

AOC 4 Monitoring Program

Former DuPont Waynesboro Site - AOC 4

South River Science Team Spring Meeting

April 10, 2019



Agenda

- Monitoring Program Overview
- Data Trends
- Hypotheses
- Separating the Signal from the Noise...



Monitoring Program: Components & Objectives

STM Program

- Document system improvements due to remedy
- Relatively short timeframe
- Small spatial scale (e.g., adjacent to specific BMA)



LTM Program

- Provide data to assess efficacy of remedy in the broader ecosystem
- Long timeframe (e.g., 5-10+ years)
- Larger spatial scale
 - South River
 - South Fork Shenandoah River
 - Shenandoah River



Short-term Monitoring Program

- Abiotic exposure media
 - Near-bank sediment
 - Pore water
- Biological exposure media
 - Periphyton (near bank/mid-channel)
 - Transplanted Asiatic clams
 - Near-bank
 - Mid-channel
- Enhanced vegetation/habitat monitoring elements

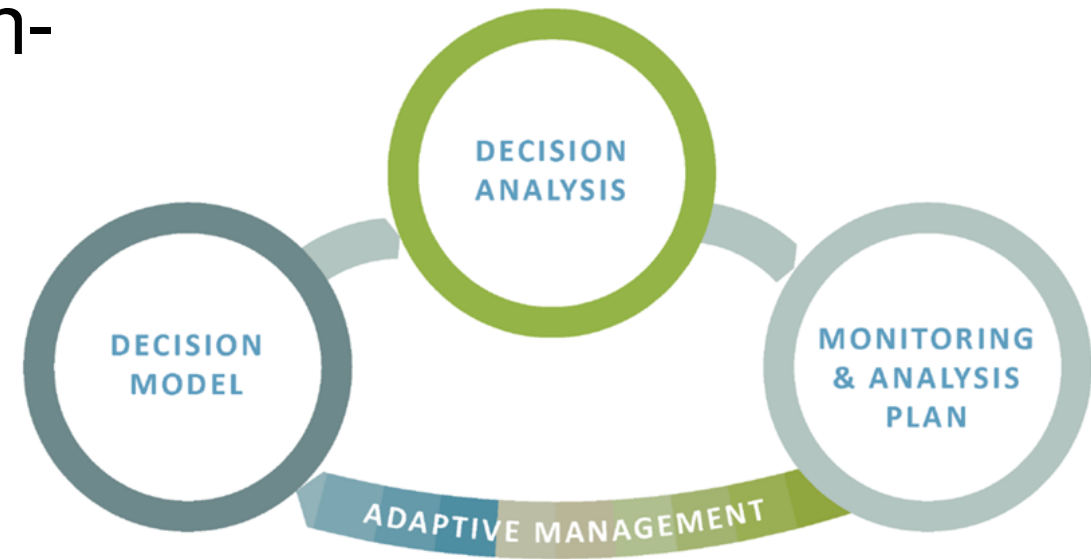


Baseline Long-term Monitoring Program

- Hg exposure >160 miles of river and floodplain
- Data collection focused on three potential receptor groups:
 - Human
 - Bass, Snapping Turtles, Mallard Ducks
 - Aquatic Ecological
 - Periphyton, Asiatic Clams, sediment, mayflies, YOY Smallmouth Bass
 - Terrestrial Ecological
 - Carolina Wren, Earthworms, Wolf Spiders



- New information informs on-going decisions
- Examples:
 - Is remedy effective?
 - Can we improve remedy/monitoring?
 - Are data collections redundant?



2018 LTM Program Revisions

- Revised LTM Plan
 - Media
 - Analytes
 - Frequency/Locations



Human Health

- Adult Bass
- Snapping Turtle
- Mallard Duck



Aquatic Ecological

- Sediment
- Mayflies
- Clams
- Benthic Comm.
- Periphyton



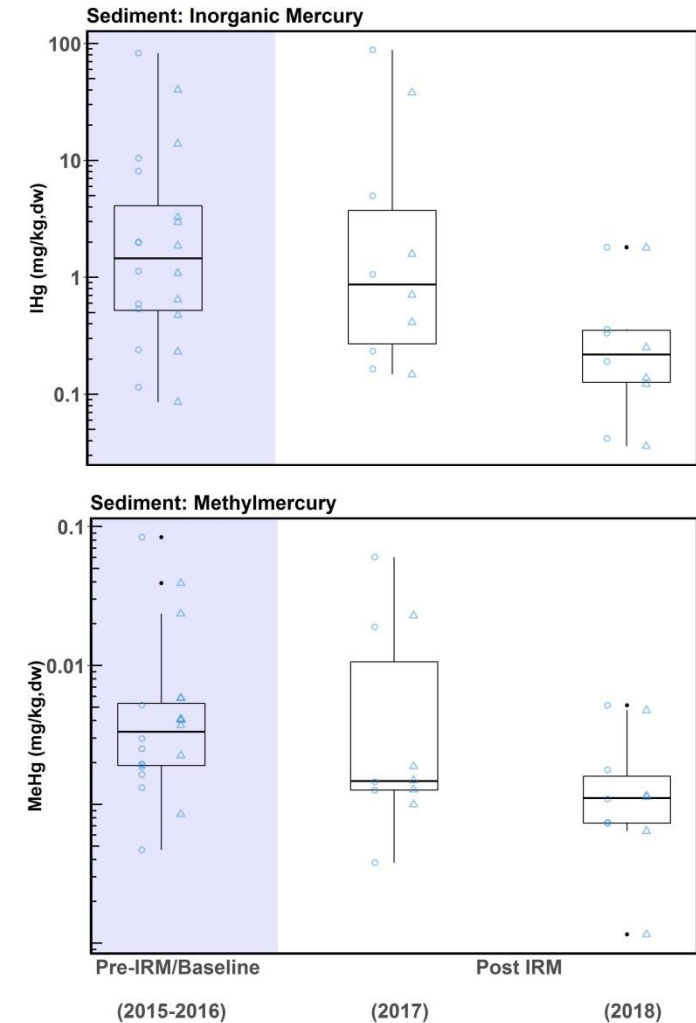
Terrestrial Ecological

- Wolf Spiders
- Carolina Wren
- Earthworms
- Soil

Short-term Monitoring Data

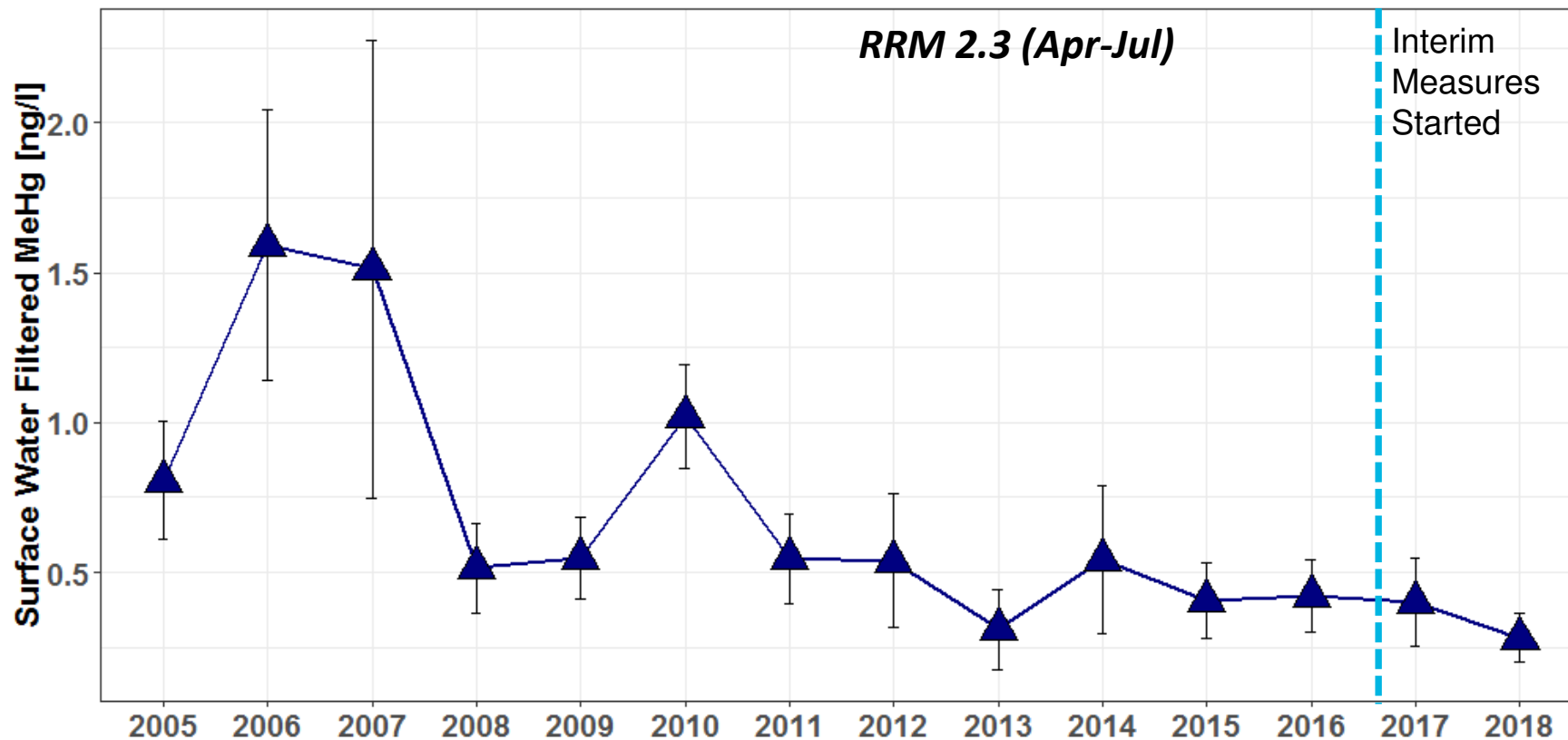
- Decreasing IHg and MeHg concentrations in sediment at remediated BMAs
- Post-IRM bulk sediment IHg concentrations similar to those on particles in water column
- Similar declines not observed at non-remediated BMAs

Constitution Park



Long-term Surface Water Data Trends

- Declining spring FMeHg concentrations
- Important time period for methylation and YOY-bass exposure



Inter-Annual Variability

- Aquatic Ecological Receptors
Baseline (2014-2016) vs. Post IM (2017-2018)



Sediment

IHg ↓

MeHg ↑



Mayflies

THg ↓



Asiatic Clam

IHg =

MeHg ↑

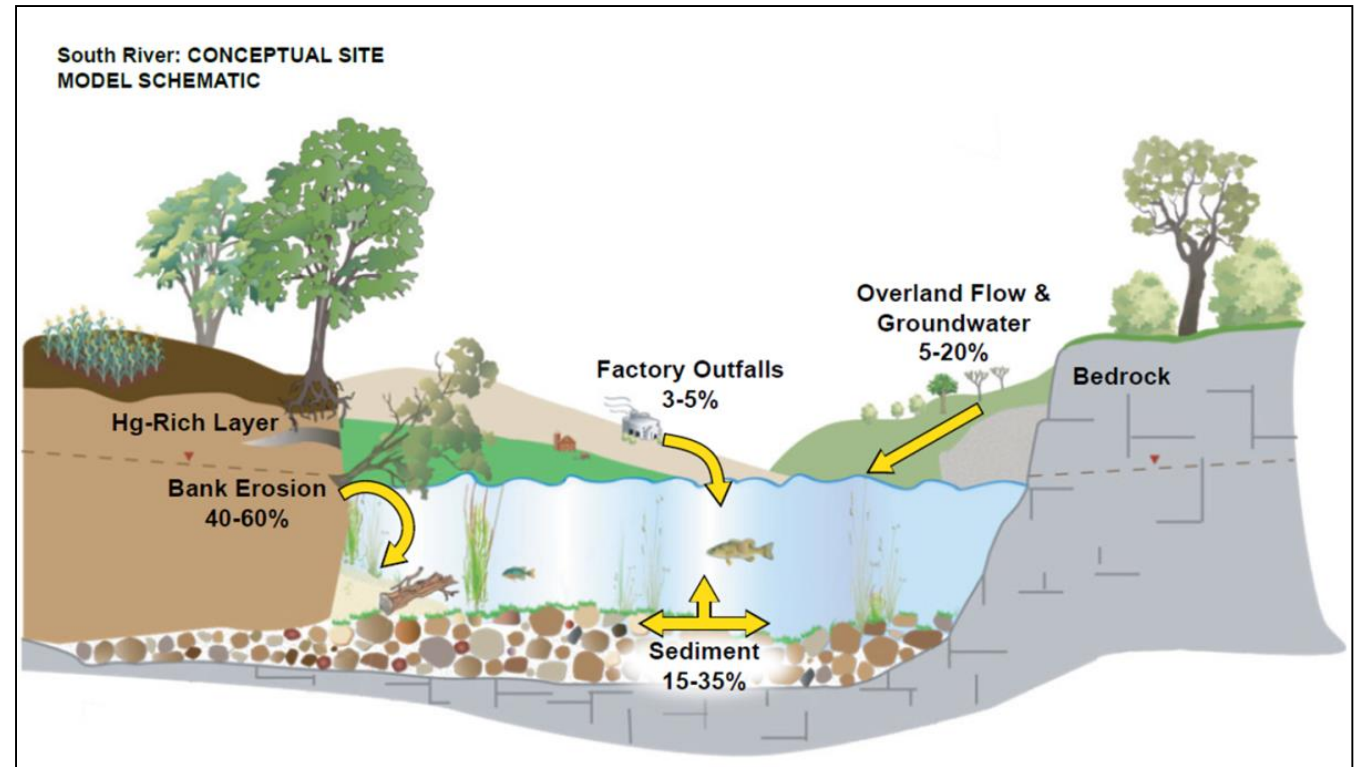


YOY Smallmouth

THg ↑

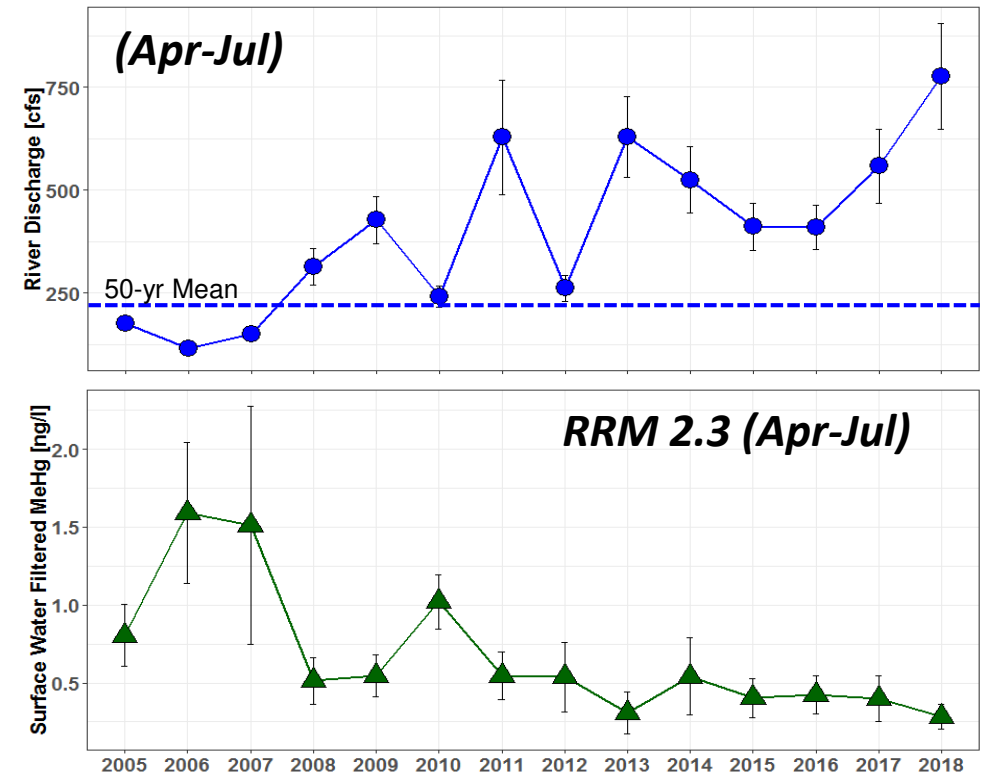
Many controls on MeHg production and uptake

- Climate
- Bank loading
- Plant outfall
- Biological processes

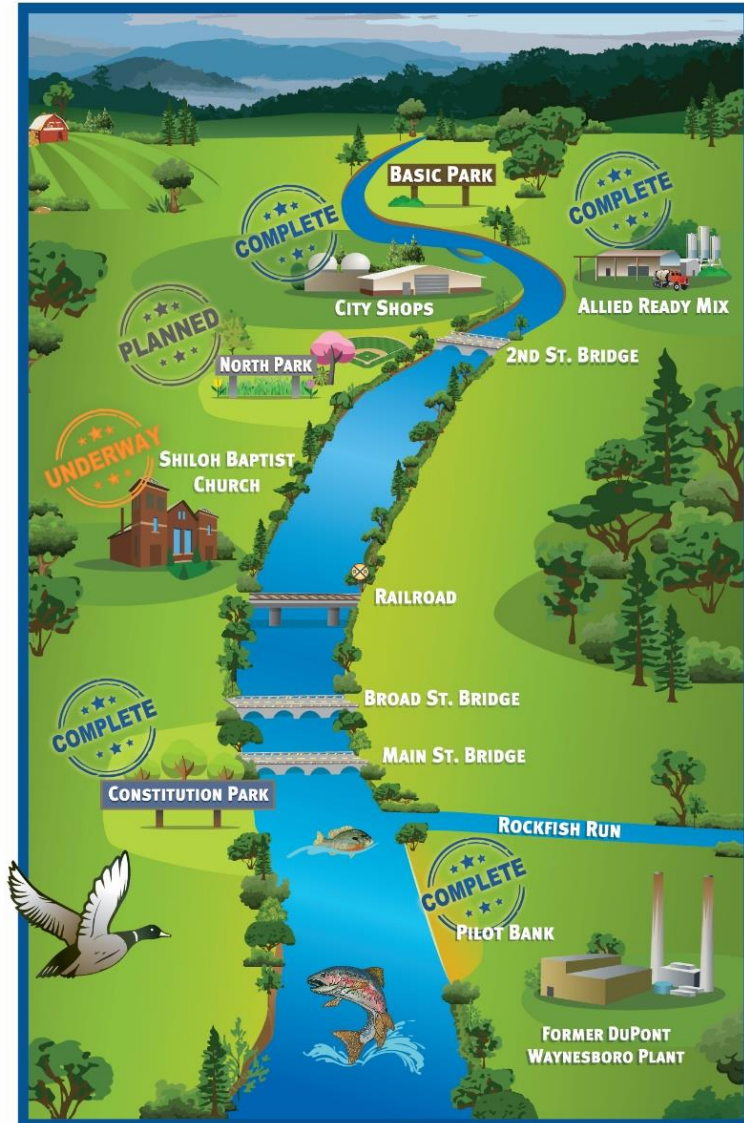


Climate Influence?

- Generally higher than average stream flows over last decade
- Declining MeHg concentrations in surface water
- Similar variability observed in lower trophic level biotic media



Phase 1 Interim Measures



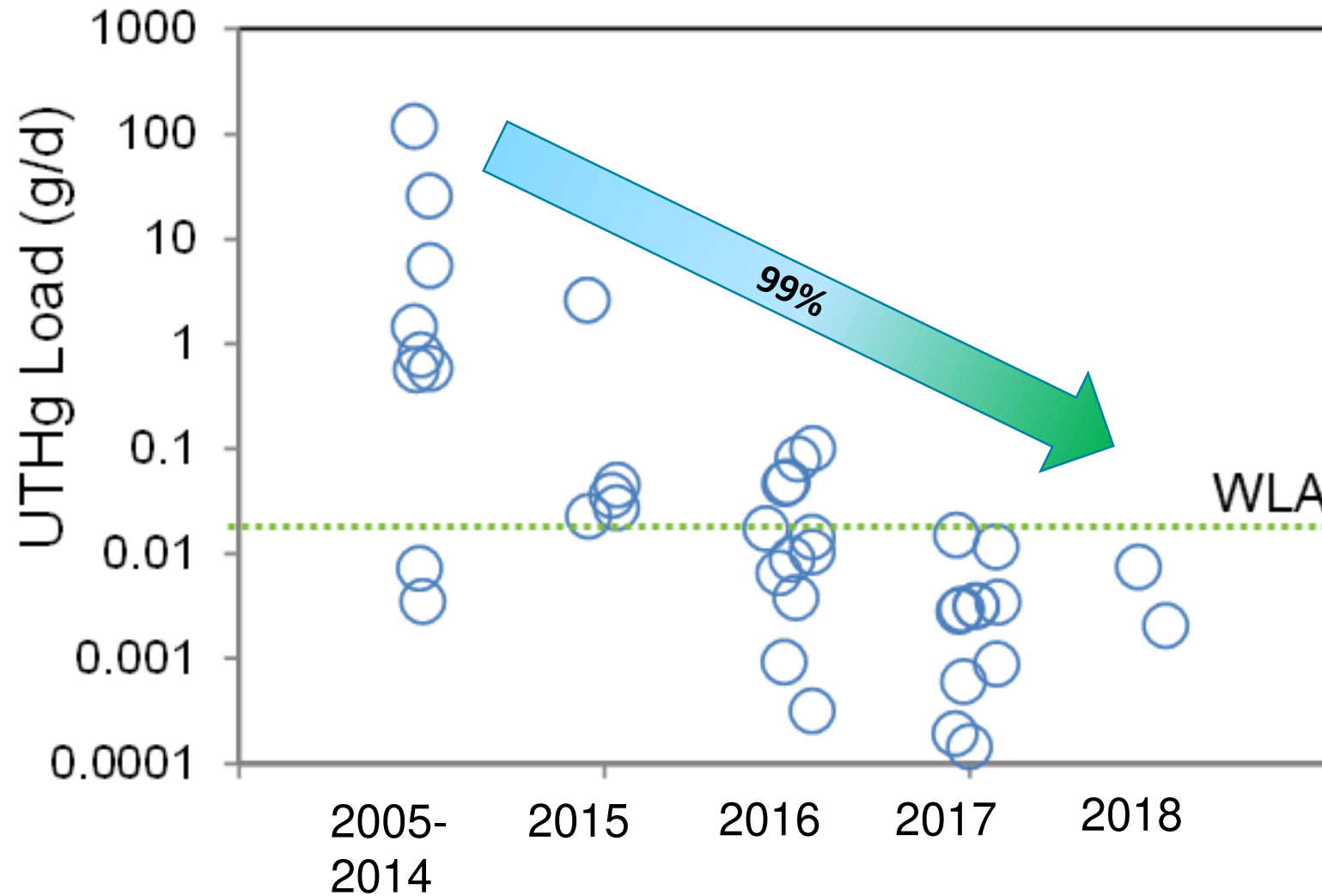
Estimated Percent of Mercury Input From Banks Reduced to Date

(October 2018)



It is estimated that the erosion of six South River riverbanks contributes appreciable mercury to the river each year. The goal of the remediation work is to stop the erosion of these riverbanks and, in doing so, reduce the mercury input into the South River by 90%.

Outfall 011 THg Loading



- Developed statistical models to **test effects** of different **variables** to predict **surface water methylmercury**:

Fixed Effects

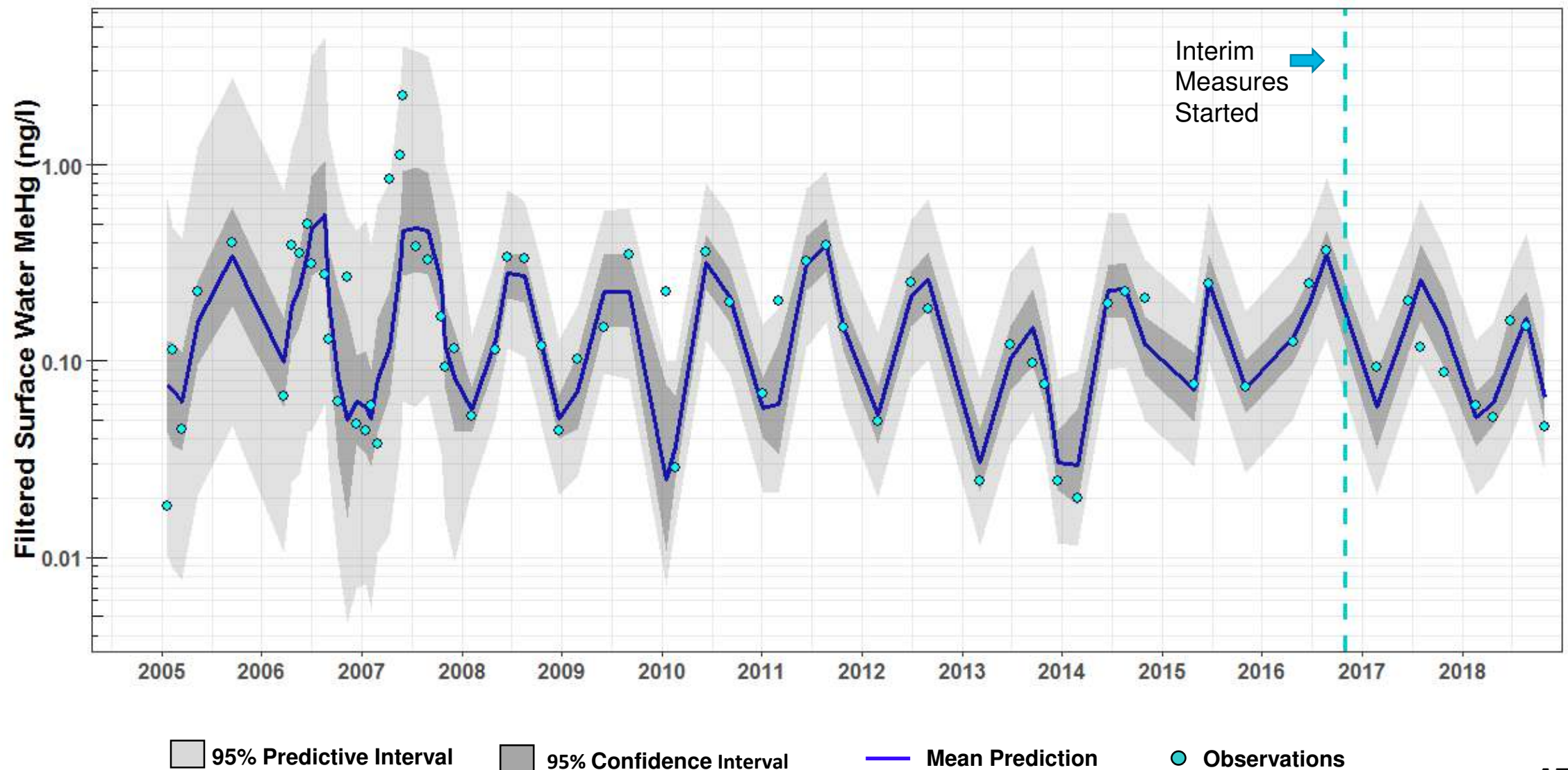
- Water temperature
- River discharge
- Outfall load

Random Effects

- Location (River Mile)
- Bank remediation

Uncertainty Analysis

Separating the Signal from the Noise – Results



Concluding Remarks

- Climate has significant effect on surface water MeHg
- Surface water MeHg predictions are lower than long-term average predictions at RRM 2.3 in the ‘Post-remediation’ period
- *Monitoring is on-going – tools are in place to better separate the remediation ‘signal’ from the noise*

Hot Off the Press!





Thank You!