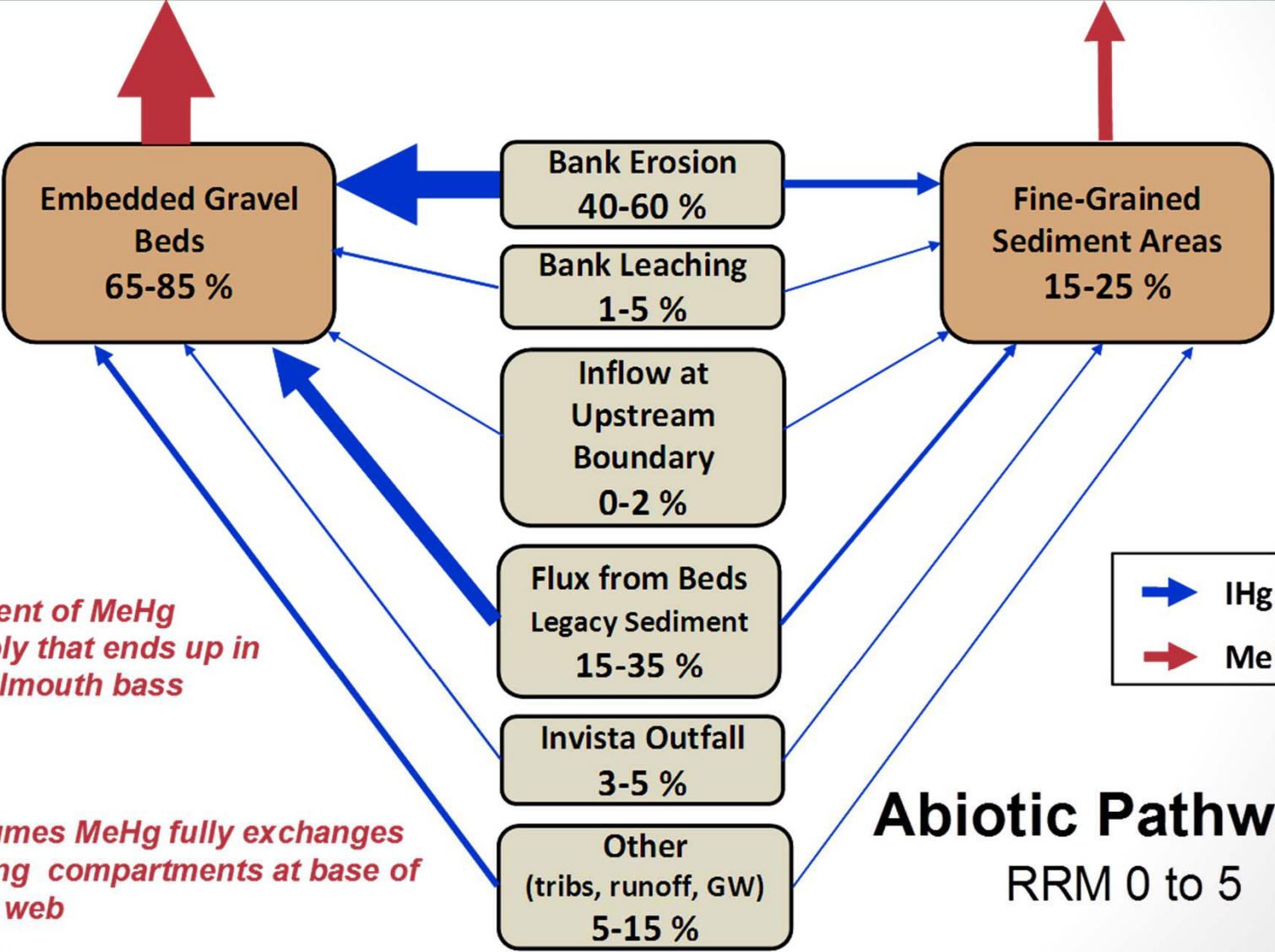
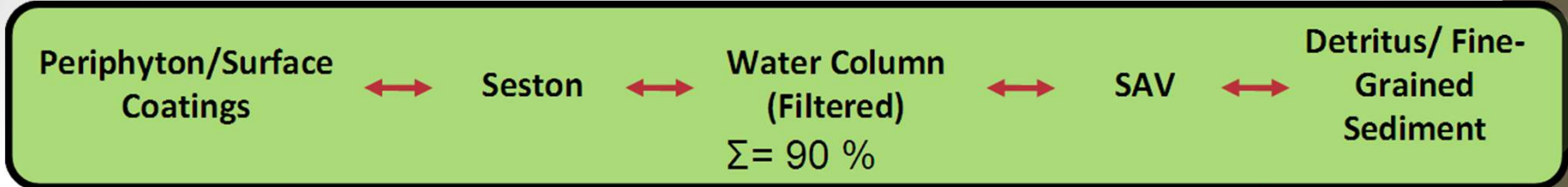


Remedial Options Program Task Team Update

July 17, 2013

Yesterday's Agenda

- Reviews of Ongoing Work
 - Carol Ptacek – Characterization of Hg in SR sediments and assessment of treatment options
 - Danny Reible – Voltammetry and DGT probe work
- Progress Updates on New Work
 - Robert Brent and Kip Mumaw – Mesocosm study of water column treatment techniques
 - Mike Newman – Biological assessment of potential amendments
 - J.R. Flanders – Floodplain bioavailability and treatment study
 - Olesya Lazareva – Biogeochemical dynamics of Hg in floodplain banks and alluvial groundwater
- Remediation Proposal – Clay Patmont



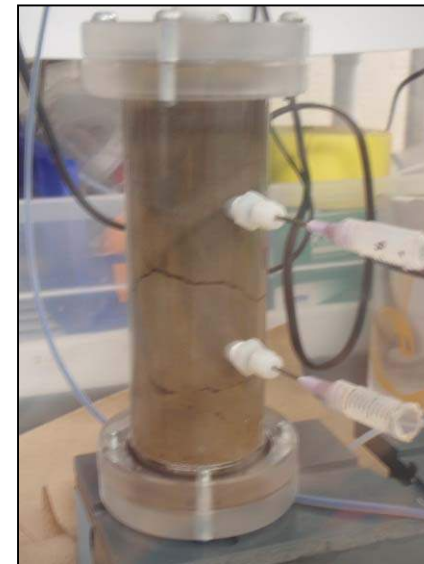
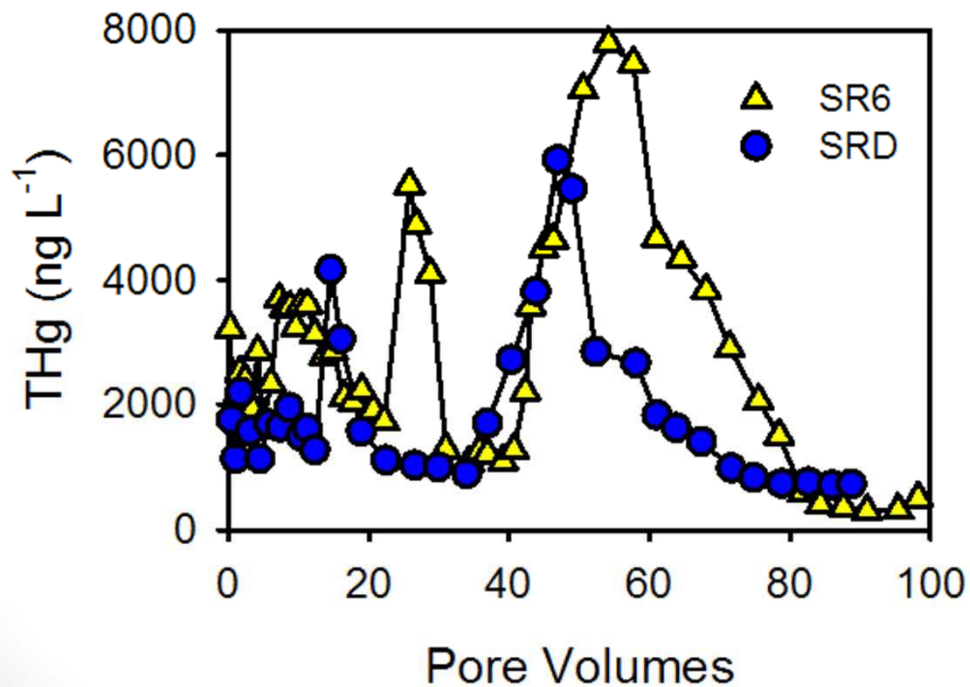
Percent of MeHg supply that ends up in smallmouth bass

Assumes MeHg fully exchanges among compartments at base of food web

Abiotic Pathways
RRM 0 to 5

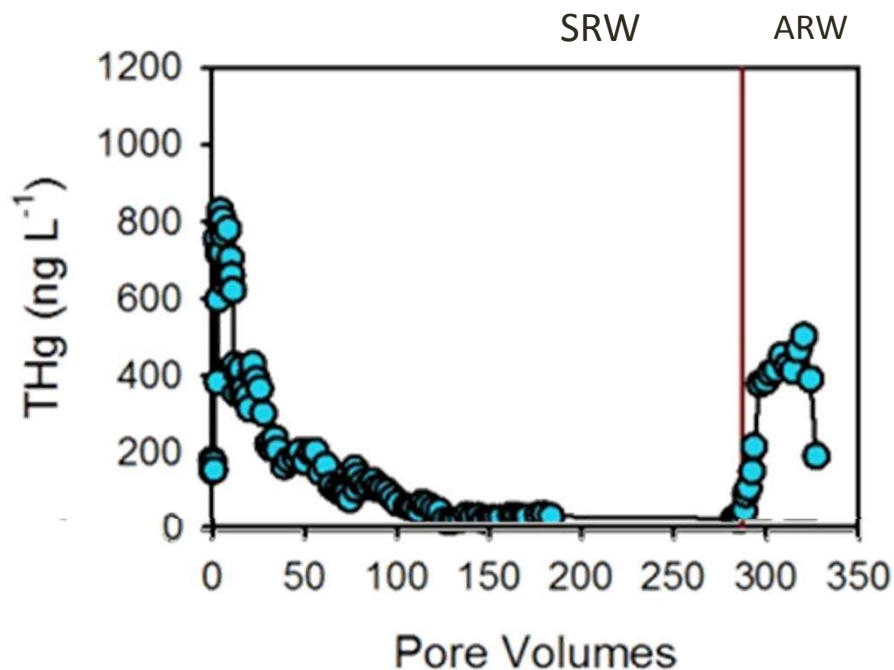
Ptacek – Take Home Messages

- 1. Large amounts of Hg can be leached from SR soils/sediments
 - Important for conceptual model assumptions about loadings from banks



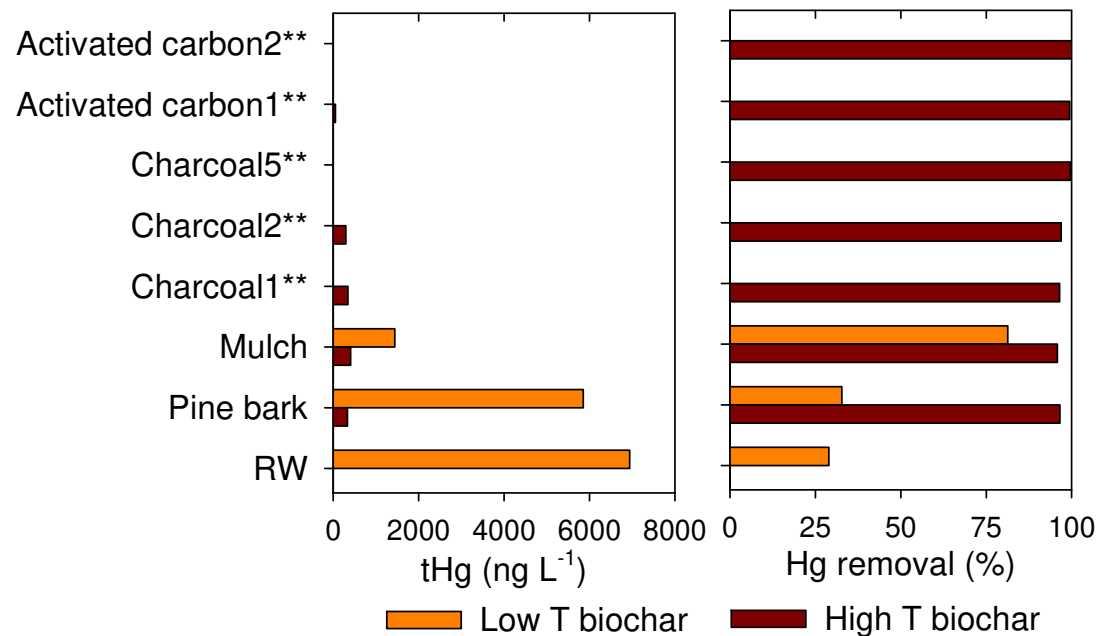
Ptacek – Take Home Messages

- 2. Leaching decreased over time, but could be restimulated by introduction of acid rain water
 - Important because rainwater leaching through the banks may be of much lower pH than river water



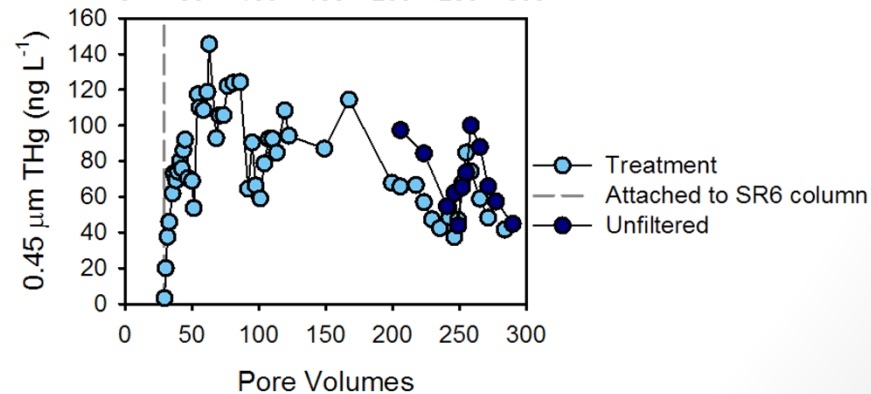
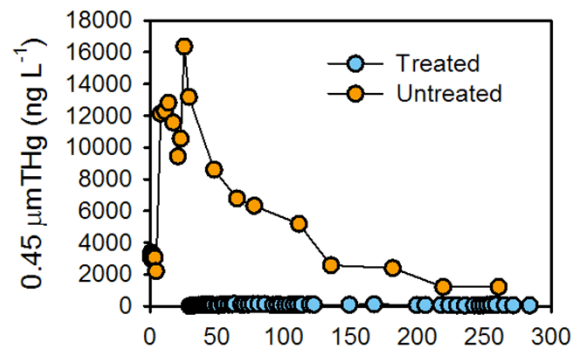
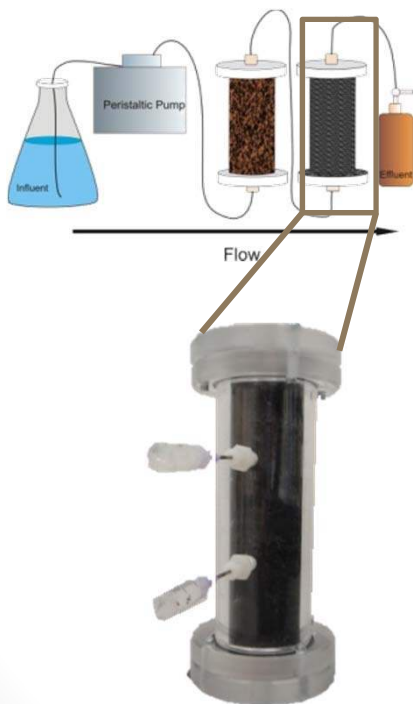
Ptacek – Take Home Messages

- 3. Different adsorptive media varied in treatment effectiveness and introduction of byproducts (nutrients, etc.)
 - Cowboy Charcoal (hard wood biochar) performed among the best
 - This has led to its use in other SRST studies



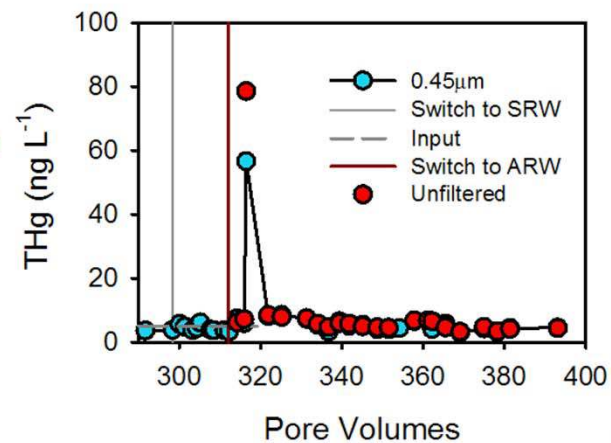
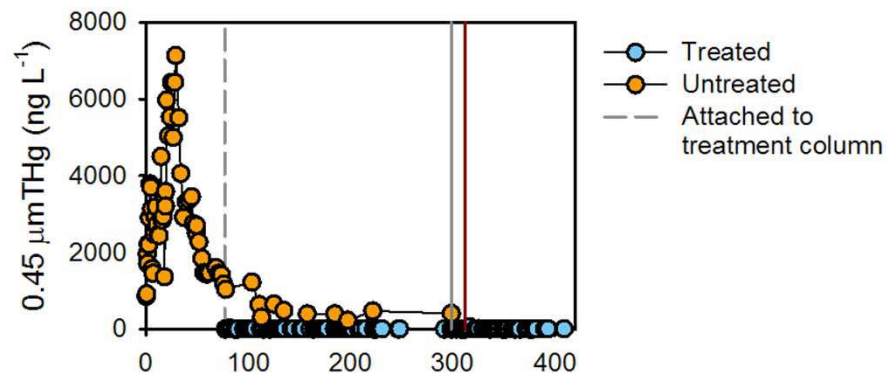
Ptacek – Take Home Messages

- 4. Biochar is very effective at removing leached Hg under saturated conditions
 - Important as a possible treatment technology



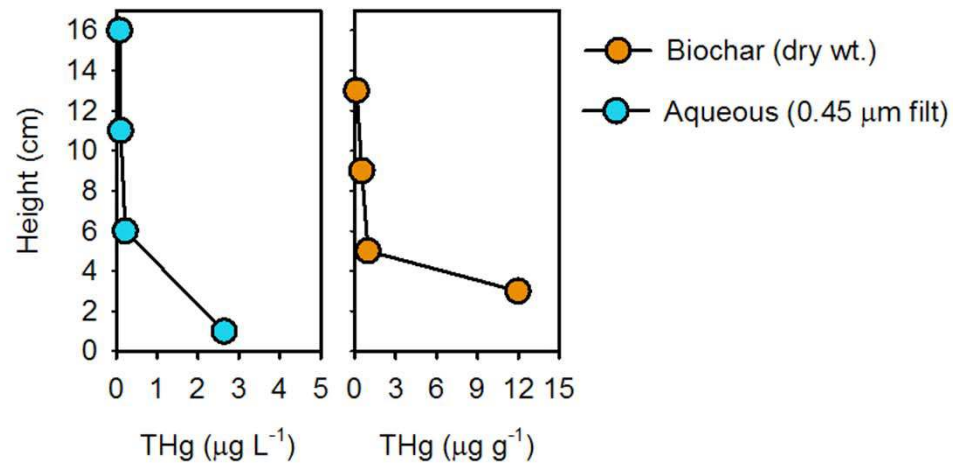
Ptacek – Take Home Messages

- 5. Removed Hg is tightly bound
 - Important to ensure that treatment technologies using biochar won't easily exchange Hg with water column



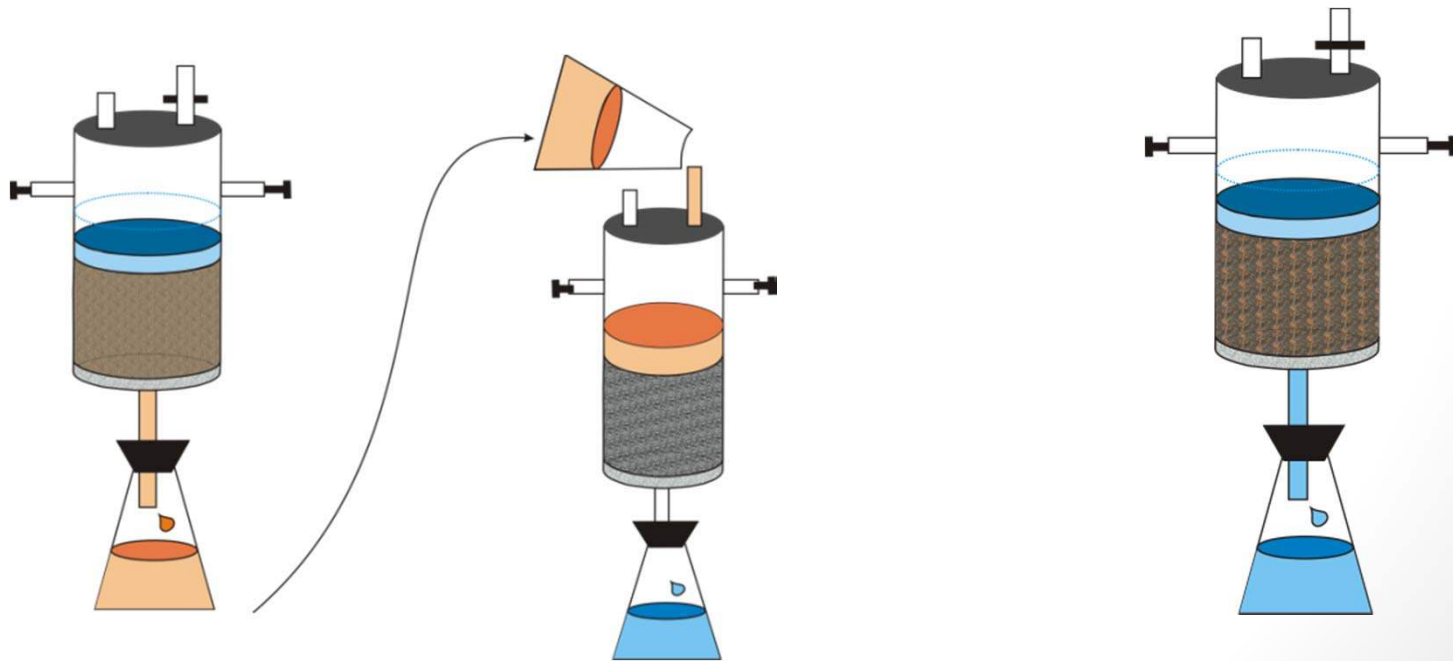
Ptacek – Take Home Messages

- 6. Hg is bound in first several cm of column
 - Indicates high adsorptive capacity or possibly thinner treatment layers needed in treatment applications



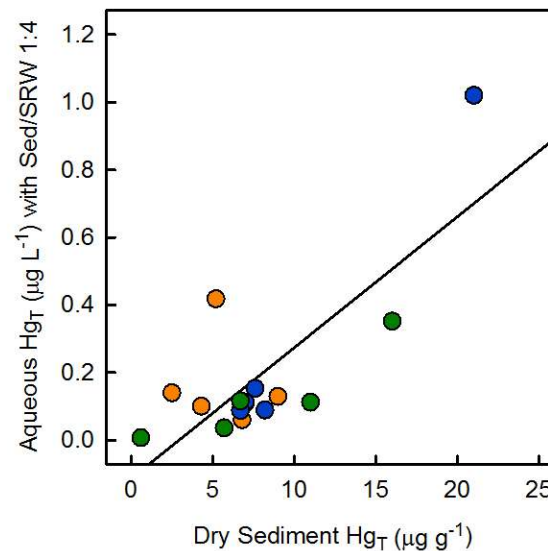
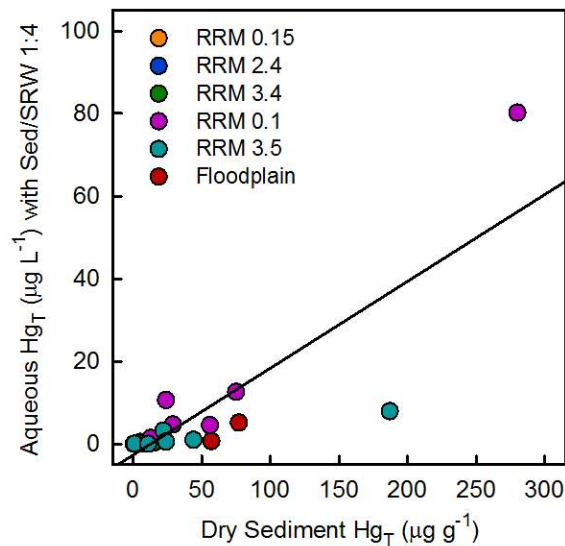
Ptacek – Take Home Messages

- 7. Biochar treatment was good under saturated and unsaturated conditions
 - Indicates flexibility in eventual applications



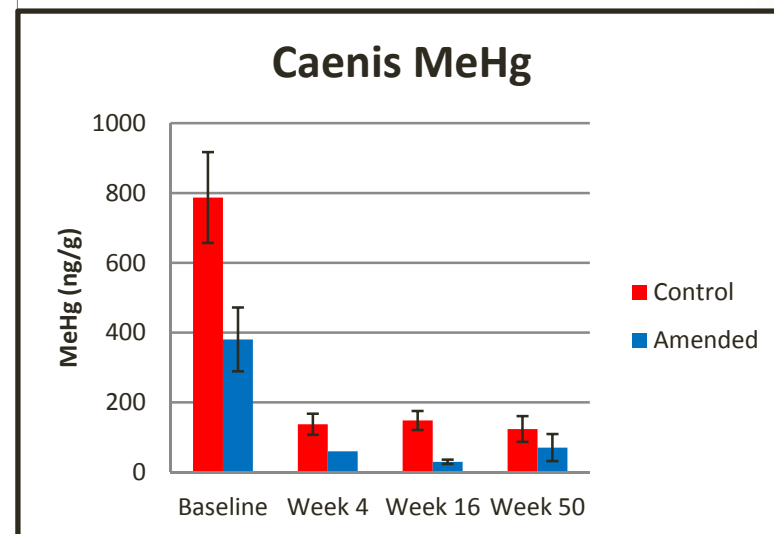
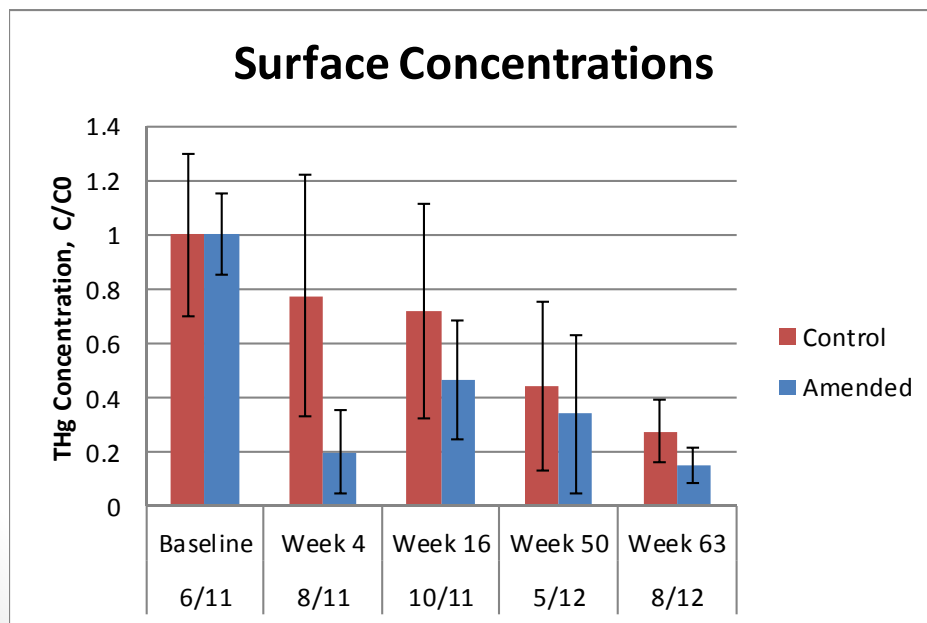
Ptacek – Take Home Messages

- 8. Leaching from low Hg soils/sediments is ~linear and still a potential Hg source to river
 - 10 $\mu\text{g/g}$ soils produce ~ 200 ng/L aqueous concentration, more than an order of magnitude higher than water column concentrations



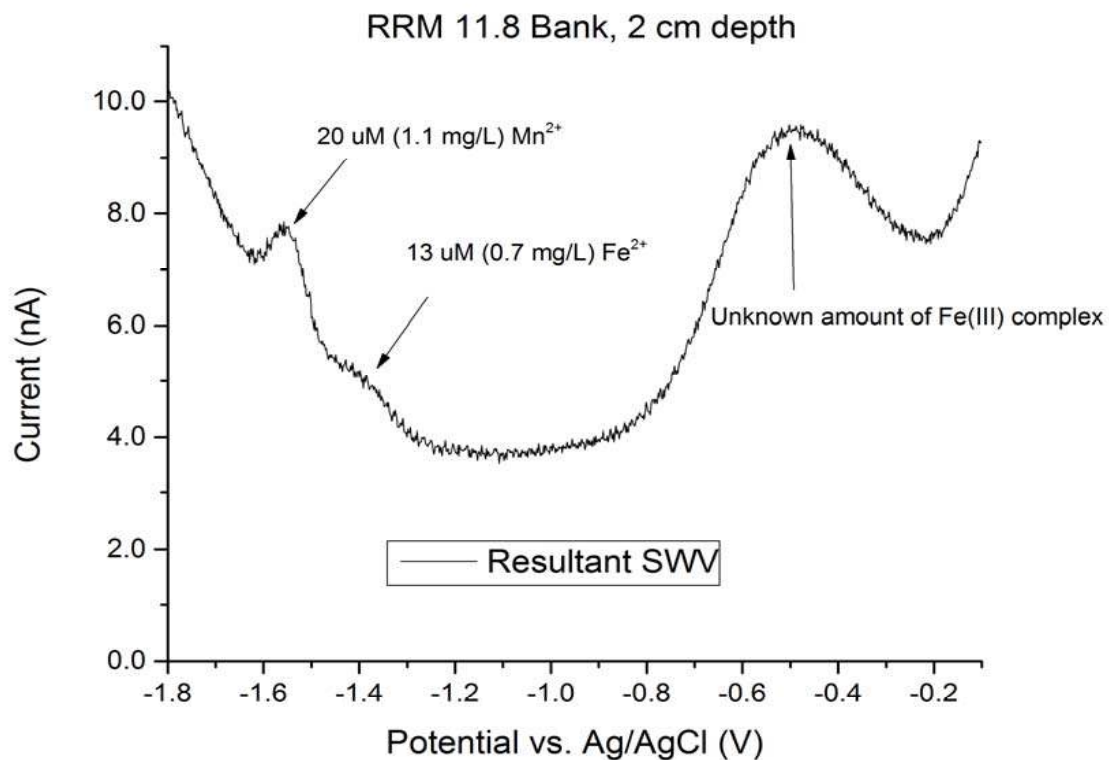
Reible – Take Home Messages

- 1. In Wertman Pond amendment study, there were substantial reductions in pore water and biota Hg
 - Confounding factor of control reductions over time
 - Monitoring continues



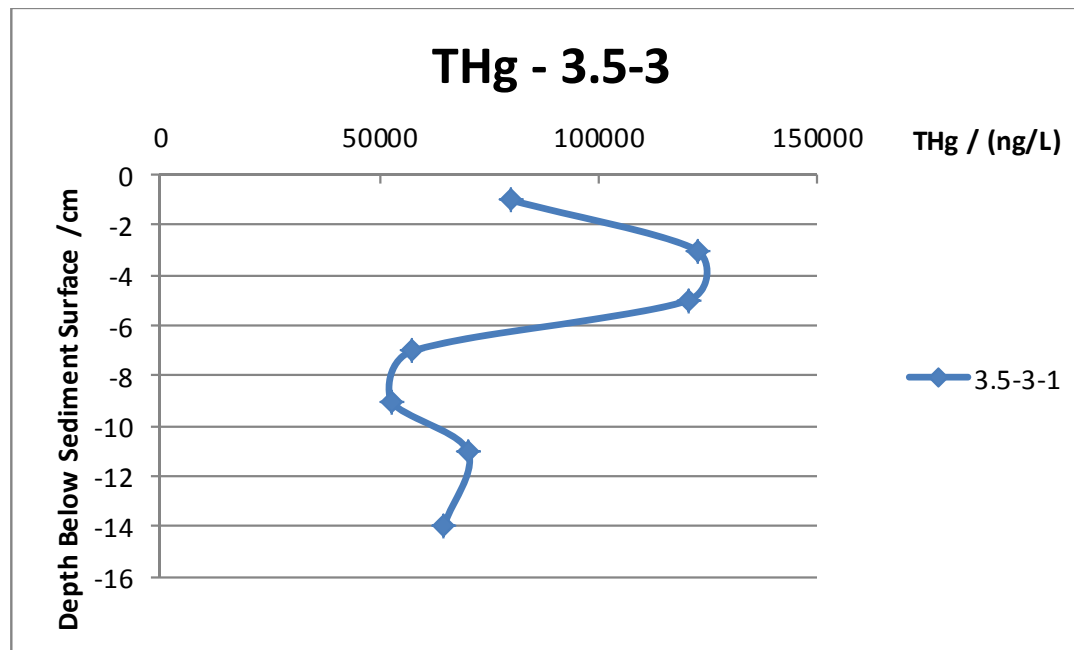
Reible – Take Home Messages

- 2. Voltammetry indicates reduced conditions at shallow depths
 - Reduced Mn and Fe identified, but S below detection



Reible – Take Home Messages

- 3. Pore water Hg at base of bank was ~10x higher than previous measurements
 - Measurements were taken after large rain and flooding event
 - Flushing from banks?
 - MeHg was not elevated above previous measurements



Brent – Study Design

- Experiment designed to test the effectiveness of treating the water column with biochar to remove Hg



Control Treatment #1



Adsorptive filter



Adsorptive Filter Treatment #2



Adsorptive Media Structures



Adsorptive Media Structure Treatment #3



Adsorptive Structure Treatment

ROCK DROP
STRUCTURE

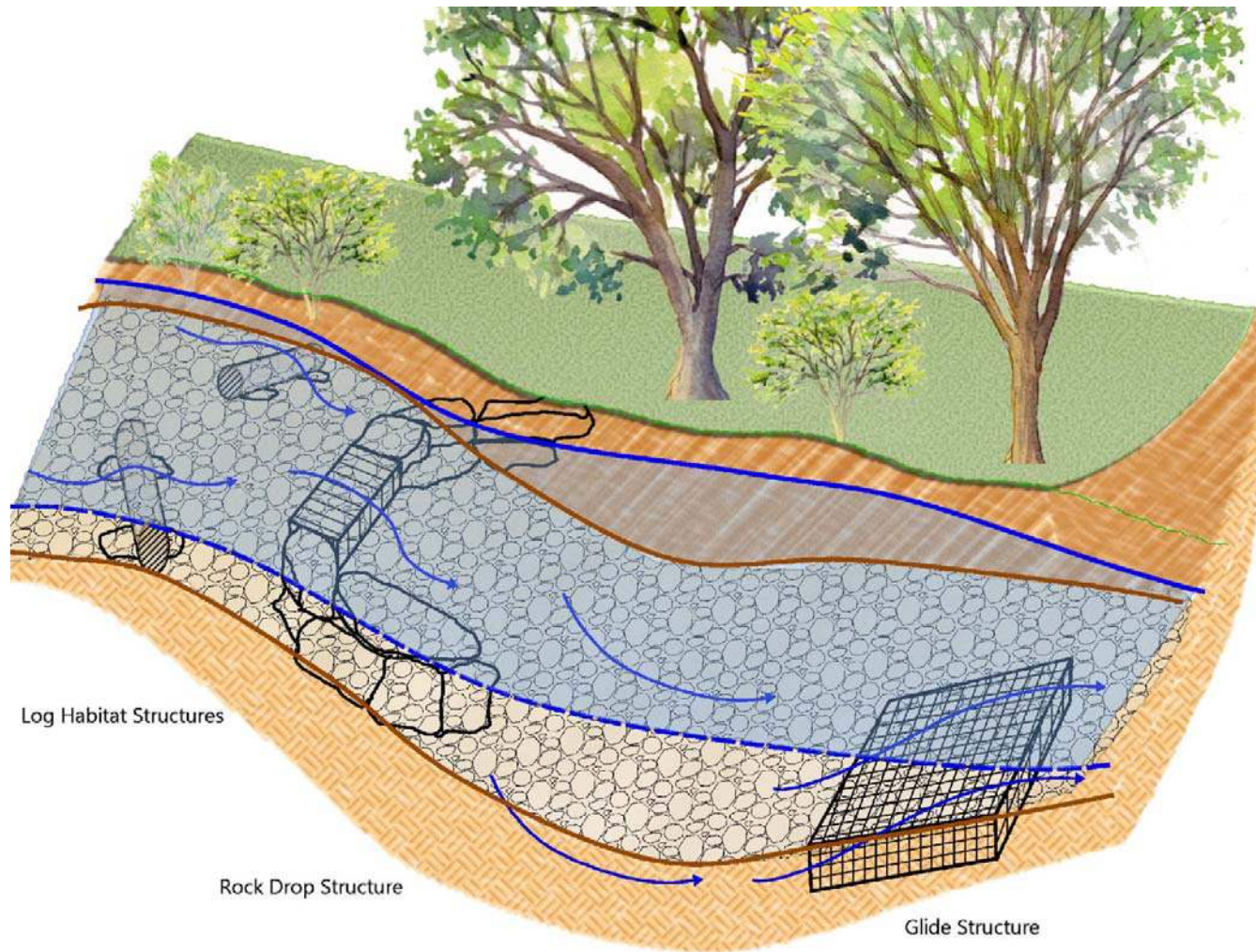


LOG HABITAT
STRUCTURE

GLIDE STRUCTURE



Conceptual design



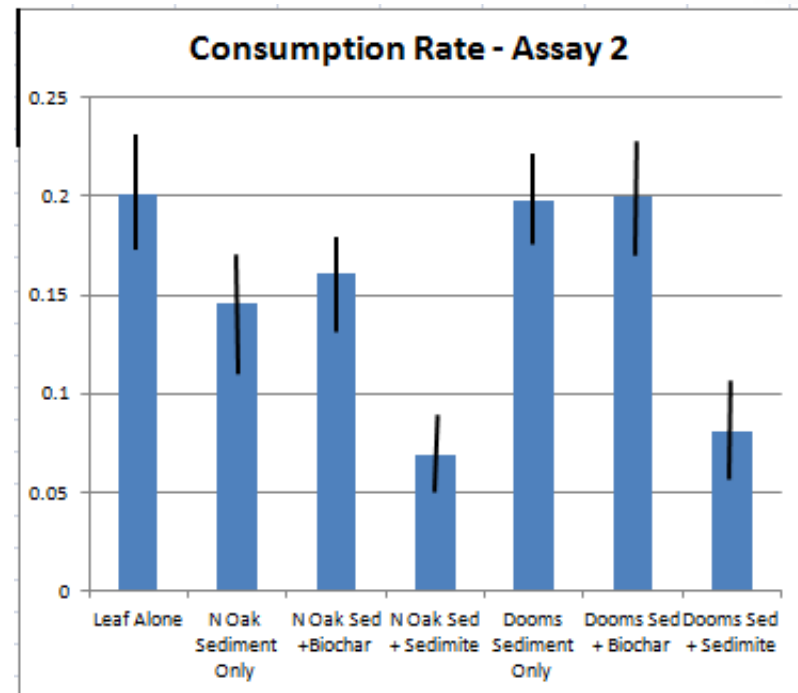
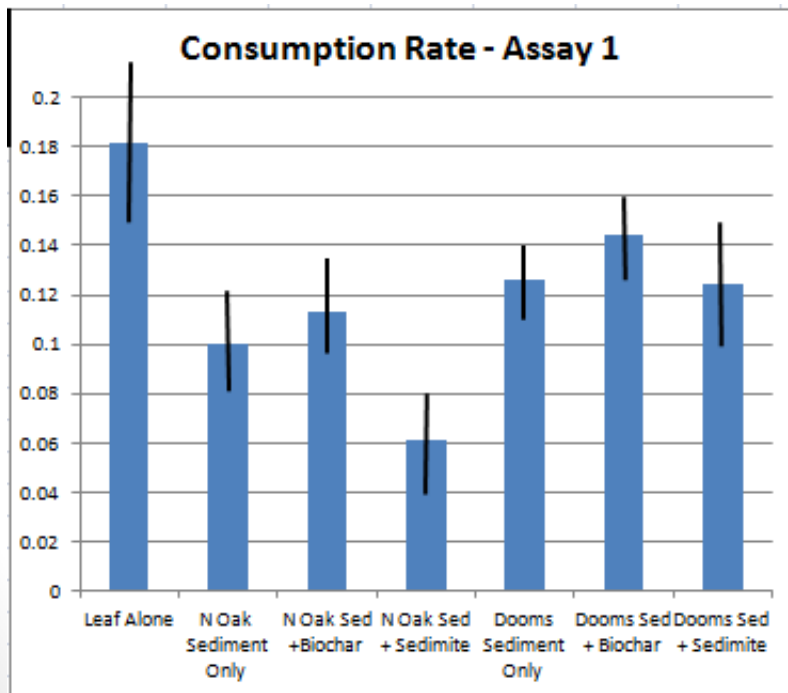
Newman – Study Design

- Evaluate detrital processing and bioaccumulation in sediments amended with biochar and sediment
- Evaluated at 1 wk, 1.5, 3, and 6 mo.
- 30 *H. azteca* per treatment



Newman – Take to Your Car Message

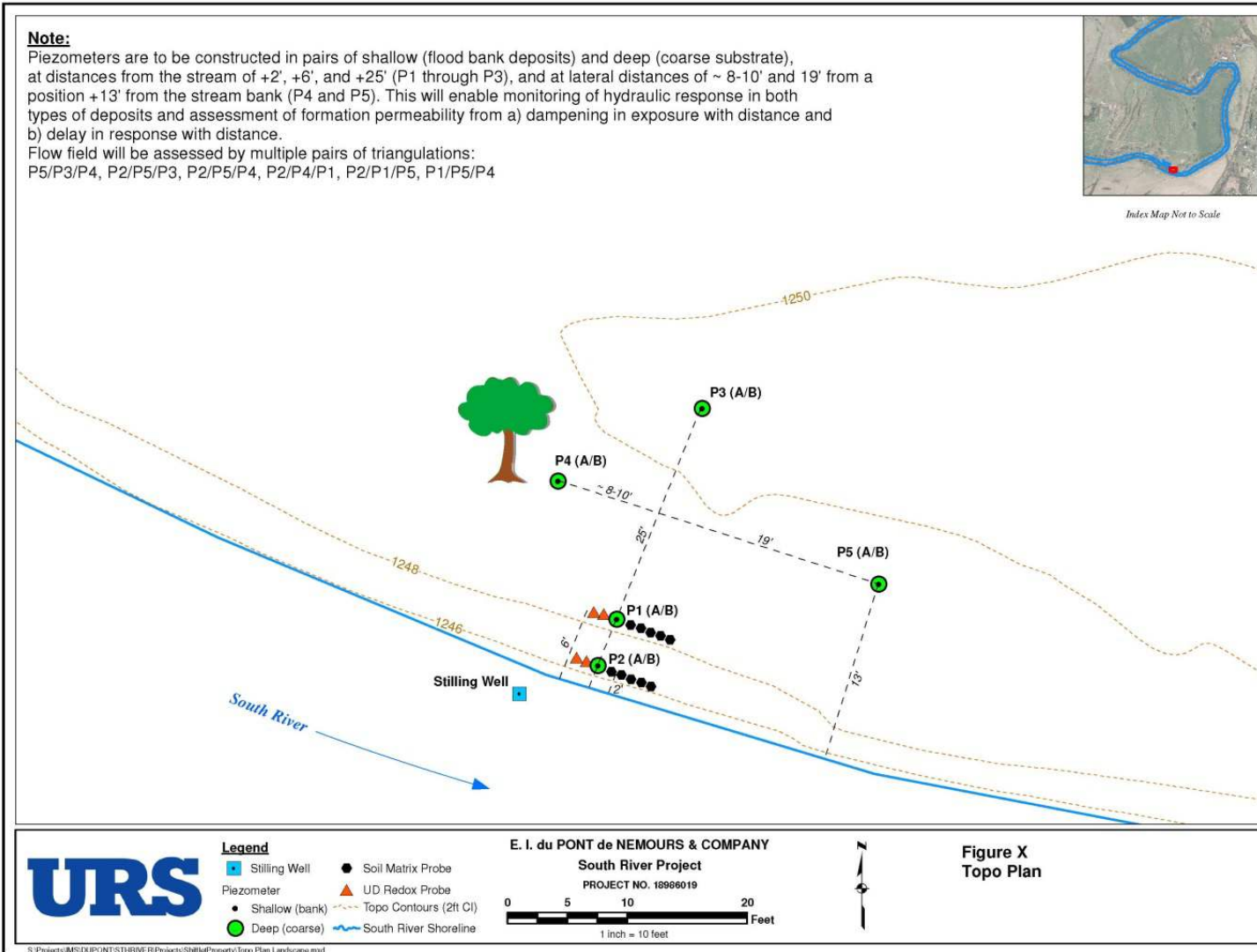
- 1. Detrital processing seems to be decreased in sediment amended treatments (not in biochar amendments)



Flanders – Study Design

- Three biochar concentrations: 0% (control), 5% and 10%
 - Cowboy charcoal
 - Sieved to <2mm
- Two THg mercury concentrations (0.3 and 40 mg/kg)
- Endpoints:
 - Earthworms:
 - 4 weeks: weight change, mortality, [THg]_{adult} and [MeHg]_{adult}
 - 8 weeks: reproduction, [THg]_{offspring} and [MeHg]_{offspring}
 - Plants:
 - Shoot emergence
 - Shoot weight and height
 - Three species (minimum)
- THg and MeHg in soil at beginning and end of experiment
- Sequential extractions on soil

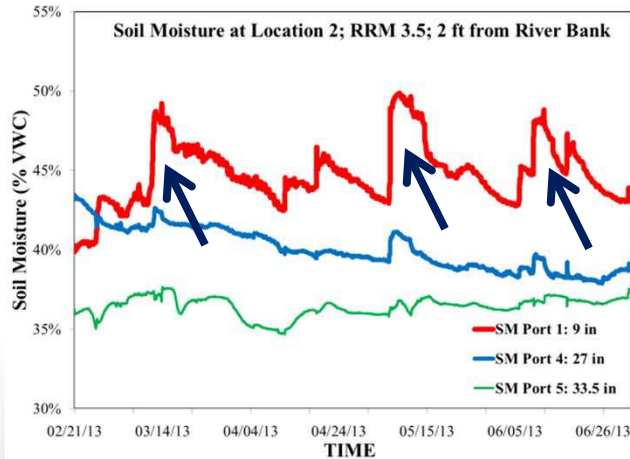
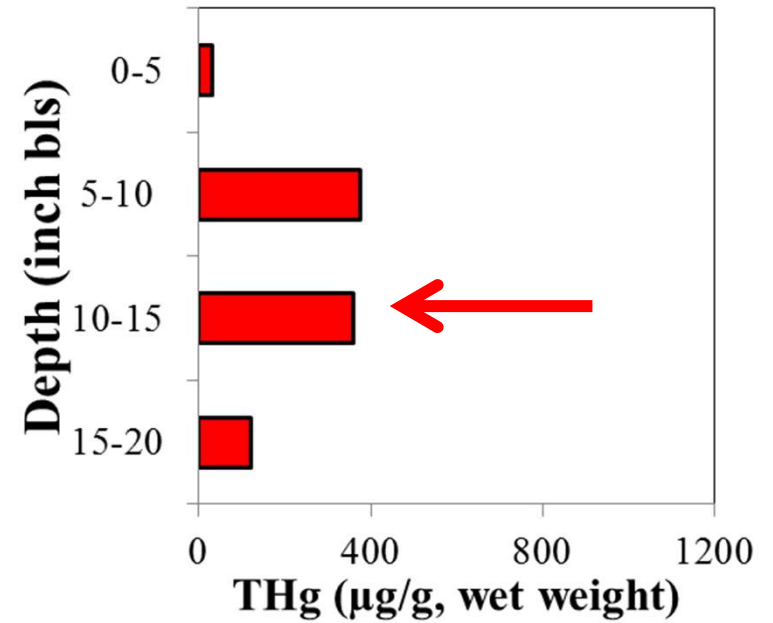
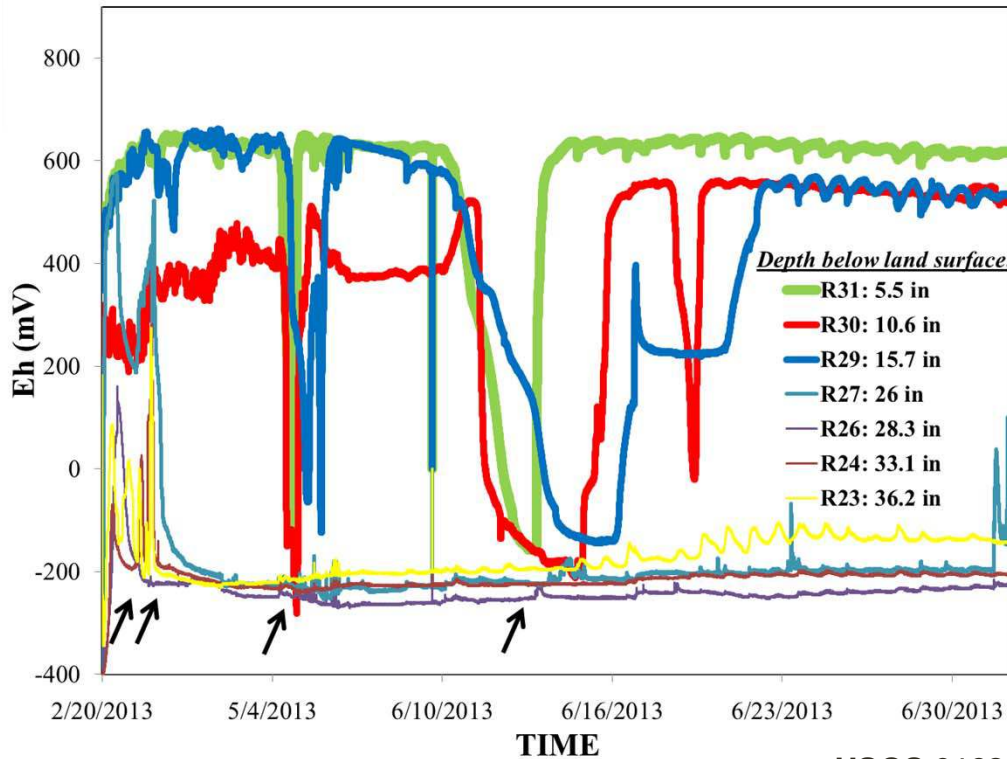
Lazareva – Study Design



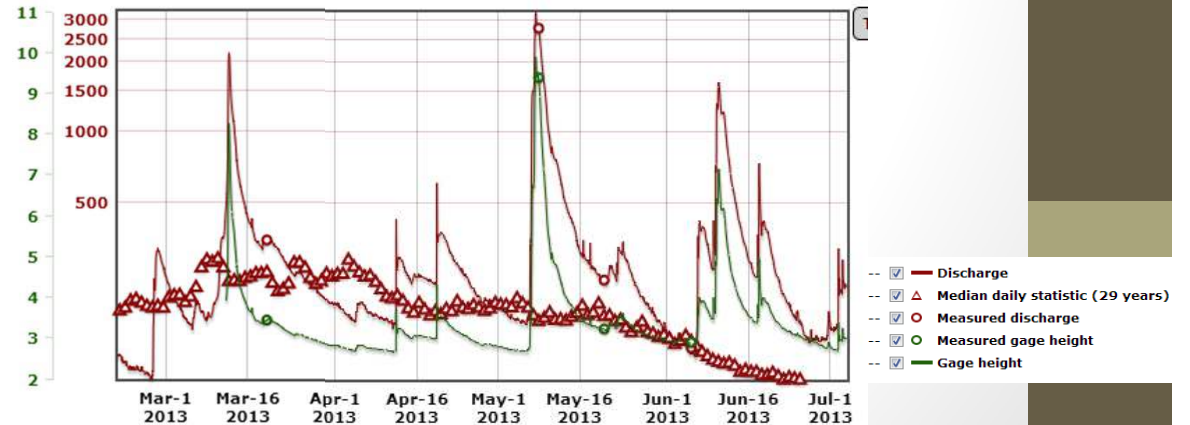
Lazareva – Study Design

- Sampling
 - Soil cores
 - Groundwater
- Continuous Monitoring
 - Redox
 - Soil Moisture
 - Temperature
 - Level
 - Conductivity

Redox and Soil Moisture: Location 2 at 3.5 RRM; 2 ft from River Bank



USGS 01626850 SOUTH RIVER NEAR DOOMS, VA



Remediation Proposal

- Draft available
- See Clay for access to draft (if you don't have it already)
- Comments due to Clay by August 9, 2013