

AOC 4 Monitoring Program Update

Former DuPont Waynesboro Site, Virginia

South River Science Team Meeting
October 21, 2015

Overview

- Review of monitoring program objectives
 - Short-term monitoring (STM)
 - Long-term monitoring (LTM)
- Remaining 2015 data collection activities
- Discussion



Short-term Monitoring Program Data Review

Review of Monitoring Program Objectives

STM Program

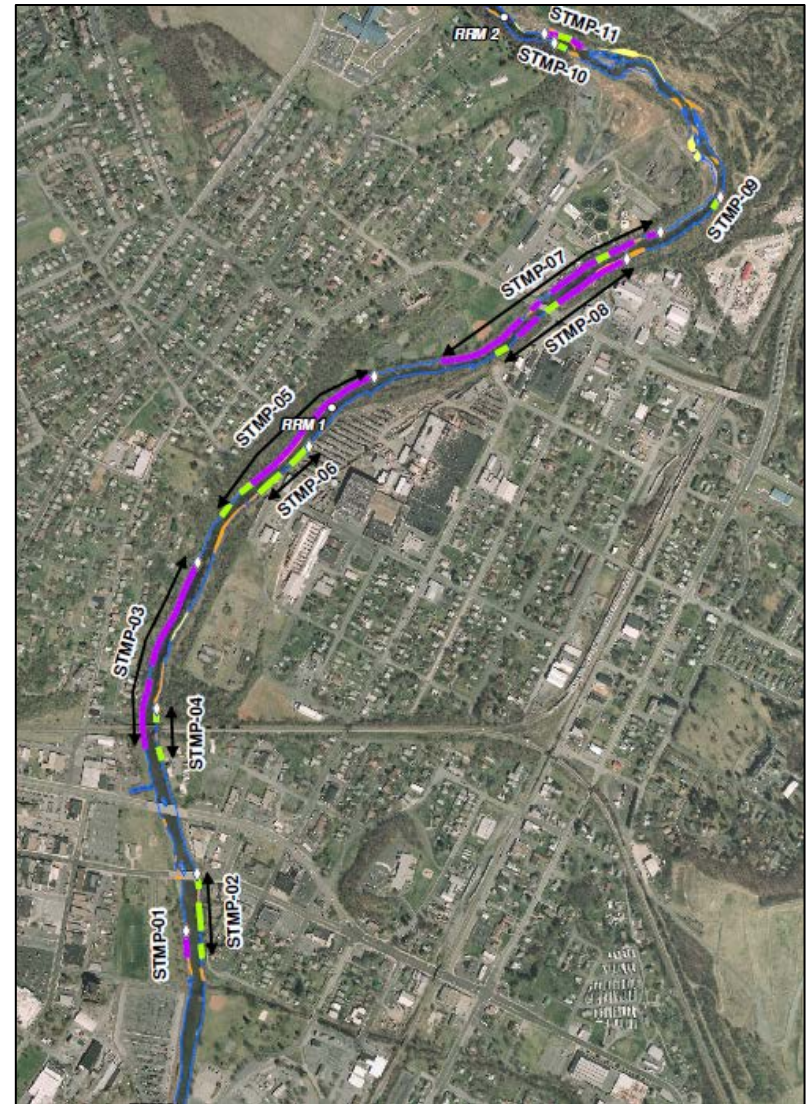
- Document potential improvements to the system attributable to implementation of the bank stabilization interim measures
- Measure improvements over a relatively short timeframe (e.g., two to ten years)
- Small spatial scale (e.g., adjacent to a particular BMA)

LTM Program

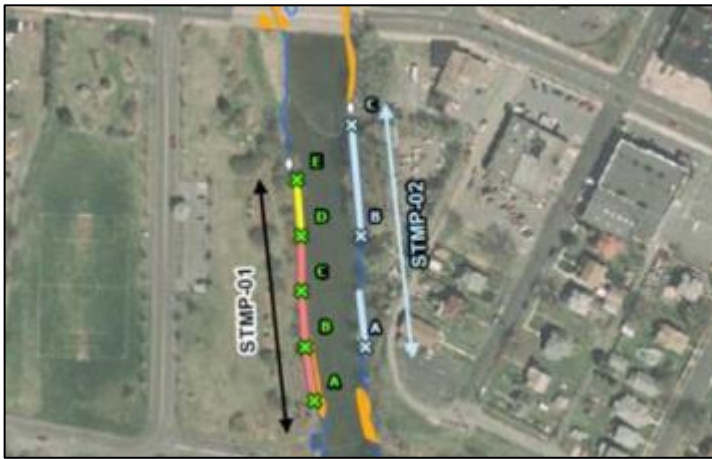
- Provide data to assess the efficacy of the remedy in addressing both migration and potential exposure pathways within AOC 4
- Measure changes over a large timeframe (e.g., ten+ years)
- Larger spatial scale – South River, SFS and Shenandoah rivers (~ 160 river miles)

Short-Term Monitoring Elements

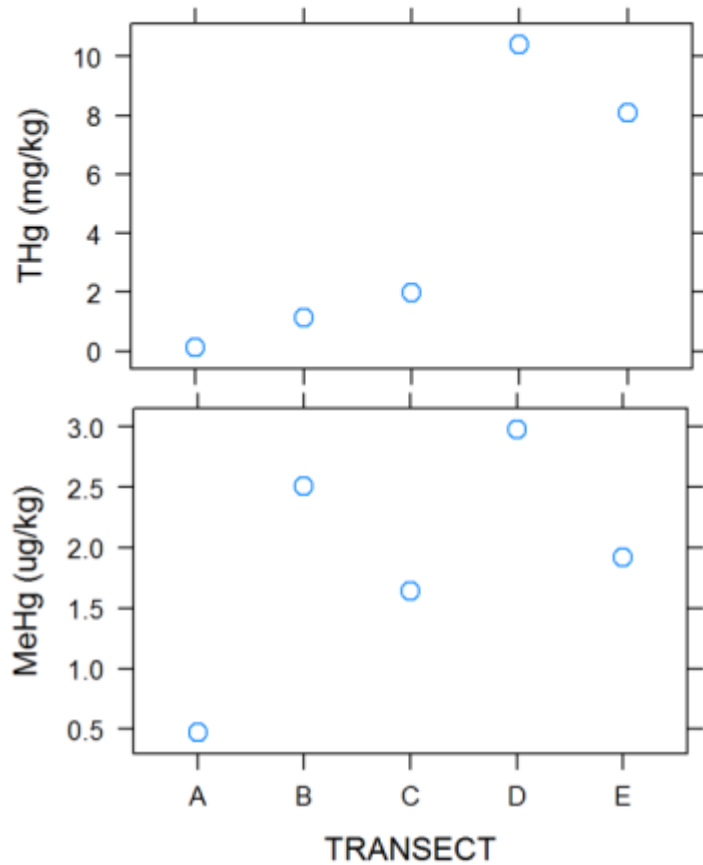
- Three STM stations implemented in 2015
 - STMP-01
 - STMP-05
 - STMP-07
- Abiotic exposure media
 - Near-bank sediment
 - Pore water
- Biological exposure media
 - Periphyton (near bank/mid-channel)
 - Transplanted Asiatic clams
 - Near-bank (seeded/caged)
 - Mid-channel (caged)
- Enhanced vegetation/habitat monitoring elements



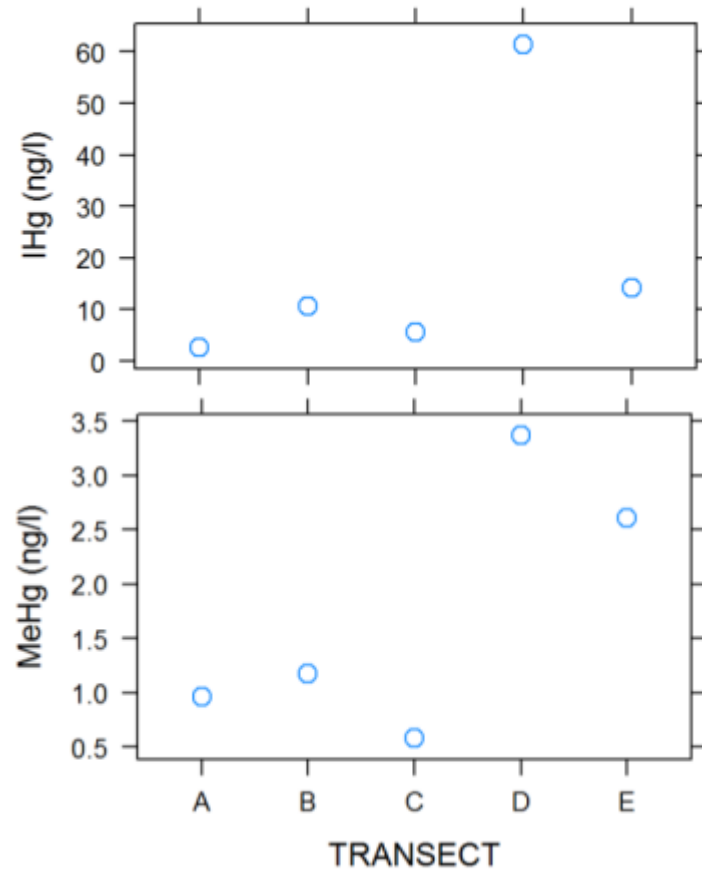
STMP - 01



Sediment



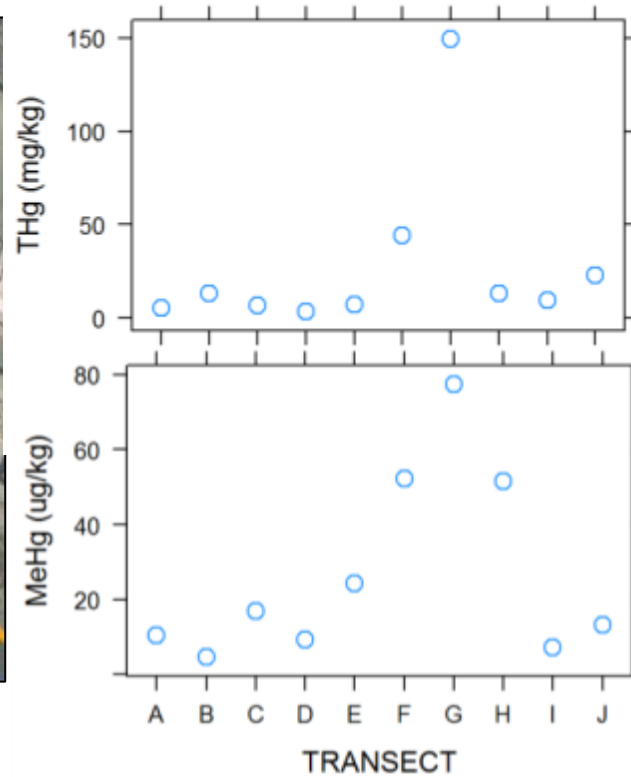
Pore Water



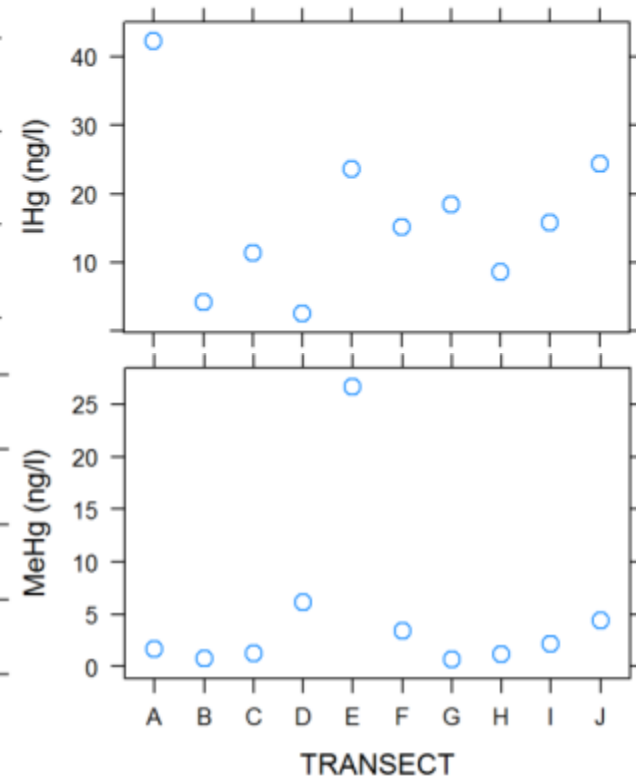
STMP - 05



Sediment



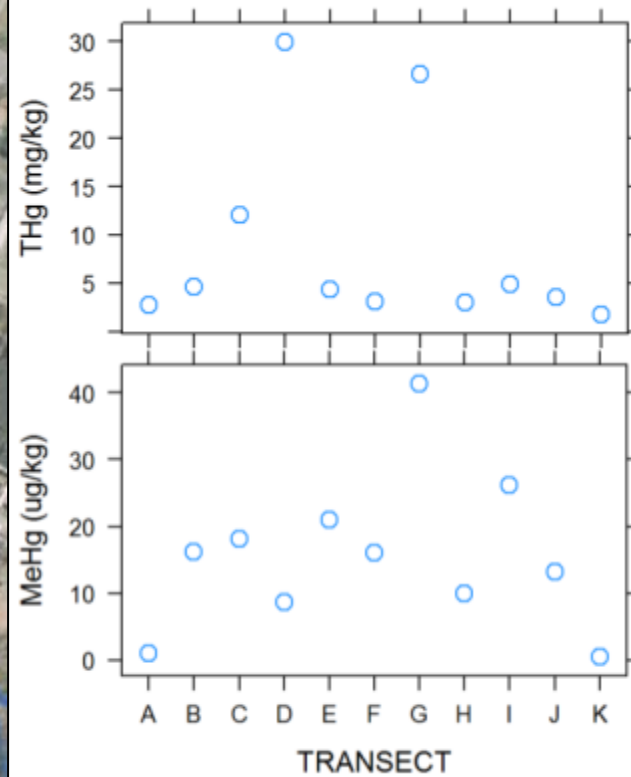
Pore Water



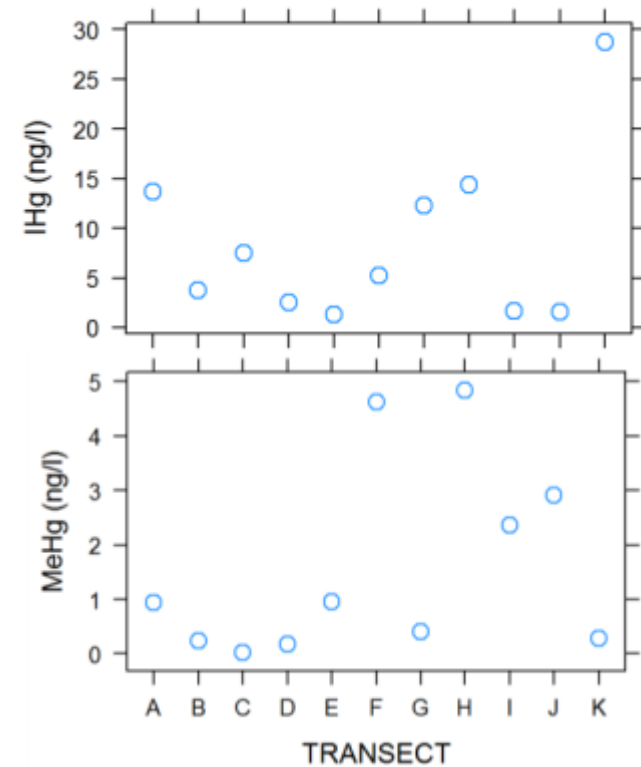
STMP - 07



Sediment



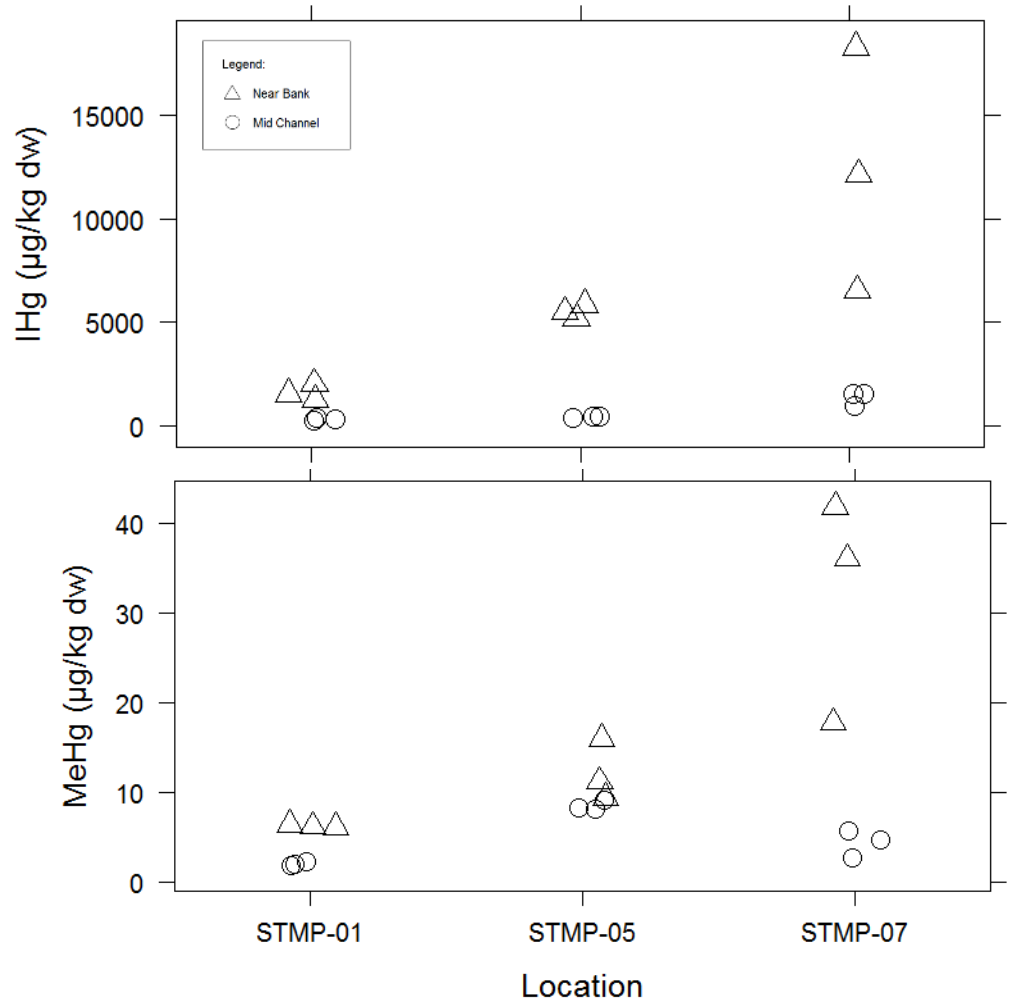
Pore Water



Periphyton



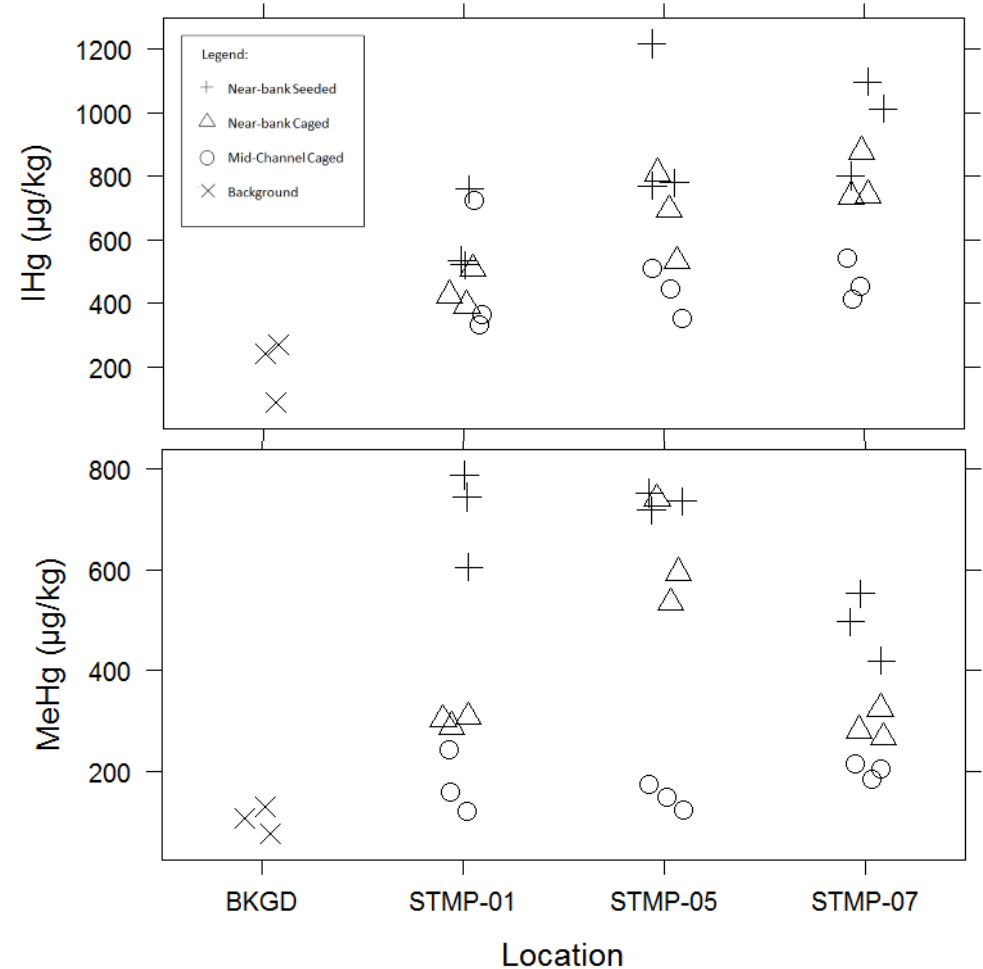
- Increasing Hg concentrations with distance downstream
- Higher Hg concentrations in near bank samples



Asiatic Clams



- Increasing Hg concentrations with distance downstream
- Higher Hg concentrations in near bank and seeded treatments



STM Enhanced Habitat Metrics

Station	Canopy Cover	In-Stream Habitat	Improvised Access
STMP-01	9%	0	2
STMP-05	37%	11	0
STMP-07	43%	7	2



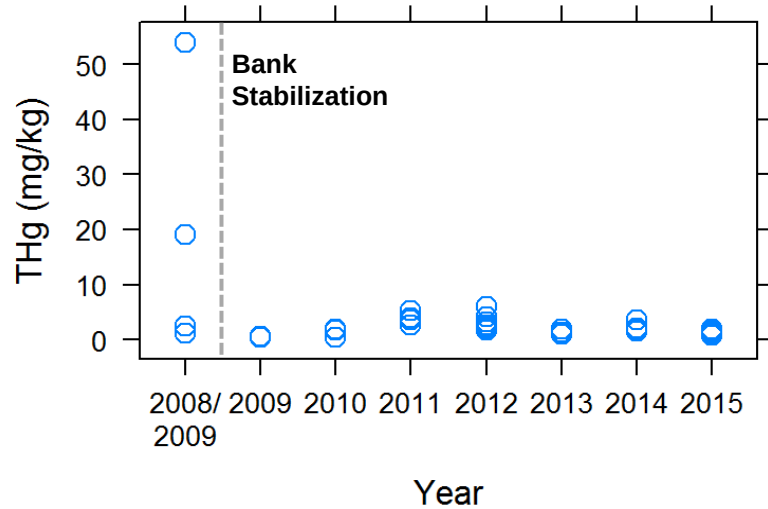
Short-term Monitoring Summary

- All 2015 data collection completed
- Elevated Hg concentrations in sediment and pore water adjacent/downstream of Primary BMAs
- Average Hg concentrations in Sed/PW lower than Pilot Bank baseline data
- Elevated Hg concentrations in near-bank periphyton and clams compared to mid-channel

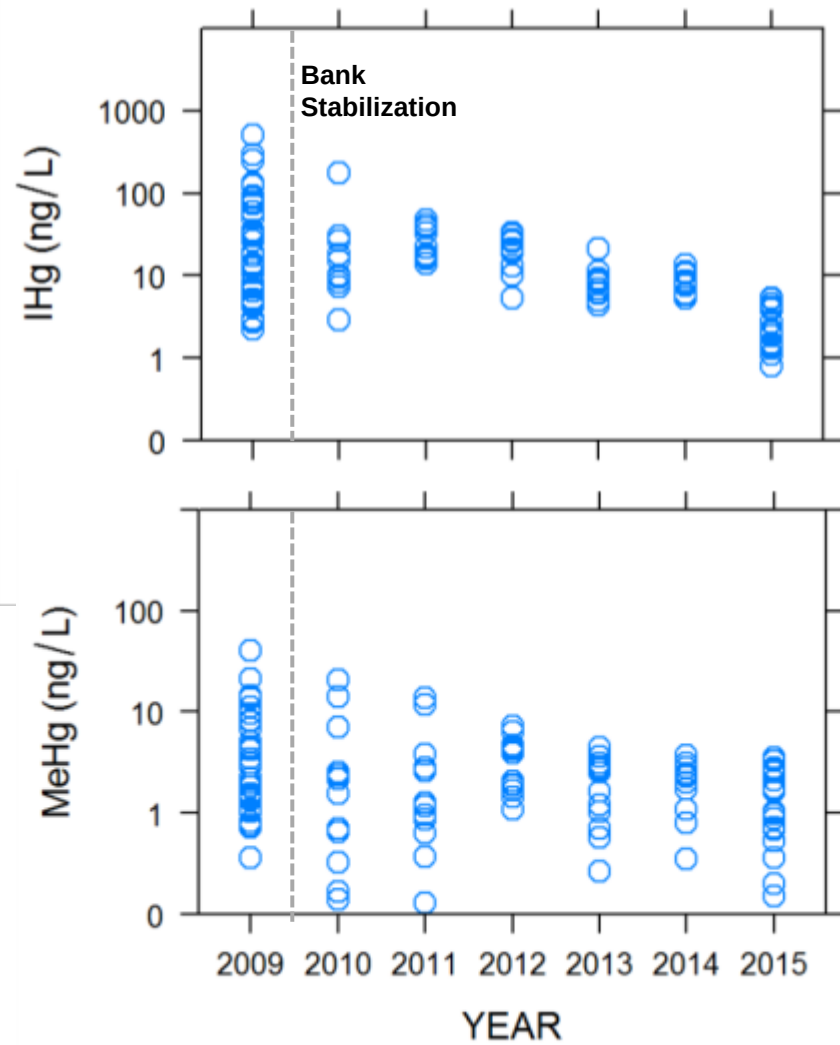


Pilot Bank Data

Sediment



Pore Water



Long-term Monitoring Program Data Review

Human Exposure Monitoring

- 13 Monitoring Locations:
 - South River (4)
 - South Fork Shenandoah (7)
 - Shenandoah (2)
- Spring/Summer 2015 Data Collections
 - Adult smallmouth and largemouth bass
 - Snapping turtles
- Fall 2015 Media:
 - Adult smallmouth and largemouth bass
 - Mallard ducks



Fall 2015 Adult Bass Monitoring Overview

- Conditional approval for non-lethal sampling methods and THg only analysis
- Coordination with VDGIF fall community surveys
- Sampling delayed due to elevated flows



2015/2016 Waterfowl Monitoring Activities

- Enhanced approach
 - Sharpshooting / net cannons
 - Thermal imaging
- USFWS/VDGIF coordination
- Sampling December 2015/January 2016



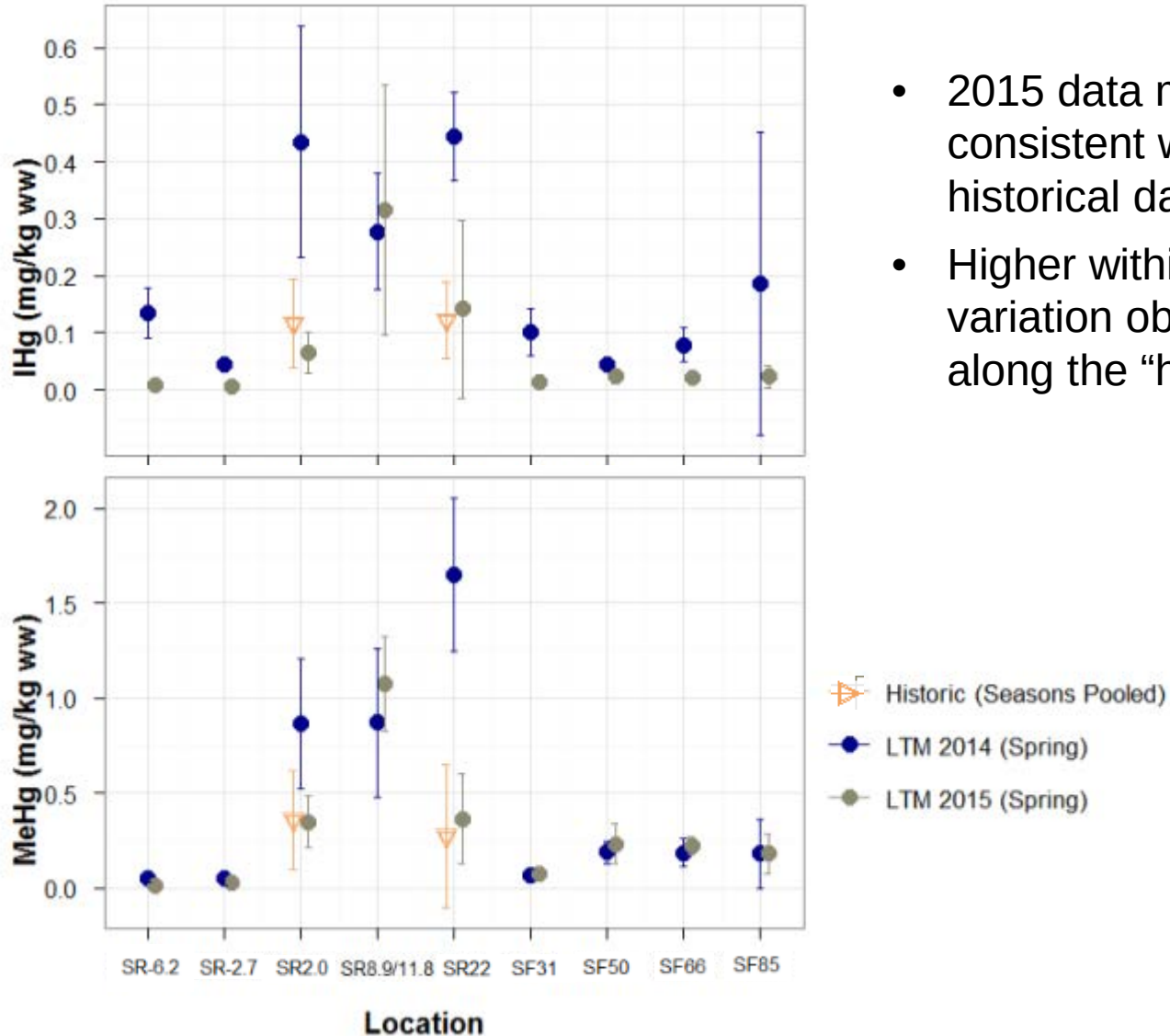
Photo: USFWS; <http://www.werc.usgs.gov/>

Terrestrial Monitoring Activities

- Nine stations sampled
- Three replicates per station collected w/in 50' of river in July/August
- Co-located soil, earthworm, spider and Carolina Wren* samples collected
- THg and MeHg analysis
 - *THg only for Wrens



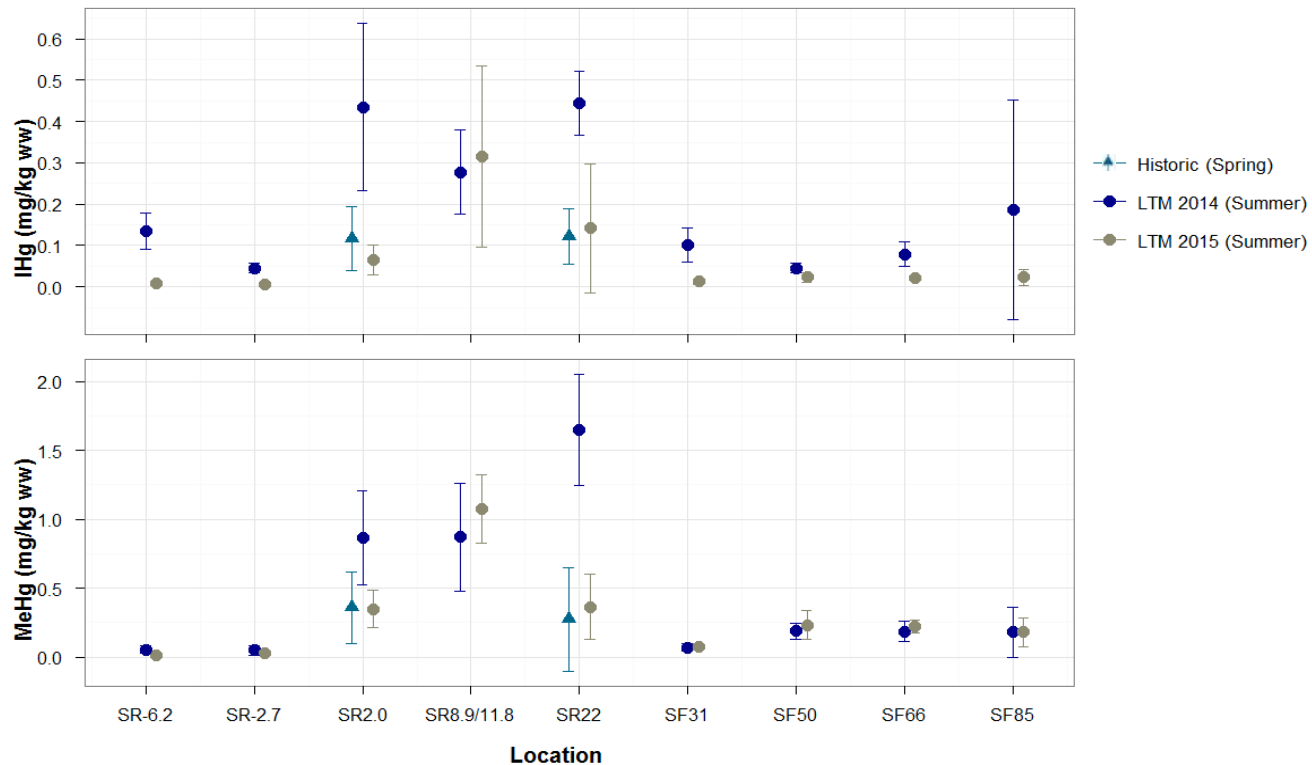
Earthworms



- 2015 data more consistent with historical data
- Higher within station variation observed along the “hump”

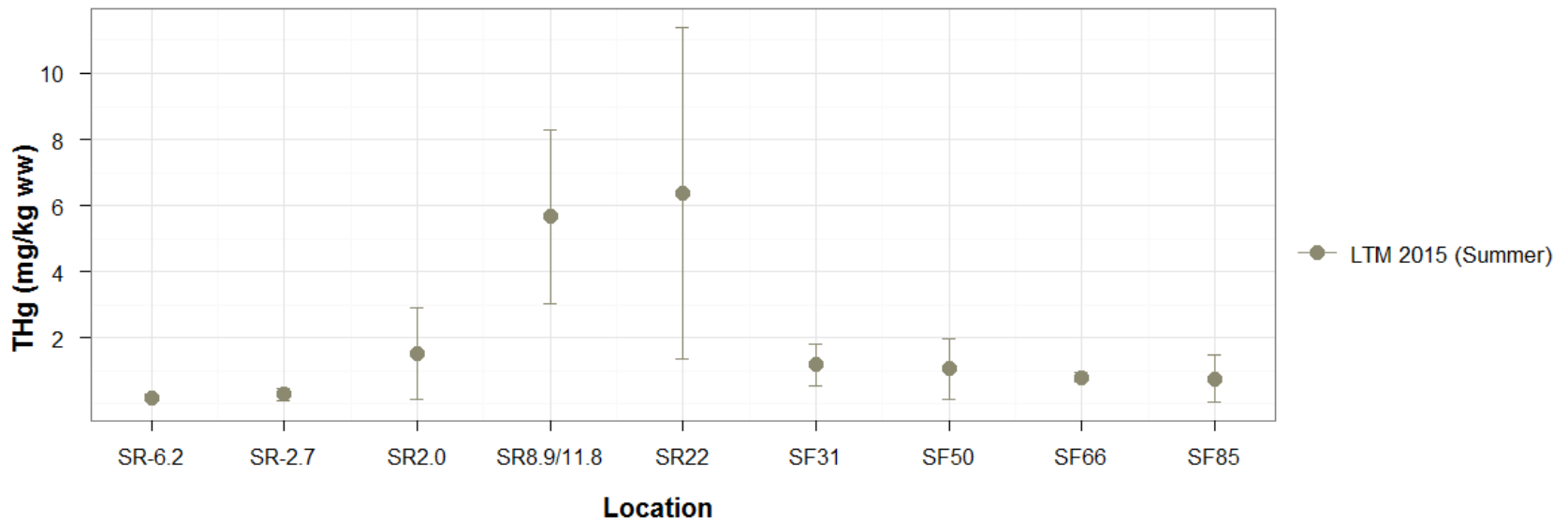
Wolf Spiders

- 2015 data more consistent with historical data
- Higher within station variation observed along the “hump”



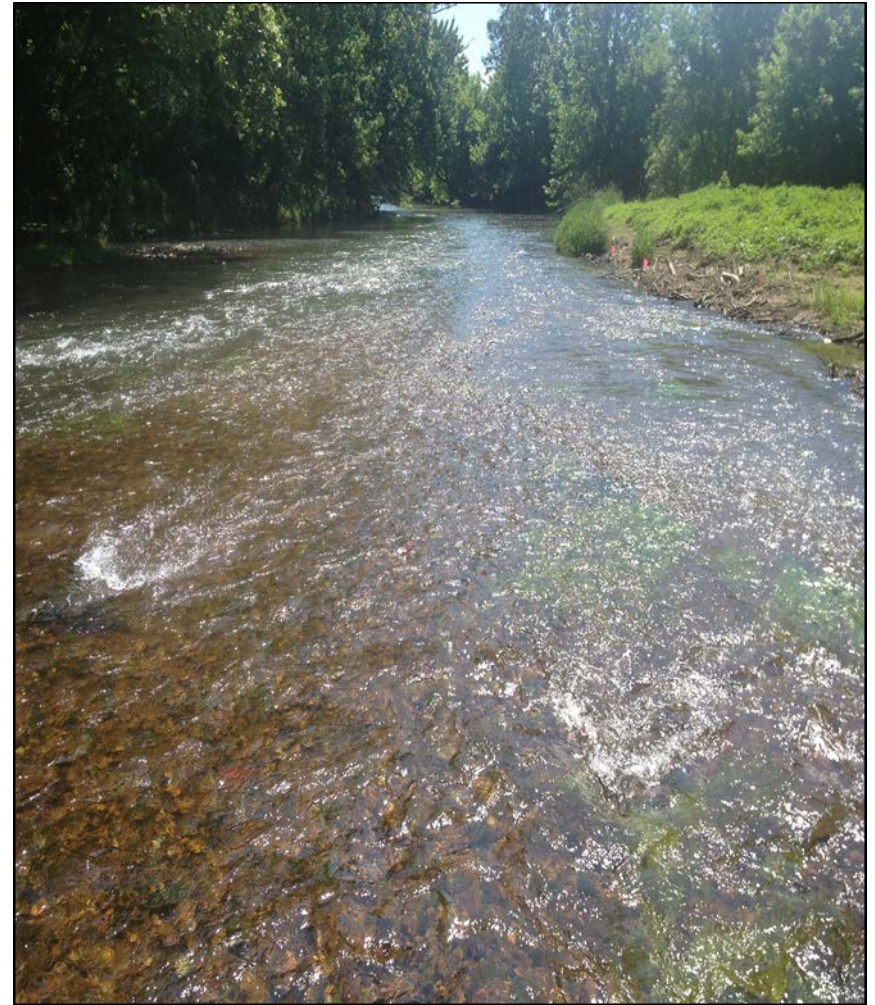
Carolina Wren

- Data collected by University of Delaware
- Juveniles and adults sampled
- Data evaluation is on-going



2015 Long-term Monitoring Conclusions

- Increased sampling efficiencies
- Sustainable sampling locations
- Data consistent with 2014 baseline and historical data
- Continued monitoring will improve understanding of relationship to historical trends in biotic media



Remaining Data Collection Activities in 2015

- Adult/YOY fish tissue
- Mallard duck



A scenic view of a river flowing through a lush green forested valley. The river is in the foreground, with gentle ripples on its surface. The background is a dense forest of green trees covering a hillside. The sky is blue with some light clouds. The word "Discussion" is overlaid in the center in a large, white, sans-serif font.

Discussion

A scenic view of a river flowing through a lush green forested valley. The river is in the foreground, with gentle ripples on its surface. The background is a dense forest of green trees covering a hillside. The sky is blue with some light clouds. The text "Supplemental Slides" is overlaid in the center in a large, white, sans-serif font.

Supplemental Slides

Human Exposure Monitoring

- Media Evaluated:
 - Adult Smallmouth and Largemouth Bass
 - Snapping Turtles
 - Mallard Ducks
- 13 Monitoring Locations
 - South River (4)
 - South Fork Shenandoah (7)
 - Shenandoah (2)

Reach Code	Description
SR-2.7	Existing SR-01 located at Lyndhurst Ave. to Ridgeview Park
SR0.1	Constitution Park/Waynesboro Reach
SR11.8	Dooms to Crimora Reach
SR23.5	Hariston to Port Republic Reach
SF26.6	SFS @ Lynwood
SF48	SFS @ Shenandoah (above dam)
SF63	Newport Landing
SF72	Hamburg, VA near Rt. 211 Bridge
SF89.4	Foster's Landing, near Rt. 694 Bridge
SF106	Bentonville Landing, near Rt. 613 Bridge
SF115	Karo Landing
SH143	Rt. 17/50 Bridge
SH158	Berryville, VA near Rt. 7 bridge

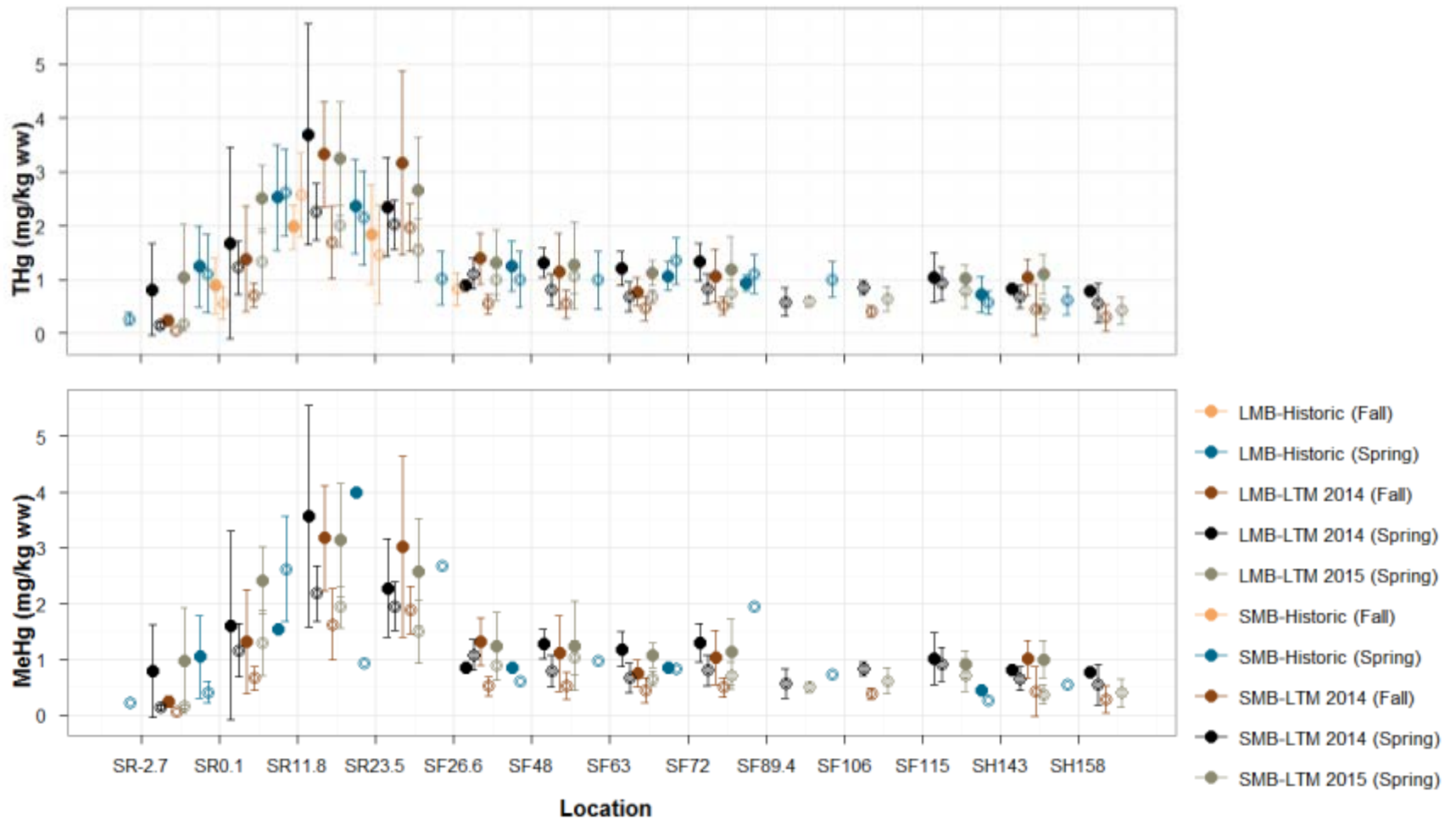
Notes:

SR = South River

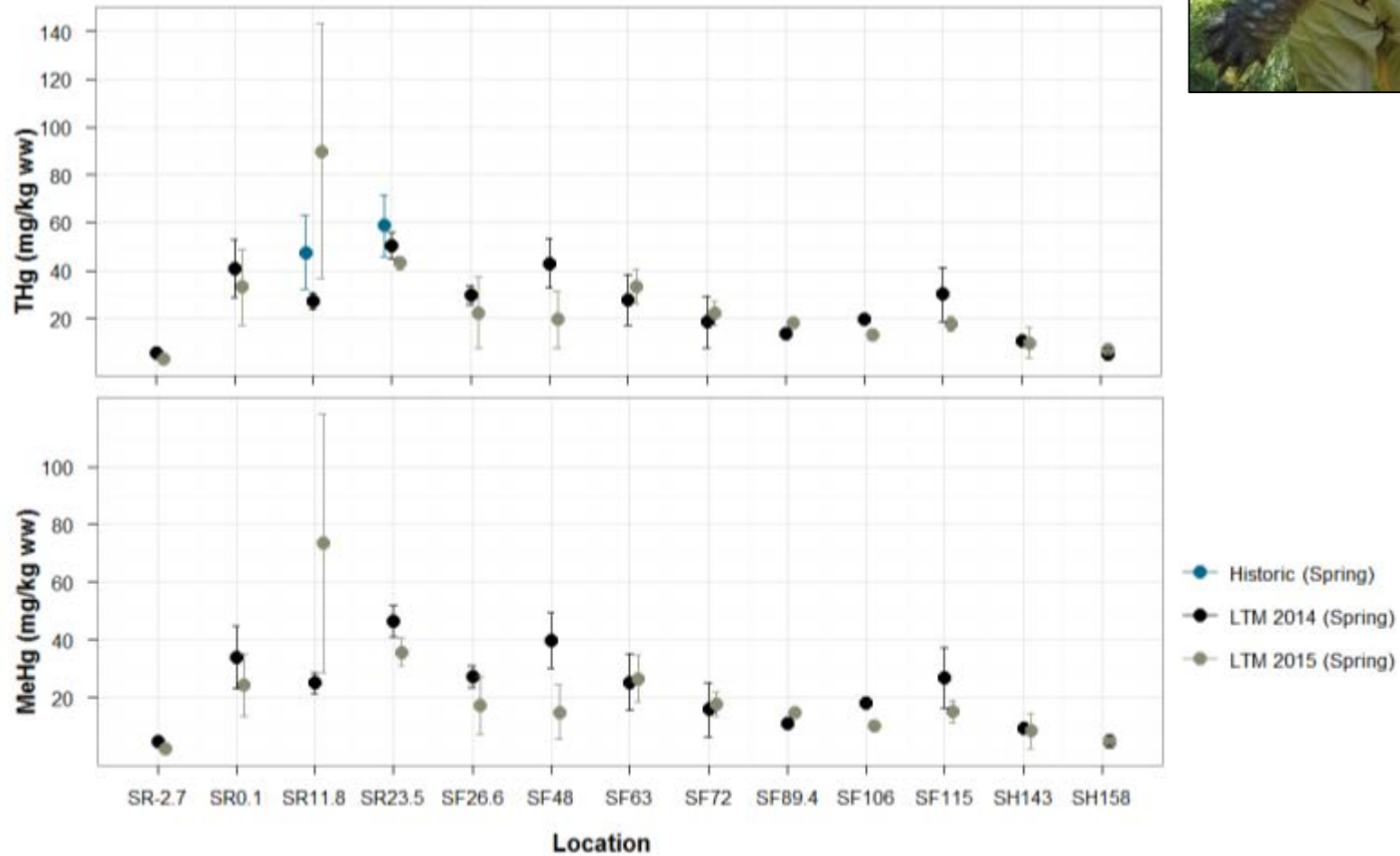
SF = South Fork Shenandoah River

SH = Shenandoah River

Adult Bass



Snapping Turtles



Aquatic Ecological Exposure Monitoring

- Five potential exposure media are being evaluated:
 - Asiatic Clams (mid-channel; caged)
 - Mayflies
 - Periphyton
 - Sediment
 - Young-of-Year Smallmouth Bass
- Benthic Community Assessment
- Eight Monitoring Locations
 - South River (5)
 - South Fork Shenandoah (2)
 - Middle River (1)

Reach Code	Description	Aquatic Ecological Exposure (Sediment, Benthic Inverts, Periphyton, Asiatic Clam, YOY Fish, Benthic Community)
SR-2.7	Existing SR-01 located at Lyndhurst Ave. to Ridgeview Park	●
SR0.1	Constitution Park/Waynesboro Reach	●
SR3.5	RRM 3.5	●
SR11.8	Dooms to Crimora Reach	●
SR23.5	Hariston to Port Republic Reach	●
SF26.6	SFS @ Lynwood	●
SF48	SFS @ Shenandoah	●
MR01	Middle River Reference	●

Notes:

SR = South River

SF = South Fork Shenandoah River

NA = Not applicable

- No YOY fish
- No Benthic community
- Benthic community only

Aquatic Ecological Exposure Monitoring

- Eight Monitoring Locations:
 - South River (5)
 - South Fork Shenandoah (2)
 - Middle River (1)
- Fall 2015 Media:
 - Asiatic Clams (mid-channel; caged)
 - Mayflies
 - Periphyton
 - Benthic Community Assessment (*analyses pending*)
 - Young-of-Year Smallmouth Bass (*to be collected*)

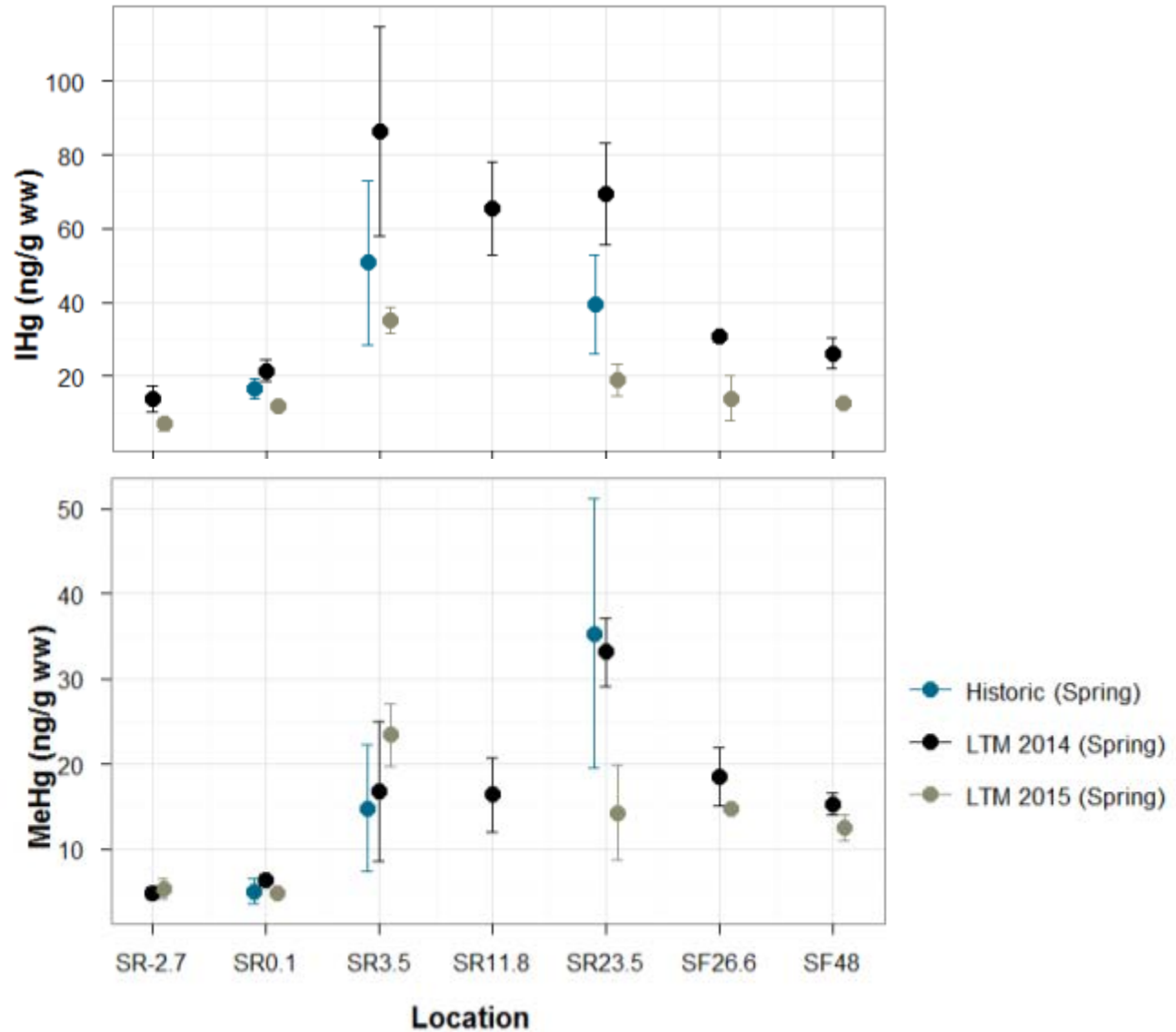


Asiatic Clam Monitoring Activities

- Transplanted caged clams deployed mid-channel
- 5-week deployments (spring and fall)
- Three replicates per location
- 24-hr depuration
- THg and MeHg analysis
- Able to recover clams prior to elevated flows



Summary of Asiatic Clam Results

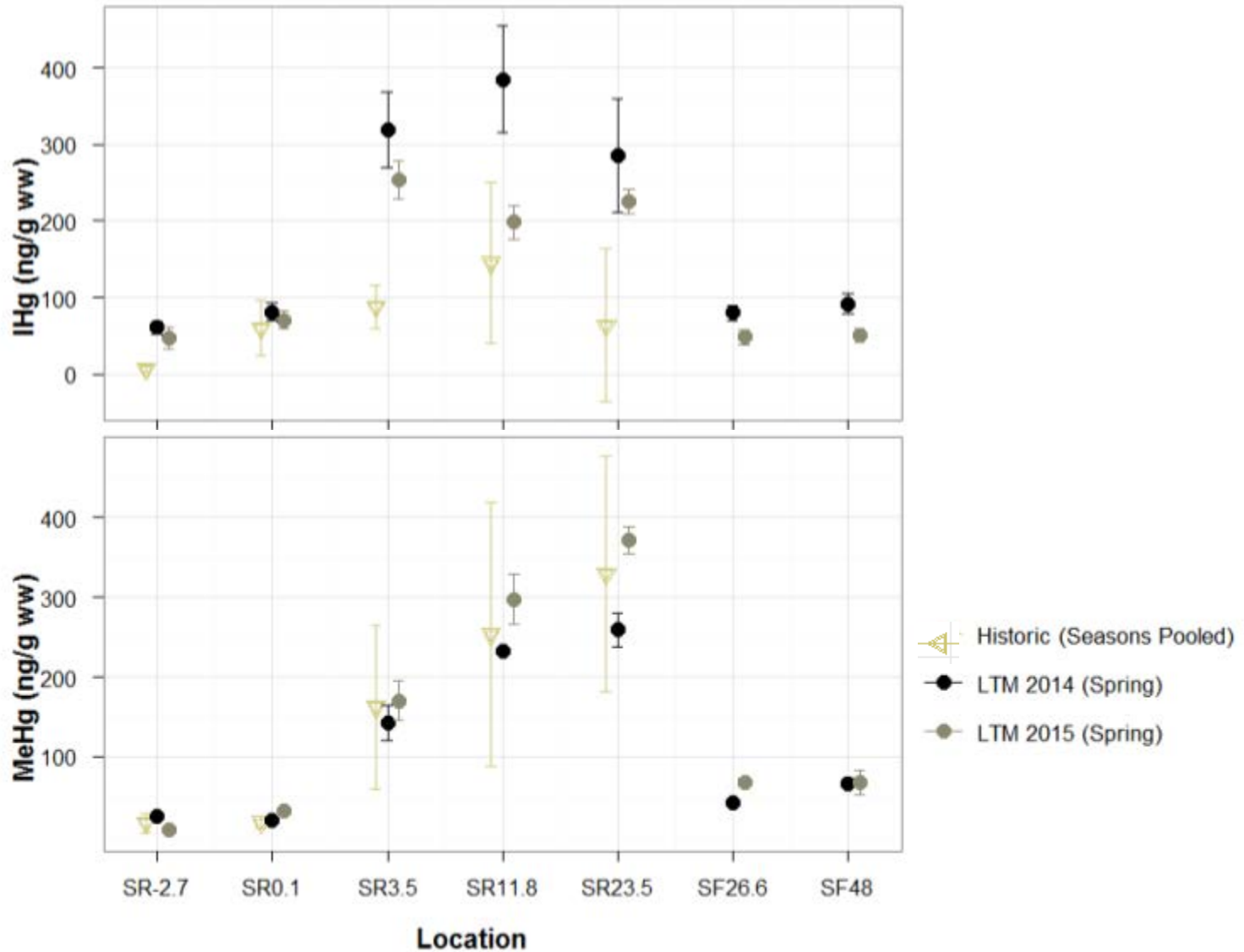


Mayfly Monitoring Activities

- *Heptagenid* mayflies collected in spring and fall of 2014
- Three replicates per location
- 10 individuals per composite
- THg and MeHg analysis



Summary of Mayfly Results

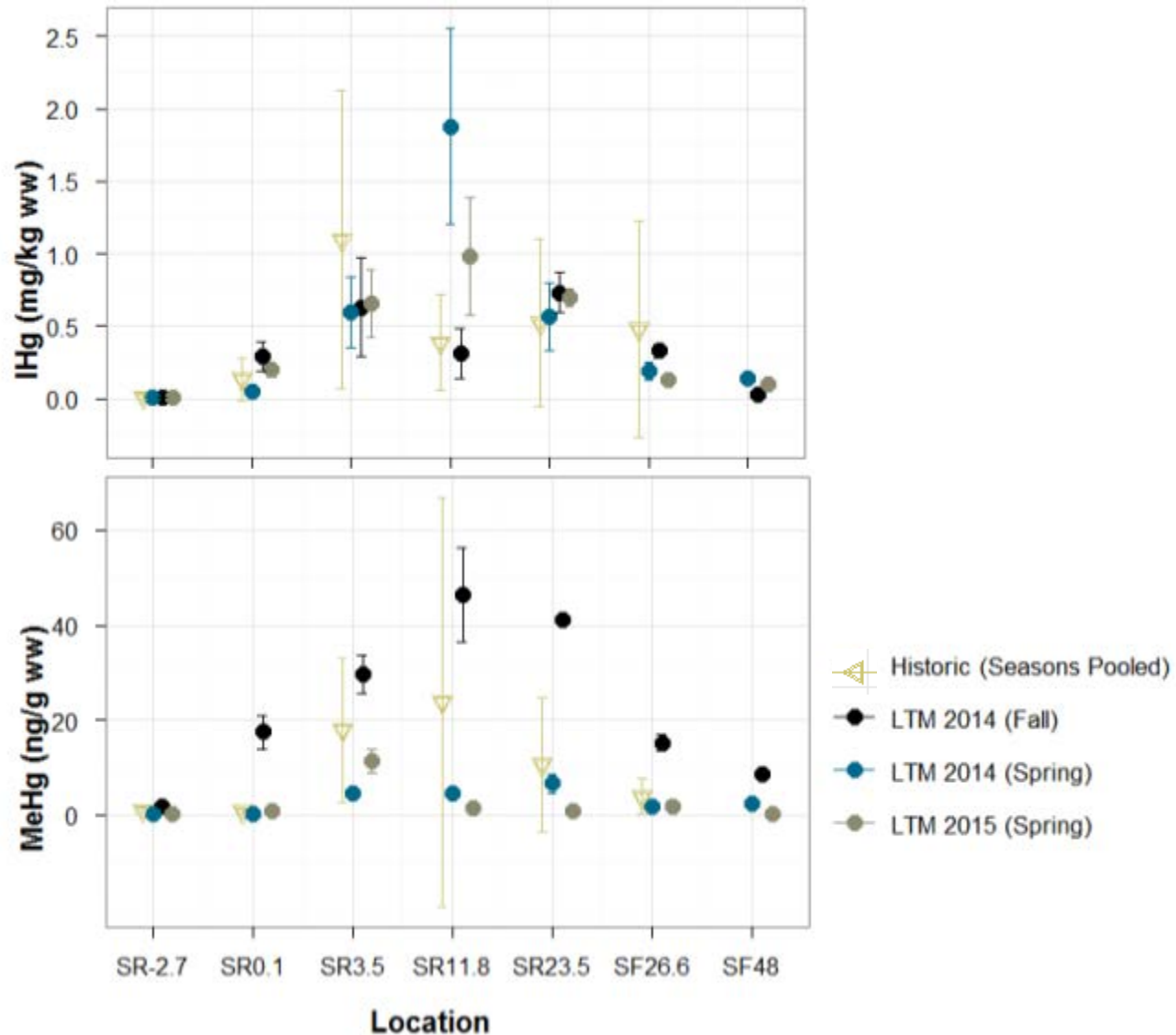


Periphyton Monitoring Activities

- Native periphyton sampled from cobbles
- Three replicates per location collected in the spring and fall of 2015
- THg and MeHg analysis

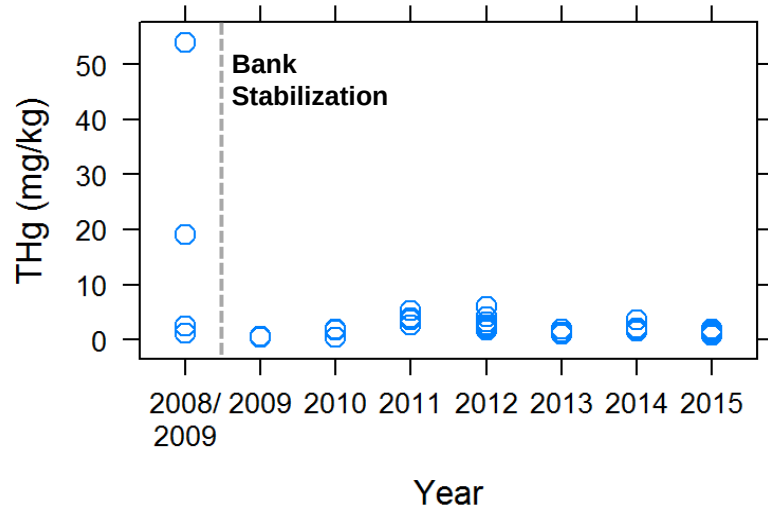


Summary of Periphyton Results

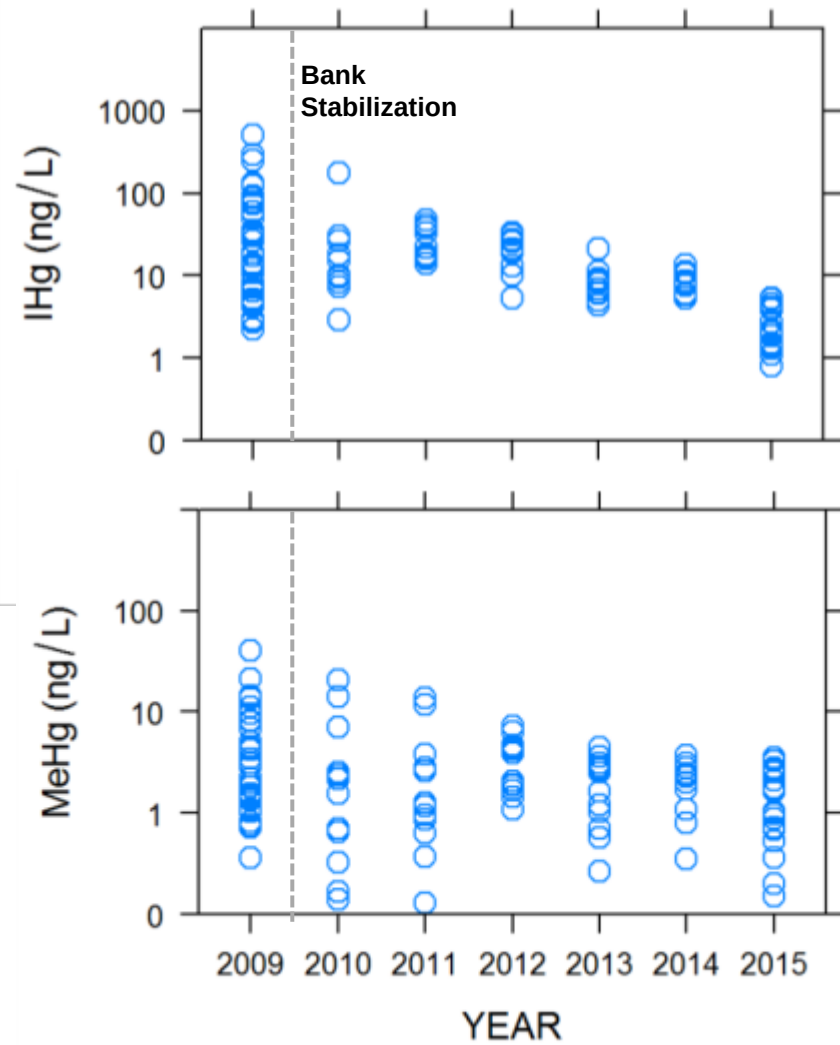


Pilot Bank Data

Sediment



Pore Water



Pilot Bank Clams

