

Floodplain Pilot Study Update

Carbon Amendment of Floodplain Soil

AOC 4, Former DuPont Waynesboro Site, Virginia

May 13, 2015



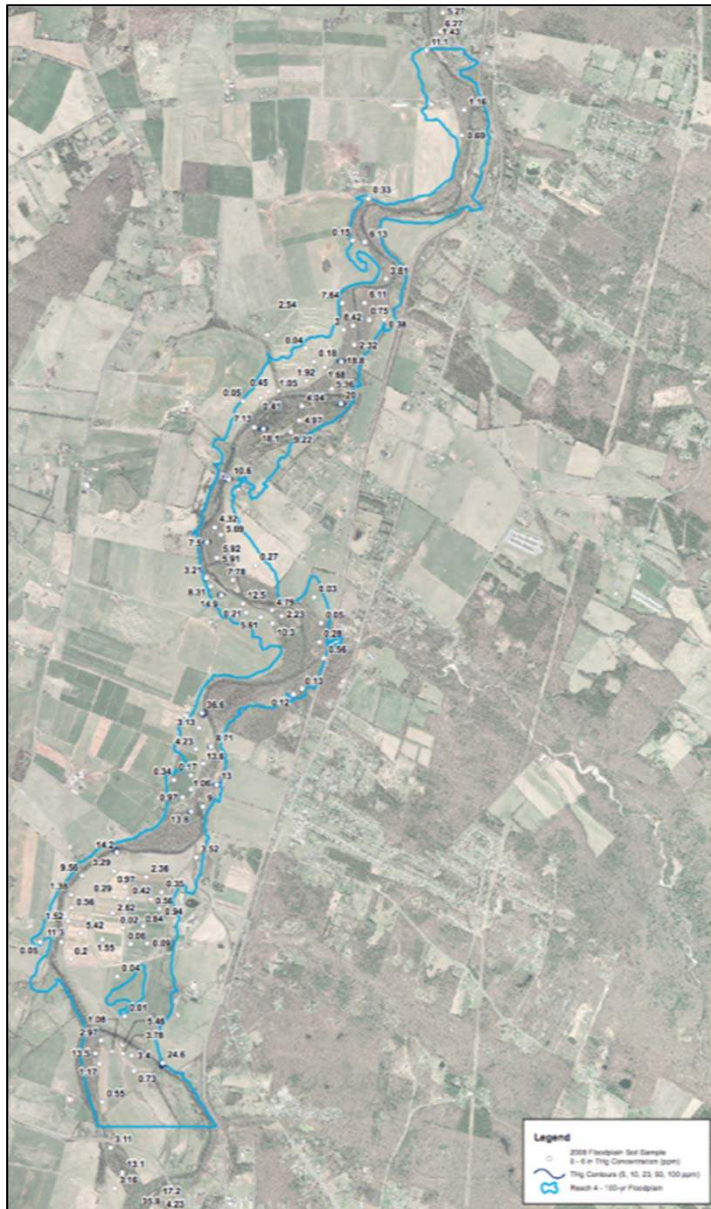
Agenda

- Background
- Phase I Review
- Phase II Overview
- Phase III Design
- Summary



Background

- Methylmercury (MeHg)- Bioaccumulative form of mercury
- Use of carbon amendment
- Integration for remedial design
- **Floodplain Pilot Study Objectives:**
 - Test effectiveness of carbon amendments
 - Evaluate for potential unintended consequences



–Study Phases:

- Phase I: Laboratory Pilot (Completed 2014)
- Phase II: Field Pilot (Spring/Summer 2015)
- Phase III: Field Application (*Pending* 2016)

Phase I Overview- Laboratory Pilot

- Three Biochar treatments (Cowboy Charcoal): 0% (Control), 5% and 10% by dry weight
- Two soils: RRM 11.8 soil and background soil based on total mercury (THg) concentrations
- Soils sieved to < 2 mm and Biochar sieved to < 1.25 cm
- Test receptors: Earthworms and plants
- Conclusions:**
 - Potential reduction in MeHg bioaccumulation
 - No adverse effects on earthworms or plants

Phase II- Field Pilot

- Validate the effectiveness and potential unintended consequences of using carbon amendments *in situ*



Phase II- Study Location

Augusta Forestry Station (RRM 11.8)



Phase II- Study Design

- Biochar rates 5% (unsaturated and saturated) and 10% (unsaturated)
- Three replicates per treatment
- In situ* soil moisture and redox potential monitored for each treatment type
- After aging for a few months, background-level (or laboratory-reared) worms will be added to cages and sampled after 4 and 8 weeks of *in situ* exposure

Cowboy Charcoal



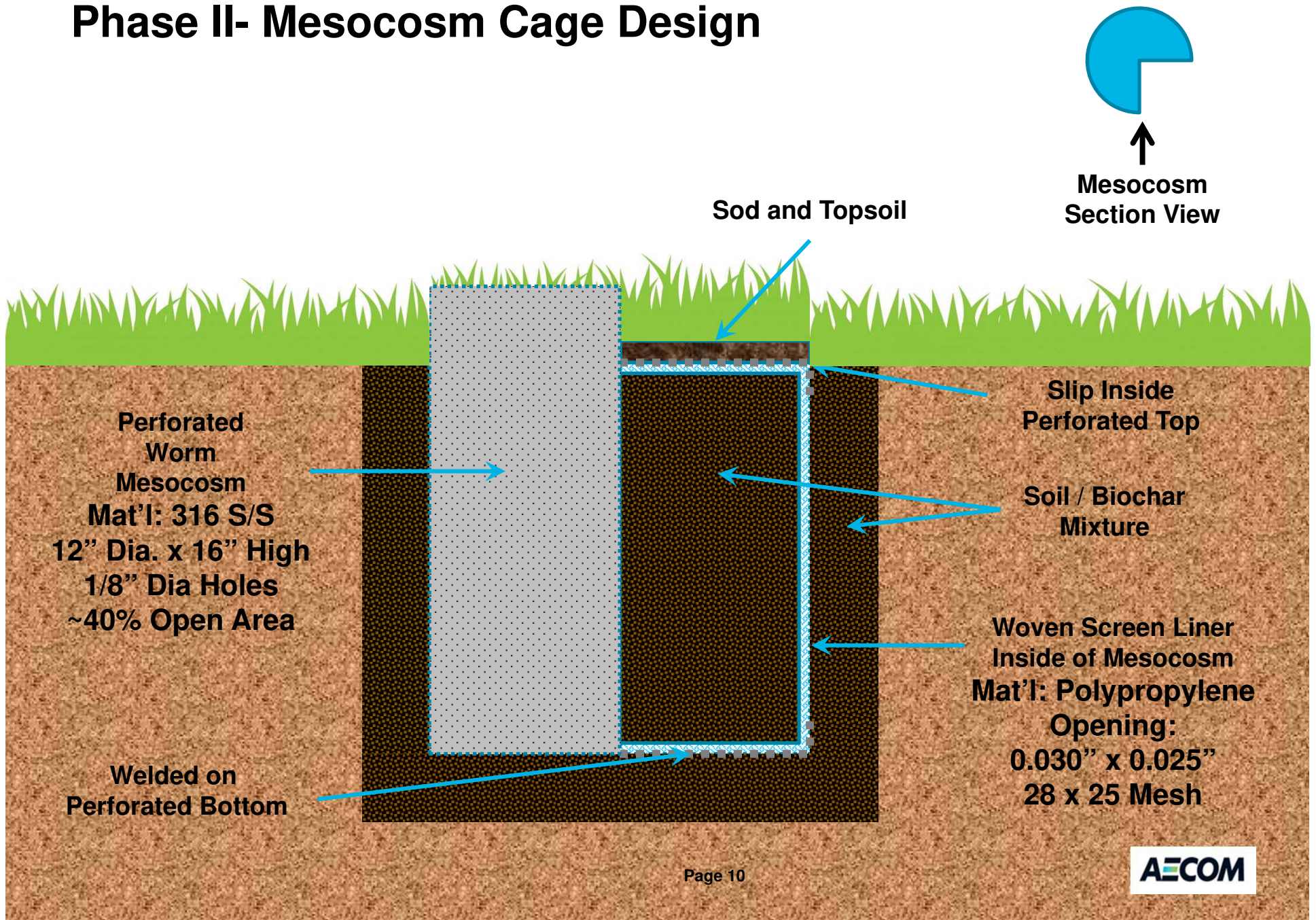
Source: University of Waterloo 2011

Phase II- Study Metrics



- Adult and juvenile earthworm tissue: THg, MeHg, lipids
- Survival and growth
 - Number, length and mass of adults
- Reproduction:
 - Number and length of juveniles or cocoons produced
- Soil: THg, MeHg, organic carbon

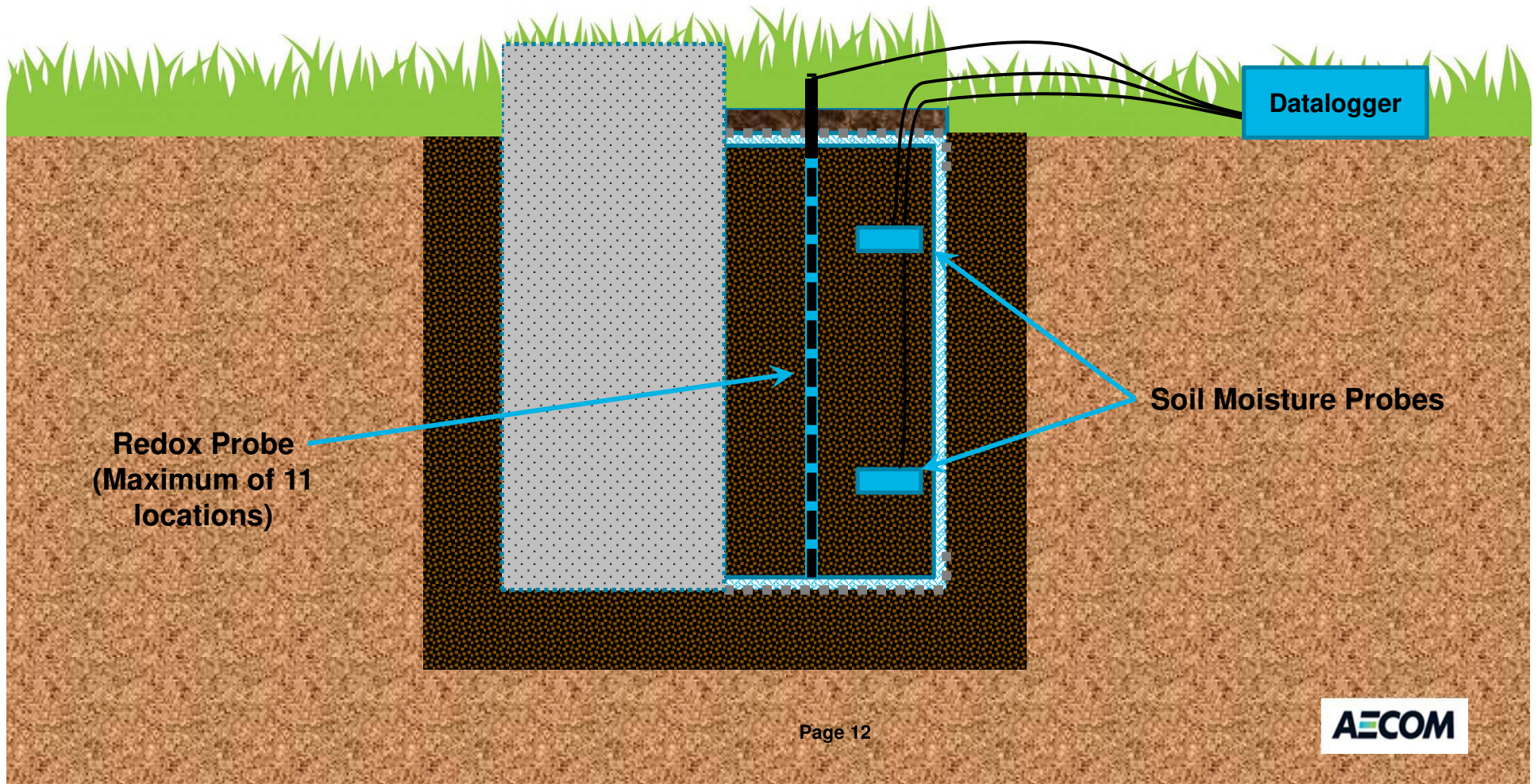
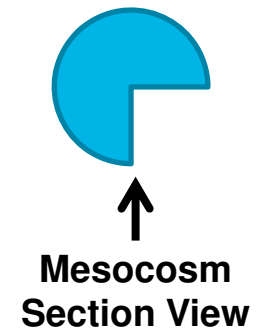
Phase II- Mesocosm Cage Design



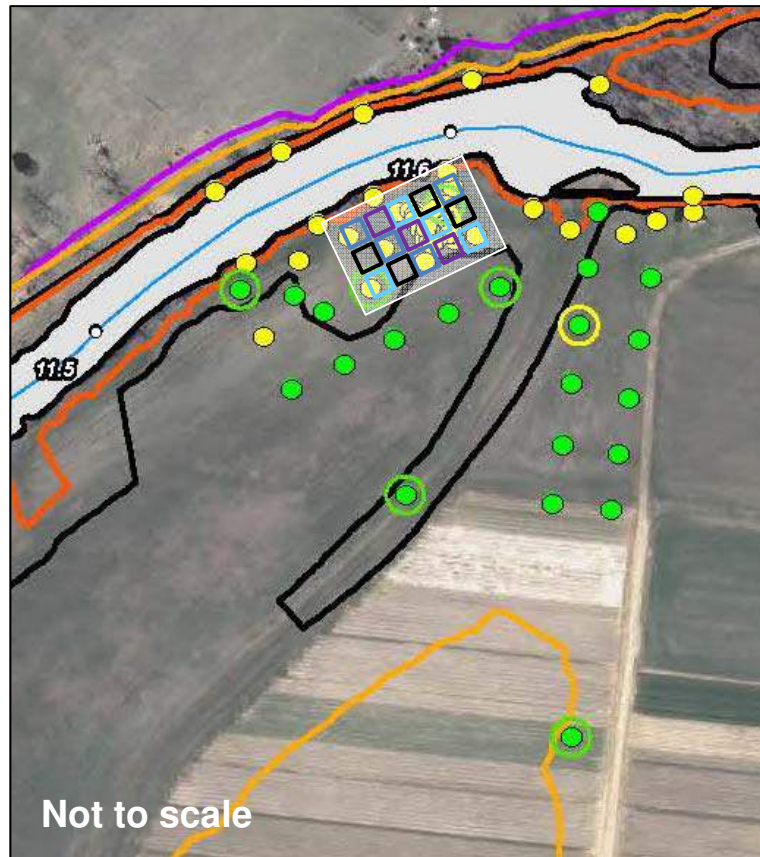
Phase II- Soil Moisture and Redox Monitoring

- Redox potential and soil moisture monitored within dedicated cages for each treatment type and undisturbed resident soil
- Probes connected to data-loggers for real-time data collection along the vertical profile of the cage

Phase II- Soil Moisture and Redox Monitoring



Phase II- Schedule



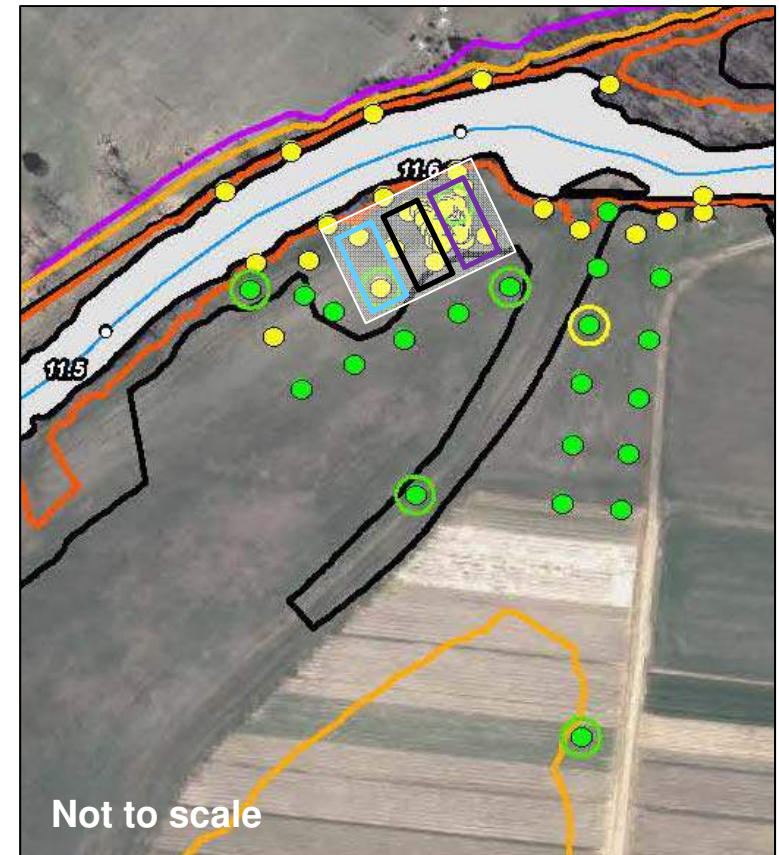
Note:

Phase II amendment exposure cage locations are preliminary. Final locations will be determined by field personnel based on study location site conditions.

- Spring 2015
 - Exposure cage construction
 - Exposure cage deployment
- Summer 2015
 - Worm deployment
 - Week-4 monitoring
 - Week-8 monitoring

Phase III (*tentative*)- Field Application

- Study design:
 - AFC site
 - Biochar amendment
 - Till amendment material into soil to 7-12"
 - Age over winter
 - Collect resident earthworms and other invertebrates (e.g., predatory mite, collembolans, enchytraeid worms, spiders)



□ Control □ Biochar (5%) □ Biochar (10%)

Note:

Phase III amendment plot locations are preliminary and are for discussion purposes only.

Summary

- Phase II of the Floodplain Pilot Study will extend the Phase I study design into the field; mesocosm deployment is tentatively scheduled for the week of May 18th, 2015.
- Phase III (pending) may evaluate potential reductions in mercury uptake in resident invertebrates in the natural field setting.

THANK YOU
QUESTIONS?

