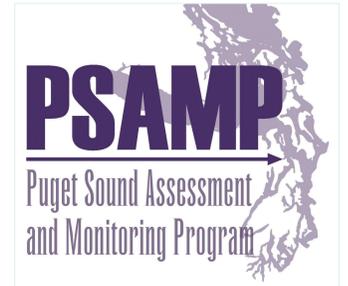


Assessing Bay-Scale Changes in Sediment Quality As Part of the Urban Waters Initiative: A New Tool for Sediment Cleanup and Watershed Managers



Valerie Partridge, Sandra Weakland, Margaret Dutch, Ed Long, Kathy Welch, and Marissa Jones
Washington State Department of Ecology, Olympia, WA

Bay-Scale Sediment Monitoring: A New Management Tool

...to answer the questions:

- Are *collective source control/cleanup efforts in bays working?*
- Is "bay-scale" sediment quality *improving, deteriorating, or remaining unchanged over time?*

Introduction

As part of Ecology's Urban Water's Initiative, sediment monitoring is being conducted in urban bays in Puget Sound to assess bay-wide:

- Extent of sediment contamination
- Changes over time (by resampling every few years)
- Long-term effectiveness of collective toxics management efforts.

Results can be used as performance measures in adaptive management strategies developed for Puget Sound.

Approach

- Study areas are "nested" within the PSAMP Sediment Monitoring sampling frame.
- Probability-based sampling design with unequal sample weighting (Individual samples represent different amounts of area – see study area map for Elliott Bay example.)
- Establish "bay-scale" baseline condition.
- Weight-of-evidence approach to comparisons of results over time
- Parameters: Sediment chemistry, toxicity, and invertebrate communities (Sediment Quality Triad Index)

Urban Bays Sampling Schedule

2007: Elliott Bay and the lower Duwamish Waterway

2008: Commencement Bay and associated waterways

2009 and Beyond (tentative):

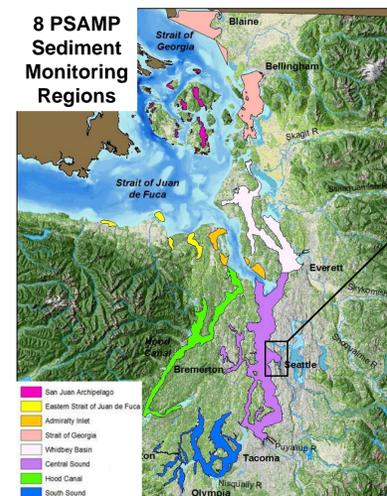
Sinclair and Dyes Inlets

Bellingham Bay

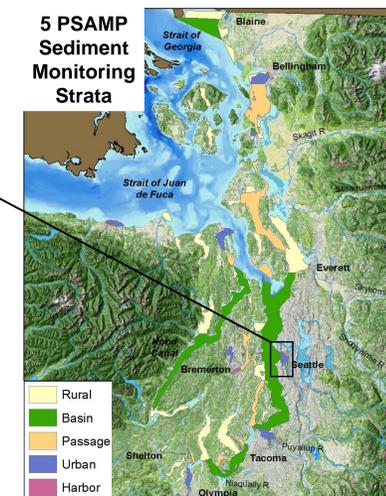
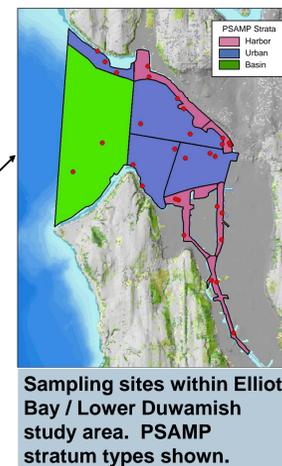
Budd Inlet

Port Gardner/Everett Harbor

Follow-up sampling in Elliott and Commencement Bays



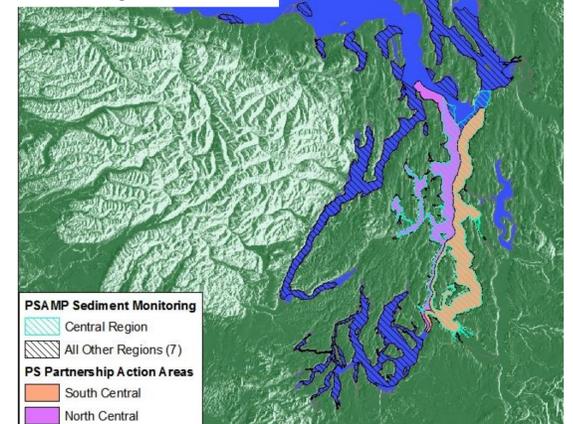
Nesting of the 2007 Elliott Bay / Lower Duwamish study area within the PSAMP Sediment Monitoring Central Region.



Nesting of the 2007 Elliott Bay / Lower Duwamish study area within the PSAMP Sediment Monitoring strata.

This sampling and analytical approach addresses the Puget Sound Partnership Action Agenda, providing **effectiveness monitoring** for management actions that can be **integrated** into the PSP Action Areas and the entire Puget Sound.

For example, the South Central and North Central PSP Action Areas are shown here in relation to the PSAMP Central Region.

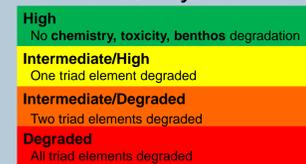


Results for Elliott Bay / Lower Duwamish

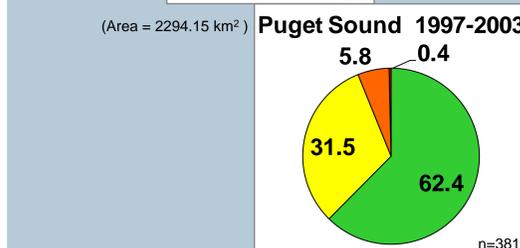
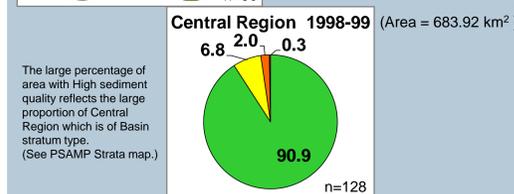
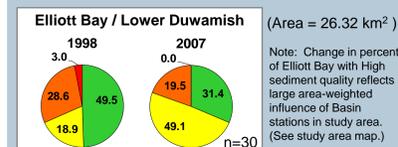
Comparisons to:

- PSAMP/NOAA 1998 survey (same stations)
- Central Region
- Puget Sound

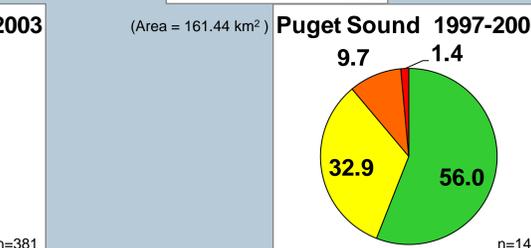
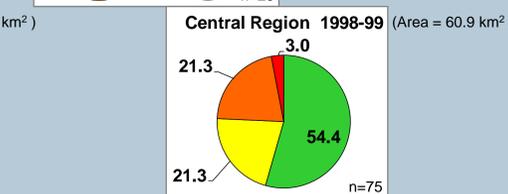
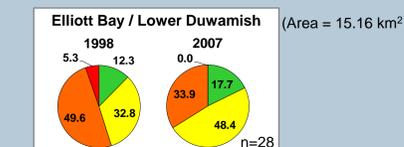
Sediment Quality Triad Index



Percent Area (all stations)



Percent Area (Harbor + Urban only)



Results for Elliott Bay / Lower Duwamish: Changes 1998 to 2007

Parameter	Bay-Scale Change
Silt-Clay Content	Decrease
TOC	Increase
Metals:	
As, Cd, Cr, Cu, Ni	No change
Ag, Hg, Pb, Sn	Decrease
Zn	Increase
Most LPAHs	Decrease or No change
Acenaphthylene, Retene	Increase
Most HPAHs	Decrease
Chrysene, Perylene	No change
Most PCB Congeners	Decrease
Total PCB Aroclors	Decrease
Sediment Toxicity	Decrease
Infaunal Communities	Improving

- No statistically significant change in spatial extent of contamination exceeding Washington State Sediment Quality Standards.
- Shift in Sediment Quality Triad Index from Intermediate/Degraded and Degraded to Intermediate/High and Intermediate/Degraded.
- Changes in contaminant concentrations occurring primarily at harbor sites representing relatively little area.

General information and all data generated during this survey can be accessed from Ecology's Marine Sediment Monitoring website: http://www.ecy.wa.gov/programs/eap/mar_sed/msm_intr.htm

This poster was prepared for the 2009 Puget Sound/Georgia Basin Research Conference, Seattle, WA