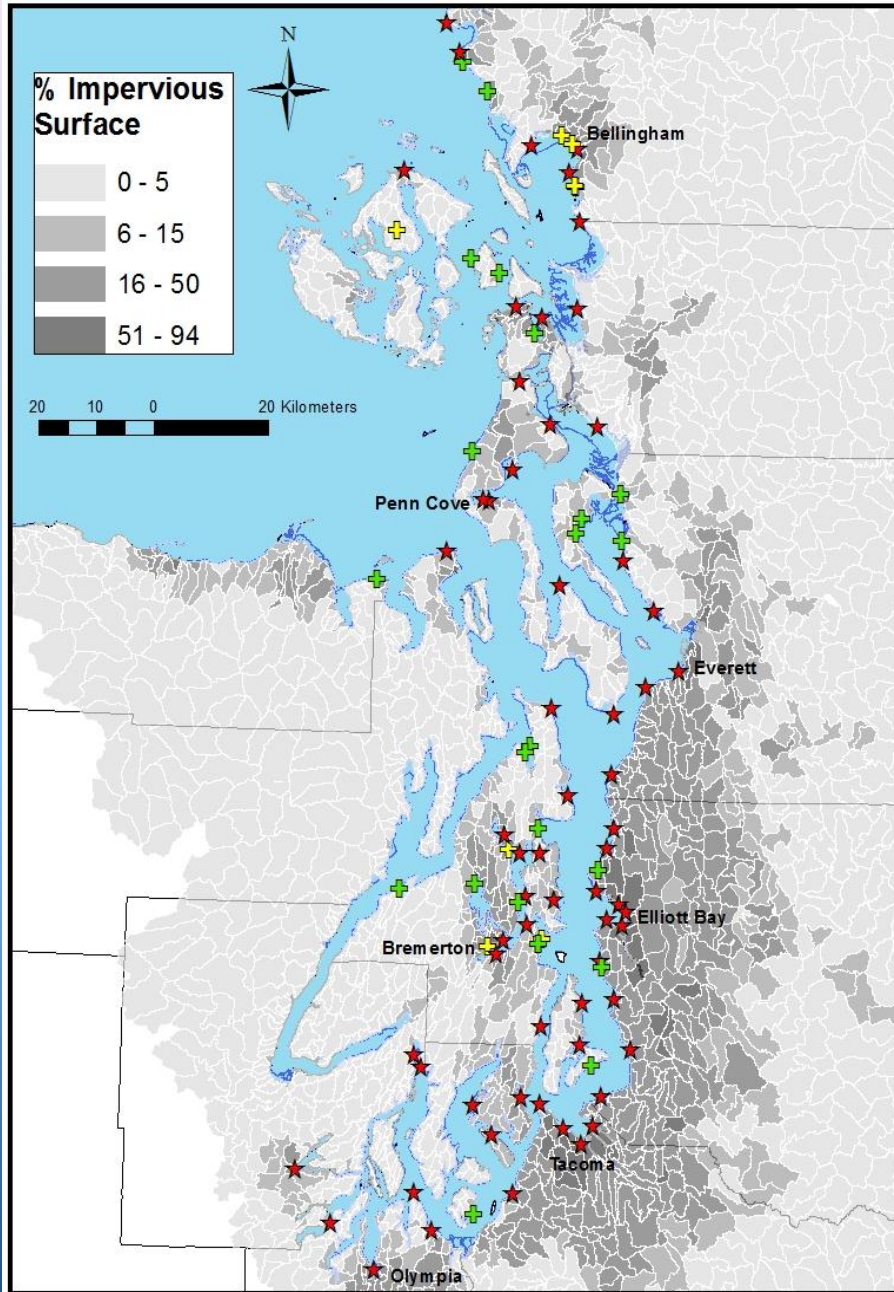
Other factors in station selection...

Co-location with other studies

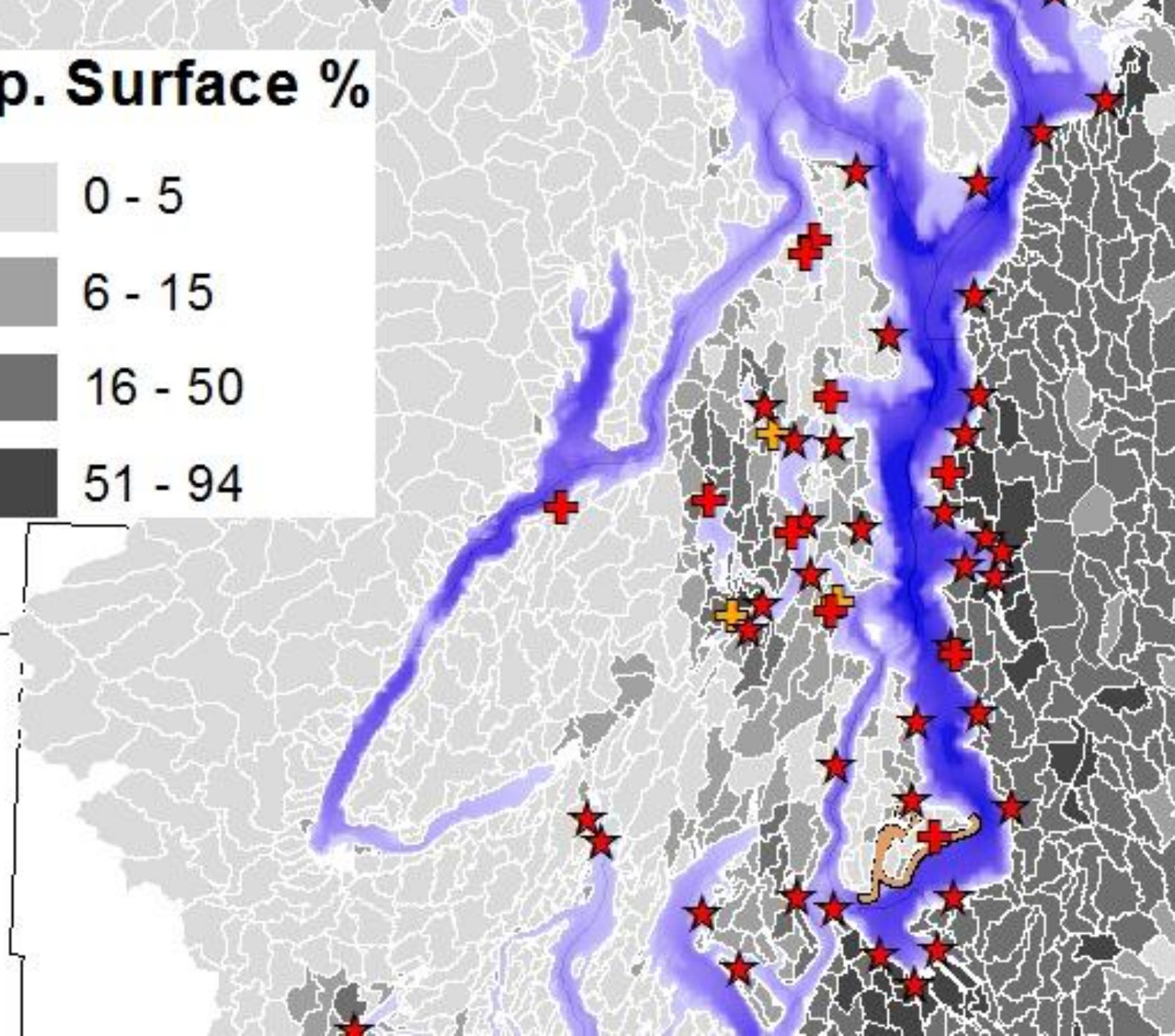
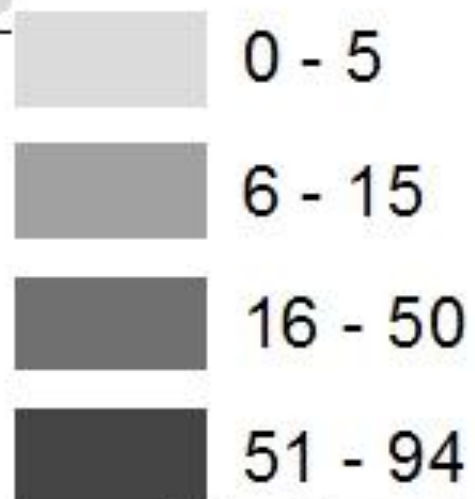
- PSEMP fish monitoring stations
- Companion eelgrass study (DNR)
- Natural Resource Damage Assessment (NRDA) baseline monitoring
- Shellfish assessment (county/local)

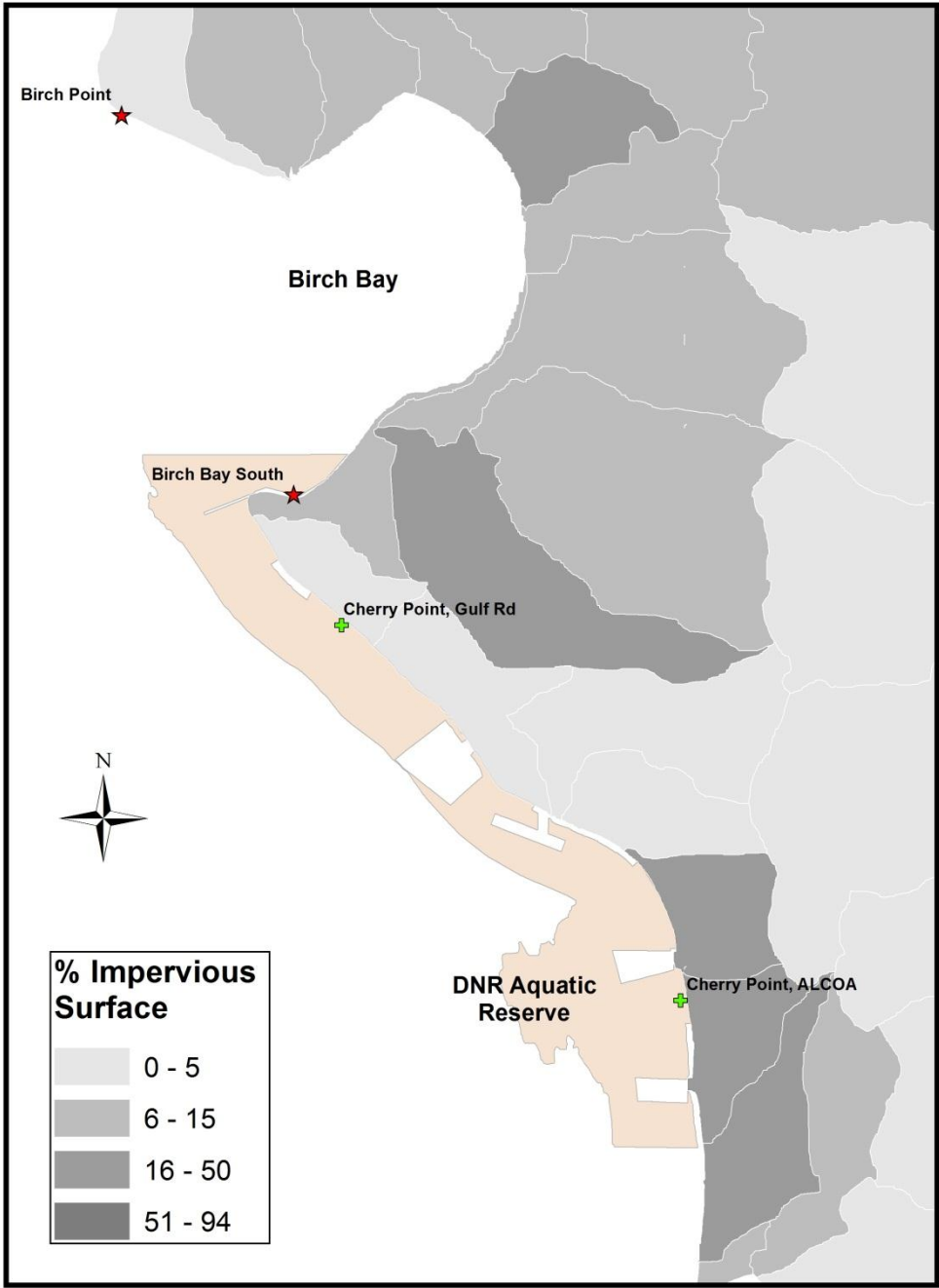
Sponsored Sites

- WADNR Aquatic Reserves
- City, county, tribal govt's, NGOs, etc.



Imp. Surface %







Birch Bay South

Cherry Point, Gulf Rd

DNR Aquatic Reserve



DNR Aquatic Reserve

Cherry Point, ALCOA

Partnership Opportunity?

1. Adopt a cage (volunteer time)
2. Sponsor a cage (\$1393 + volunteer time)

Adopt a cage

Volunteer at a Mussel Watch site...

Responsibilities:

- Pick up mussels + cage at Penn Cove Shellfish
- Deploy cage at low tide (mid-November)
- Fill out data sheet (GPS, date/time, etc.)
- Take digital photos
- Check on cage one time
- Retrieve cage in 2 months (mid-January)
- Deliver mussels on ice to WDFW
- *Get acknowledged in study report(s)*
- *Get use of study data*

Sponsor a cage

Partners sought to add to our 60 sites...

- Add extra sites inside study area
 - More sites in your county/region for better local resolution
- Add extra sites outside study area
 - Strait of Juan de Fuca, Strait of Georgia, San Juan Islands, Admiralty Inlet, Hood Canal...
 - Coverage in regions outside major urban basins

What does it take to sponsor a new site?

Costs associated with 1 site:

- Chemical analysis at both labs (\$982)
- Supplies – mussels, cage, anchoring devices (\$60)
- WDFW staff time (\$43)
- WDFW indirect fees (28.36%)
- **Total ~\$1393**

Responsibilities:

- Pick up mussels + cage
- Deploy cage at low tide
- Fill out data sheet (GPS, etc.)
- Take digital photos
- Check on cage once
- Retrieve cage in 2 months
- Deliver mussels on ice to WDFW
- *Get acknowledged in report(s) + study data*

Thank you