

2011 Sediment Quality Assessment of the South Puget Sound Region and Budd Inlet, Including Comparisons with 1999 Regional Conditions

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Pie charts represent percent of study area characterized by each of four levels of chemical exposure or toxicity

I. Introduction

• South Puget Sound and Budd Inlet sediment quality monitored in 2011: Conducted as part of the Puget Sound Ecosystem Monitoring Program and Ecology's Urban Waters Initiative.

• Regional and bay-scale monitoring: Provides current conditions and changes over time for sediment chemical contamination, toxicity, and the condition of communities of invertebrates living within the sediments.

II. Sampling Design and Methods

• 73 stations: 55 stations were used to characterize South Puget Sound, 30 for Budd Inlet; 12 stations were used in both surveys. The top 2-3 cm of sediments were collected from each station.

• >130 chemicals measured: Laboratory analyses of metal and organic chemical contaminants in the sediments.

• 2 toxicity tests (lab bioassays):

- 10-day test of amphipod mortality in bulk sediments.
- Sea urchin gamete fertilization in sediment pore water.

• Invertebrates: Species identified and counted (in progress, so not reported here).

• Sediment Quality Indicators: Data summarized as environmental indicators, including:

- Sediment Chemistry Index (SCI) (Long et al, 2012)
- Sediment Toxicity Index (STI) (Dutch et al, 2012)

• Change over time: 2011 vs. 1999 data are compared.

III. Results

Sediment Chemistry Index (Figures 1-2)

• All SCI station values were of *Minimum* or *Low Exposure*. *Low Exposure* was more prevalent at the heads of Budd Inlet and Shelton Harbor.

• The percent of stations and area of *Low Exposure* declined regionally from 14.3% of stations representing 2.6% of area in 1999 to 3.6% of stations representing 0.1% of area in 2011. The decline, however, wasn't statistically significant.

• In 2011, the percent of stations and area of *Low Exposure* was greater in Budd Inlet (20% each) than in the region.

Sediment Toxicity Index (Figures 3-4)

• STI station values ranged from *Non-Toxic* to *High Toxicity*. *High Toxicity* was most prevalent in Budd Inlet.

• The percent of stations and area with toxic effects (*Low*, *Moderate*, and *High Toxicity*) increased significantly region-wide from 9.5% of stations representing 3.0% of area in 1999 to 56.4% of stations representing 52.2% of area in 2011. In Budd Inlet, 93.3% of stations and area had some level of toxicity in 2011.

Vital Signs Indicator/Targets for Puget Sound (Figure 5)

• SCI values surpass target: Weighted mean SCI values for 1999 and 2011 South Sound region and 2011 Budd Inlet sediments surpass their target value of 93.3, indicating highest quality.

• SQS values meet target: No chemical concentrations in 2011 exceed the Washington State Sediment Quality Standards in either South Sound or in Budd Inlet, meeting the target value for that measure, and an improvement from the 1999 regional value.

• Indicator values can be compared among regions and bays.

IV. Conclusions

• Indicators of sediment quality in South Puget Sound and Budd Inlet in 2011 are mixed.

• Chemical contamination is greater in Budd Inlet than in the region, but meets or surpasses indicator targets in both areas.

• Regional toxicity increased between 1999 and 2011, and is considerably higher in Budd Inlet.

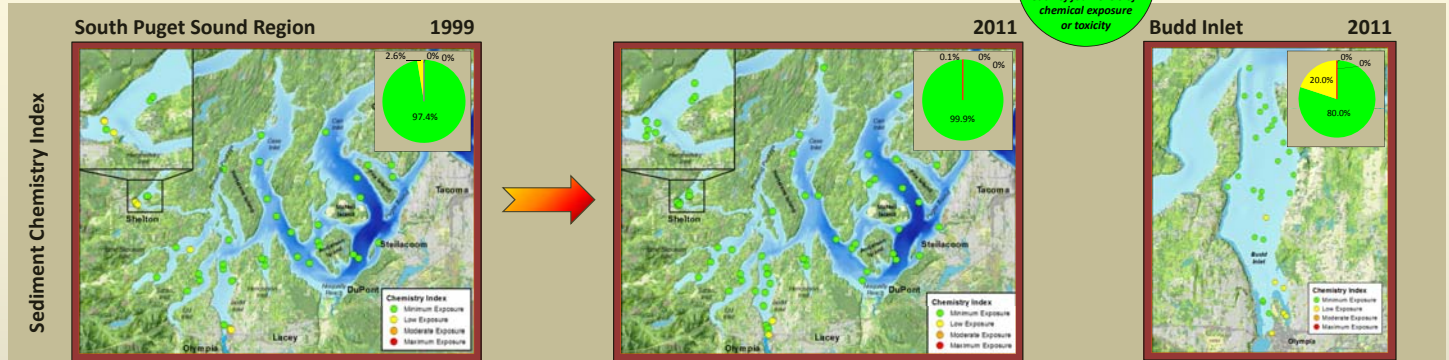


Figure 1. Sediment Chemistry Index values for the South Puget Sound sediment monitoring region - 1999 vs. 2011.

Figure 2. Sediment Chemistry Index values for Budd Inlet - 2011

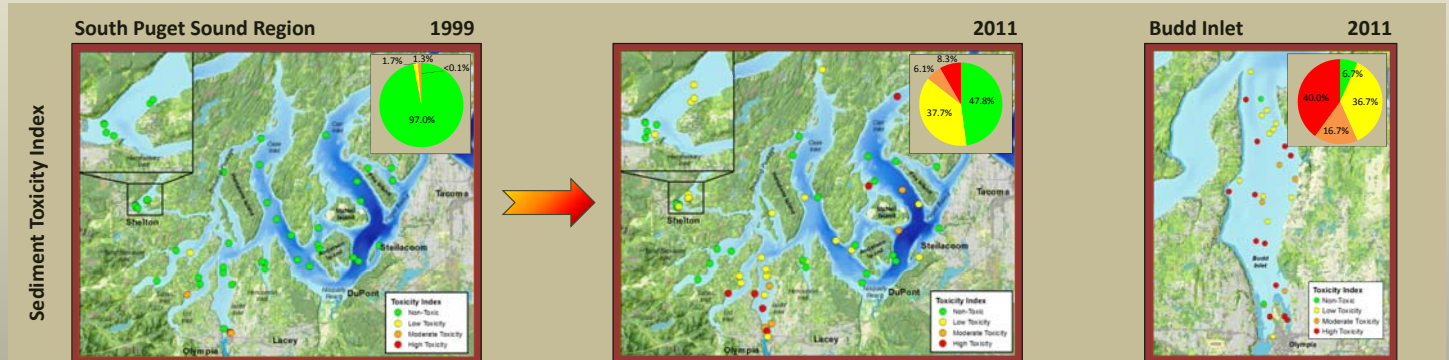


Figure 3. Sediment Toxicity Index values for the South Puget Sound sediment monitoring region - 1999 vs. 2011

Figure 4. Sediment Toxicity Index values for Budd Inlet - 2011

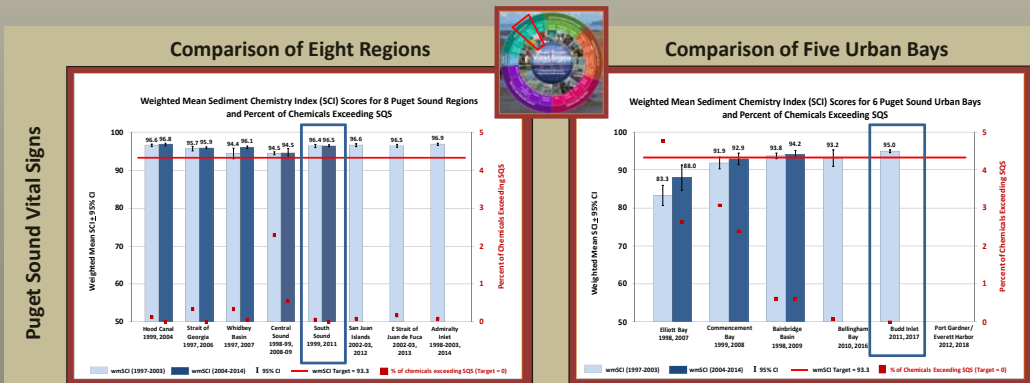


Figure 5. Weighted mean Sediment Chemistry Index values and Percent of Chemicals Exceeding SQS for all PSEMP sediment monitoring regions and bays, 1997 - 2011

V. References

Dutch, M.E., E.R. Long, S. Weakland, V. Partridge, and K. Welch. 2012. Sediment Quality Indicators for Puget Sound. Indicator definitions, derivations, and graphic displays. Washington State Department of Ecology. Unpublished document. 8 pp.

Long, E.R., M. Dutch, V. Partridge, and K. Welch. 2012. Revision of Sediment Quality Triad Indicators in Puget Sound (Washington, USA): I. A Sediment Chemistry Index and Targets for Mixtures of Toxicants. Integrated Environmental Assessment and Management. DOI: 10.1002/ieam.1309. <http://onlinelibrary.wiley.com/doi/10.1002/ieam.1309/full>

General information and all data generated during these surveys can be accessed from Ecology's Marine Sediment Monitoring website: www.ecy.wa.gov/programs/sam/sam/index.htm.

The poster was prepared for the 2012 South Sound Science Symposium, October 30, 2012, in Shelton, WA, and can be found online at www.ecy.wa.gov/biblio/1203054.html.

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