

**Combining Mass Balance Modeling with Passive Sampling at Contaminated Sediment Sites to Evaluate PCB Sources and Food Web Exposures**

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**Bkgd: some "clean ups" don't work based on food web!**  
e.g., DDT

107,000 tons of sediment were removed from the waterways and transported to disposal facilities.

mussel tissue concentrations  
Tamara Frank E2 Consulting Engineers

Concentration (ug/kg)

Year

=> missed sources?

**Bkgd: Sediments not always biggest source!**  
...for completed dredging projects...  
post-dredging residual levels ...often greater than the cleanup levels  
(Bridges et al., 2008)

other **source(s)** can lead to re-contamination.

e.g. point sources 10/20, runoff 8/20, residual sediment 8/20; other 3/20  
(Nadeau & Skaggs 2006)

**Bkgd: Large \$\$\$\$\$\$**  
e.g., PCB clean up in the Hudson River

cost ~\$700 million  
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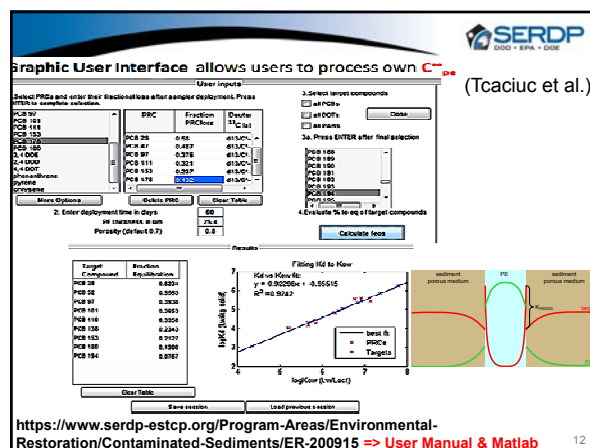
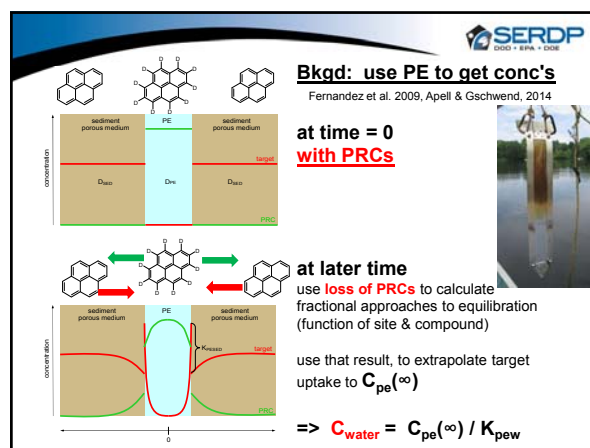
likewise for Lower Duwamish Waterway, ROD (2014):  
"Total estimated net present value costs for the Selected Remedy are \$342 million..."  
www.epa.gov/region10/duwamish.html

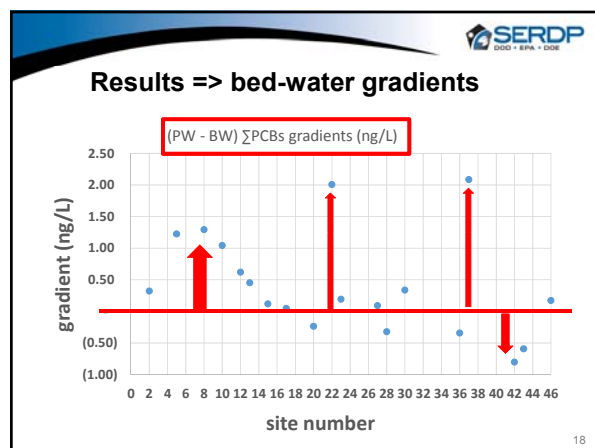
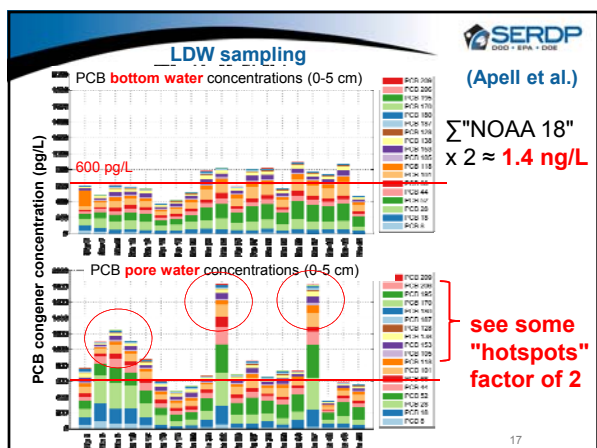
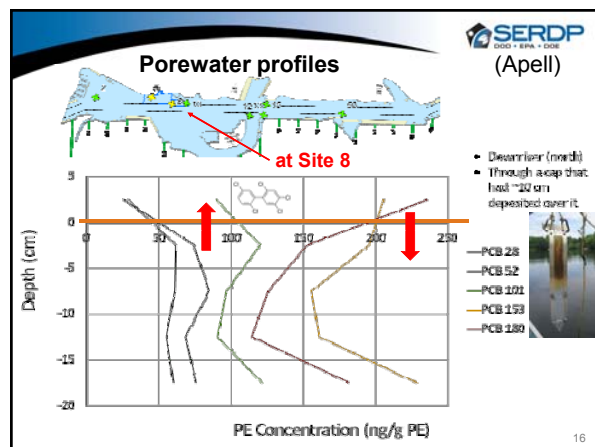
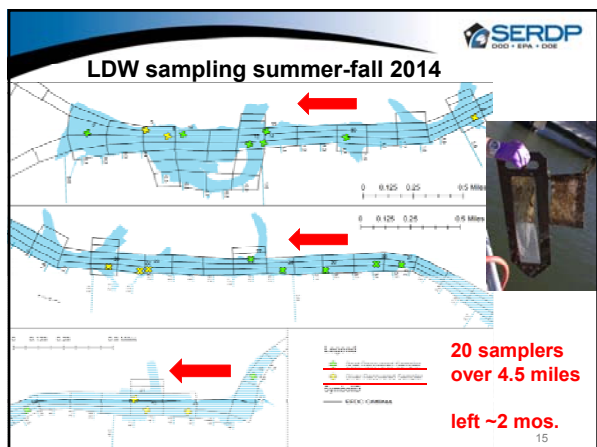
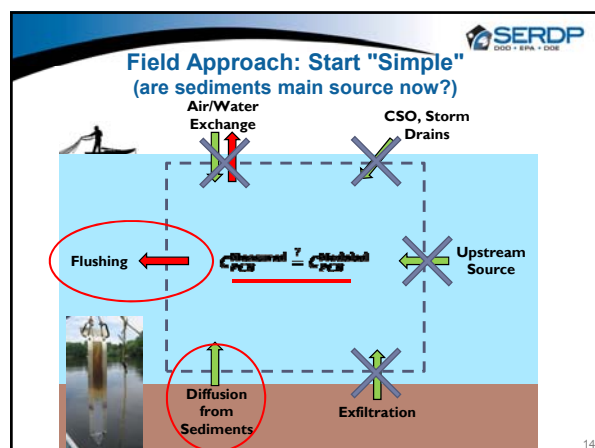
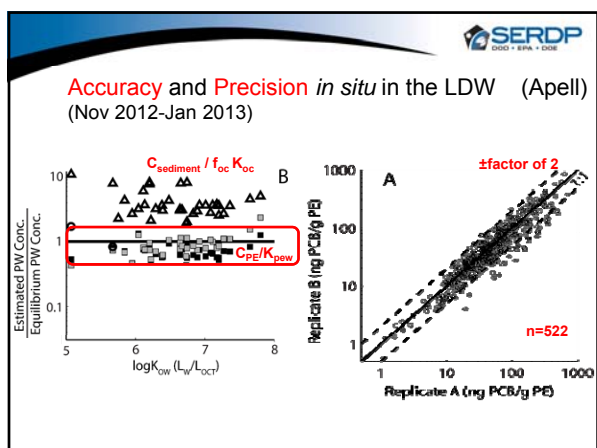
**Objectives**

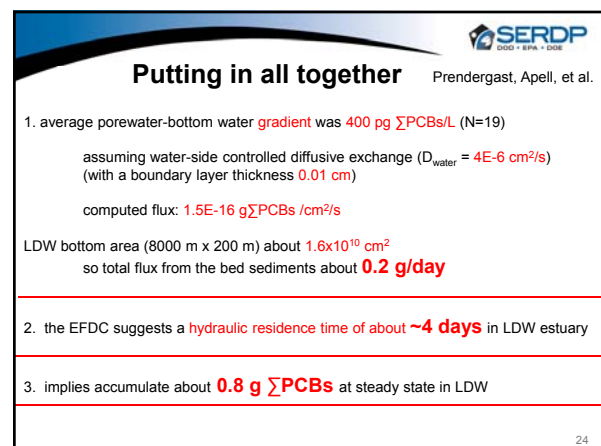
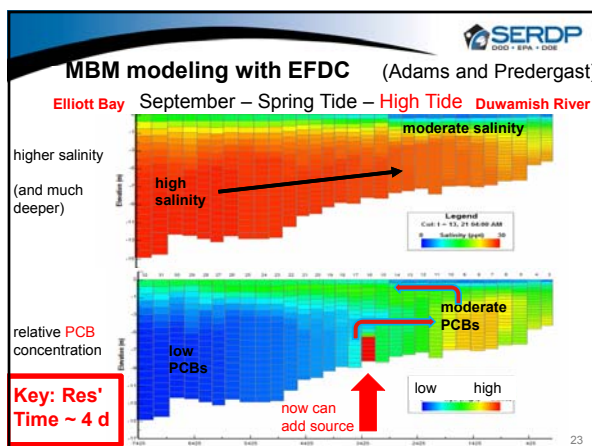
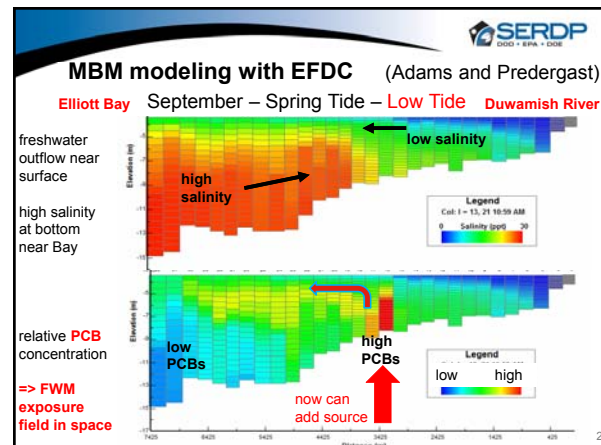
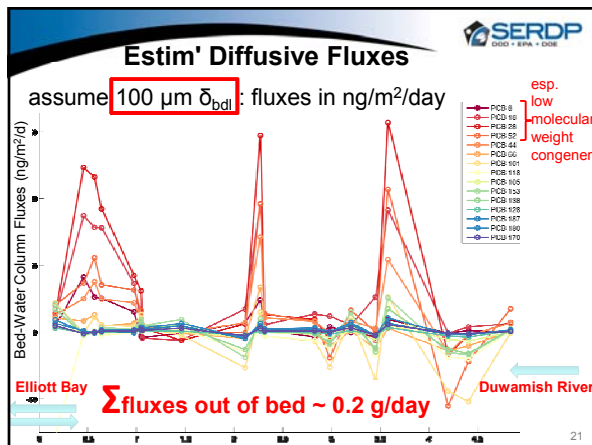
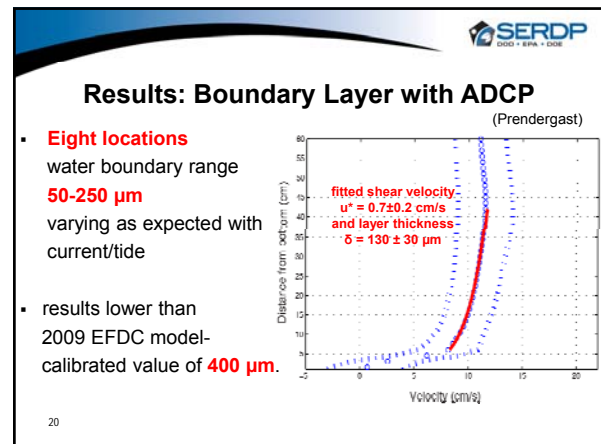
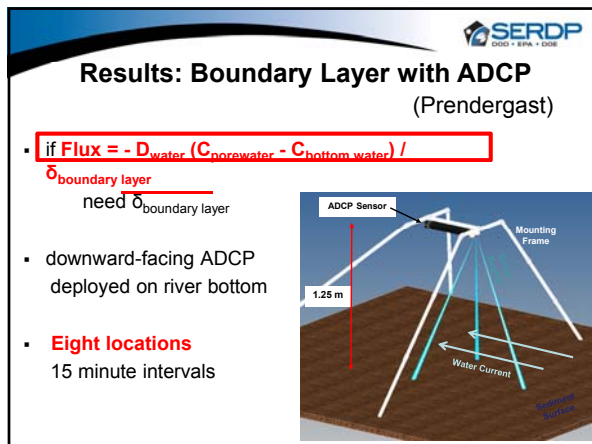
- Mass Balance Model (MBM)**  
=> do MBM estimated conc's match measures?
- Passive Sampler methods to ID hypothesized sources and "drive" the Mass Balance Model**
- integrate with Food Web Model (FWM)**  
using MBM description of exposure field, is FWM biouptake consistent with measured body burdens?

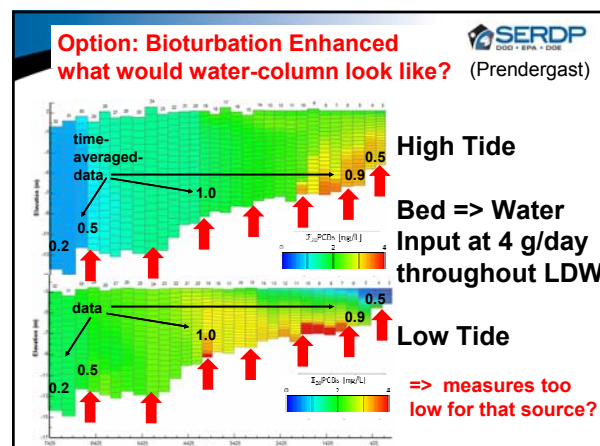
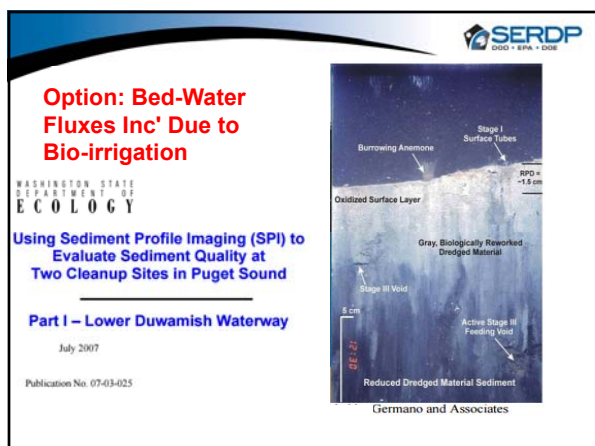
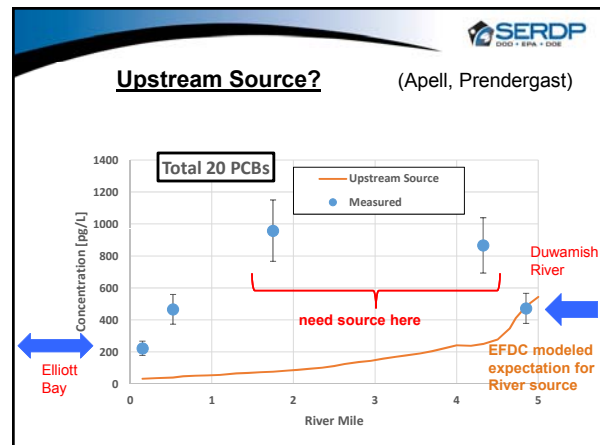
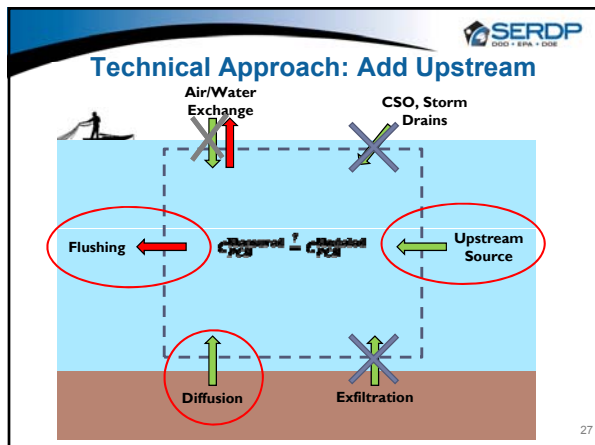
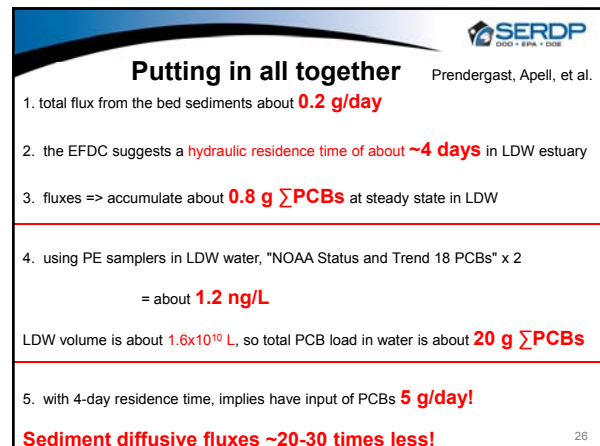
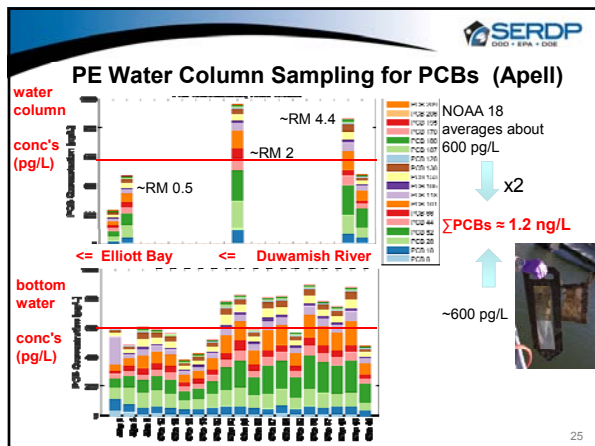
**Approach: Start "Simple"**

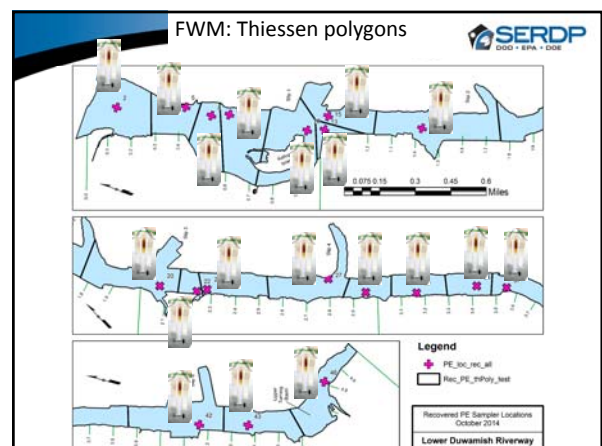
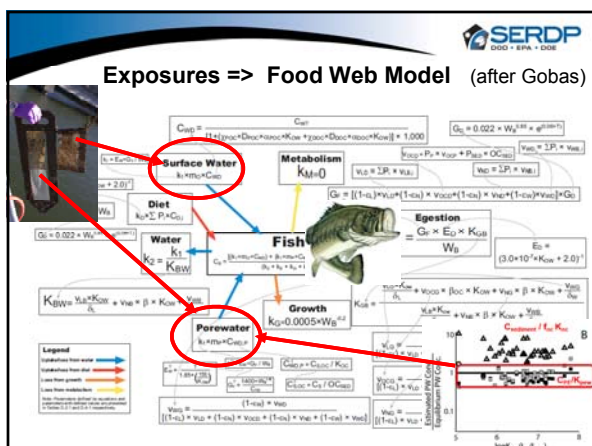
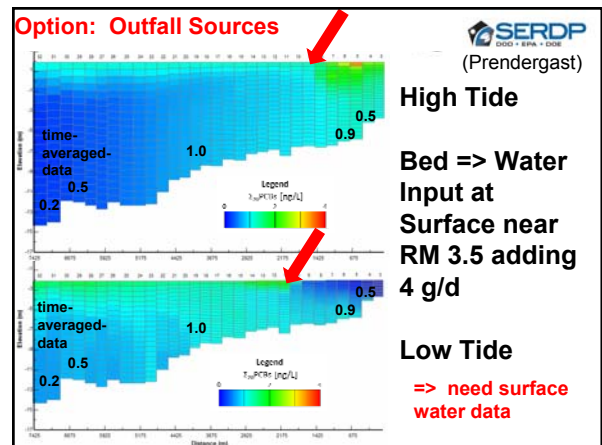
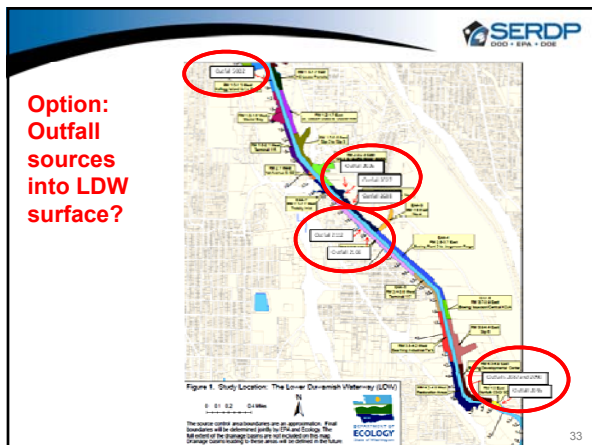
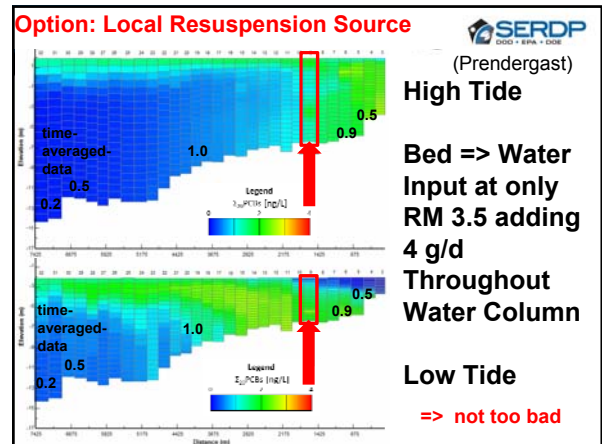
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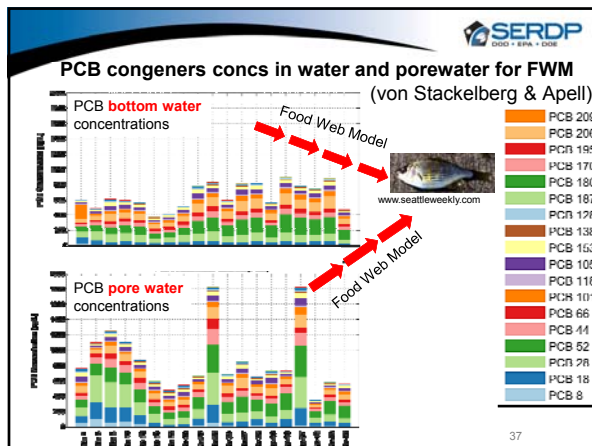












**Summary**

1. PE passive samplers => water and porewater concentrations (at sub parts per trillion levels! averaged over weeks)
2. Mass balance modeling integrates water data, "points" to most important sources (guide remediation) provides "exposure field" in space and time
3. Food web modeling should translate the exposure field to quantify risks (decisions)

38

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39