



AOC 4 Monitoring Program

Former DuPont Waynesboro Site - AOC 4

South River Science Team Meeting

April 24, 2020



AECOM

Agenda

- Monitoring Program Overview
 - Short-term
 - Long-term
- Data Review
- Adaptive Management
 - Monitoring Program Synchronizations



Monitoring Program: Components & Objectives

STM Program

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

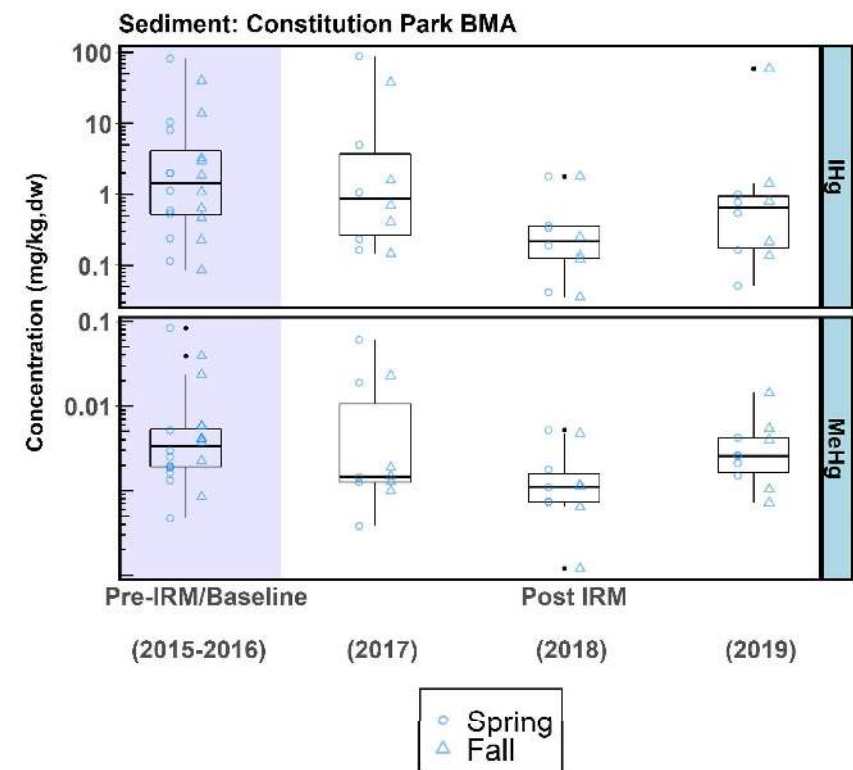
LTM Program

- 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
- 2020 1st Post-IM LTM Report



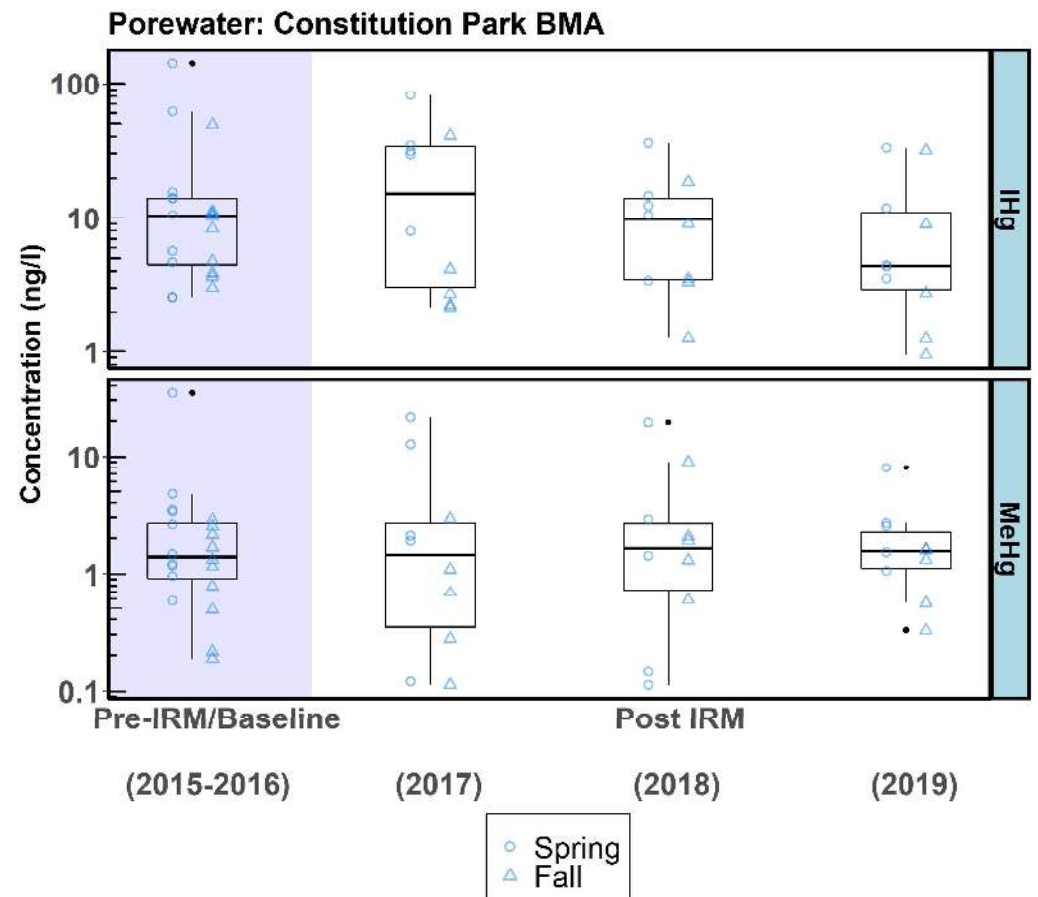
Short-term Monitoring Data

- 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



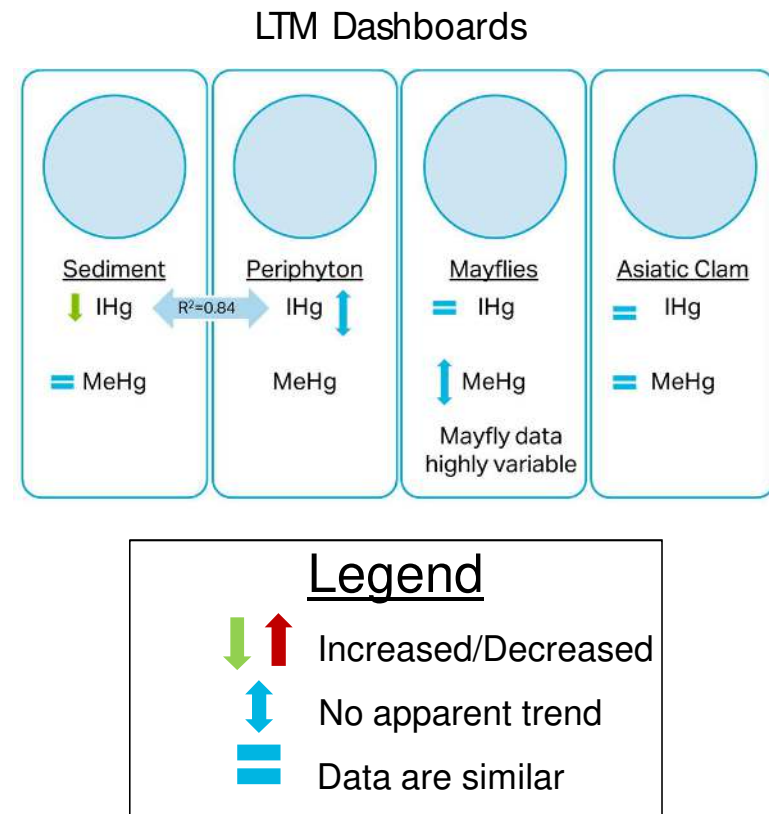
Short-term Monitoring Data

- Post-IRM pore water concentrations declining following post remedy “bump”
- Shiloh Baptist Church BMA did not have Post-IRM “bump”
- Similar declines not observed at non-remediated BMAs



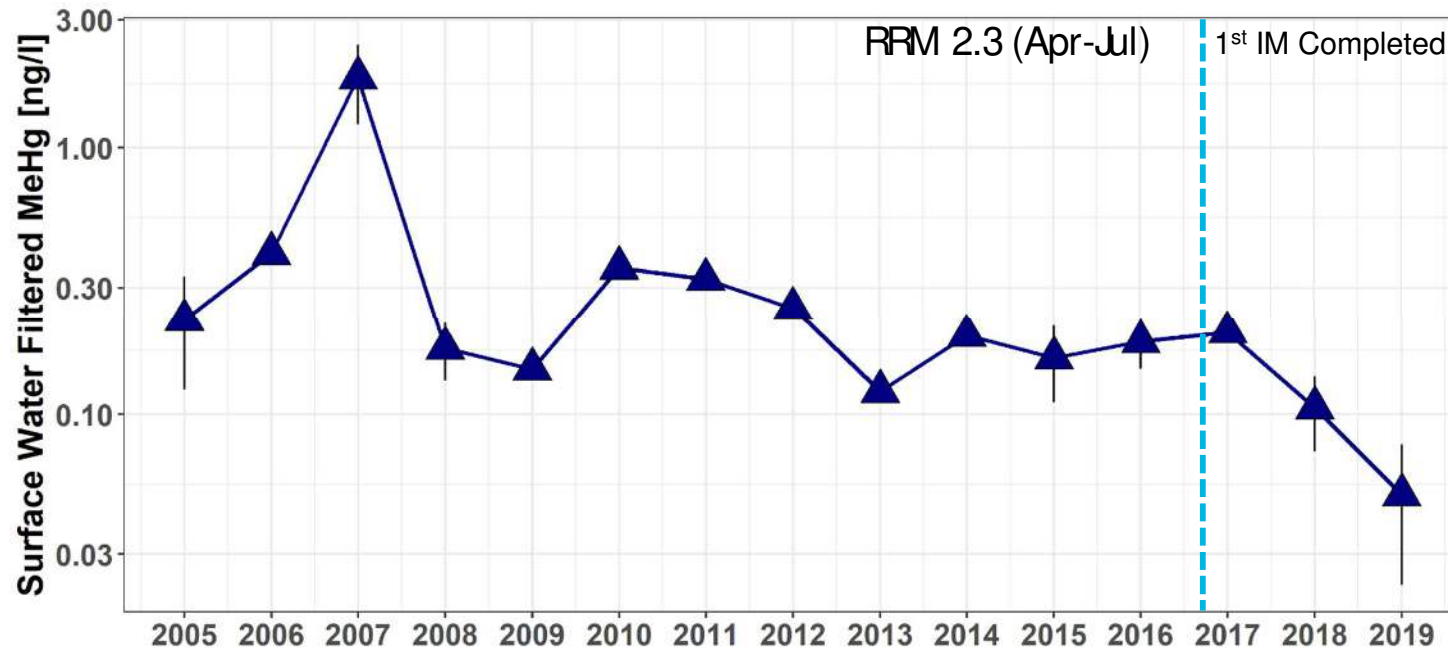
Long-term Monitoring Data Evaluation

- First Post-IM LTM report in 2020
- Statistical trend evaluation
 - Simple Linear Regression
 - Jonckheere-Terpestra Test
 - Williams' Test
- Monitoring data to inform remedial decision making through Adaptive Management



Long-term Surface Water Data Trends

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



Aquatic Ecological Receptors

Baseline (2014-2016) vs. Post IM (2017-2019)



Sediment

IHg ↓*

MeHg =



Mayflies

THg ↓



Asiatic Clam

IHg =

MeHg =



YOY Smallmouth

THg ↓ / =

* Trend may be influenced by analytical method change in 2019

Terrestrial Ecological Receptors

Baseline (2014-2016) vs. Post IM (2017-2019)



Wolf Spiders

THg ↓



Carolina Wren

THg ↓*

* Carolina wren to be sampled in 2020

Human Exposure Receptors

Baseline (2014-2016) vs. Post IM (2017-2019)



Large Mouth Bass

THg ↓



Smallmouth Bass

THg ↓

Monitoring in an Adaptive Management Framework

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



Multiple STM/BMA Monitoring Programs

1) STM Program (2015)

- Bank stability/vegetation (annual first 3-years)
- Mercury monitoring
 - Near-bank – biannual first 3-years
 - Mid-channel – annual first 10-years
- Habitat Metrics
 - Ancillary Habitat Metrics (Non-RCRA)

2) IM Work-plan Monitoring and Maintenance Plan (2016)

- Bi-annual first 3-years

3) AOC 4 Maintenance Plan (2018)

- Quarterly first year; annual next 5-years
- Every five years following initial 6-year period

AOC 4 Surface Water Monitoring Program



- Frequency
 - AECOM 5 events/yr
 - VDEQ 6 events/yr
- Stations
- Analytes
 - THg/MeHg
 - Ancillary Parameters/Nutrients

Station ID	Description
RRM -2.7	Lyndhurst Avenue Bridge
RRM 0.2	Main Street Bridge
RRM 2.3	Hopeman Parkway Bridge
RRM 5.2	Dooms Crossing Bridge
RRM 9.9	New Hope Crimora Road Bridge
RRM 16.5	Harriston (Patterson Mill Road Bridge)
RRM 23.5	Port Republic Road Bridge
SF26.6	South Fork Shenandoah River at Lynwood
SF48	South Fork Shenandoah River at Shenandoah (below dam)
SF94	South Fork Shenandoah River at Rt. Rt. 663 bridge

Path Forward

- Reporting Schedule
 - 2019 Short-term Monitoring Annual Report – Mid-Q2
 - 2019 Long-term Monitoring Report – Q2/Q3
- Monitoring Program Synchronizations – Mid-Q2





Thank You!

Short-term Monitoring Program

Short-Term Remedial Action Objectives				Monitoring Plan Designs			Adaptive Management Outcomes	
General Objective	Performance Objective	Measurable Metric	Preliminary Success Criteria	General Station Locations	Monitoring Frequency	Analytical Parameters	Contingency Actions	Decision Analysis
Reduce Mercury Transport and Exposure	Increase in Bank Stability	Topography	Reduced Annual Erosion Rate	Shore Based LiDAR Surveys Conducted at Each BMA	Annually for First 3 Years; Post-storm	Average Annual Erosion Rate	Structural and/or Vegetative Stabilization	Refine Effectiveness Estimates
		Vegetation	>80% Cover; <10% Invasives	Vegetation Plots at Each BMA	Annually for First 3 Years; Post-storm	Cover and Species Composition	Additional Vegetation Enhancement	Refine Effectiveness Estimates
		Design and Implementation	Landowner Approvals and Permits	BMA Properties	NA	NA	NA	Refine Implementation Estimates
	Reduce Mercury Loading from Bank	Surface Sediment	>75% Mercury Concentration Reduction	Transects Spaced 100-200' at each BMA	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
		Pore Water	>75% Mercury Concentration Reduction	Transects Spaced 100-200' at each BMA	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
		Periphyton	>75% Mercury Concentration Reduction	Downstream of Representative BMAs (Nearshore)	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
		Asiatic Clam Sampling	>75% Mercury Concentration Reduction	Downstream of Representative BMAs (Nearshore)	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
	Reduce In-Channel Mercury Exposure	Periphyton	>50% Mercury Concentration Reduction	Downstream of Representative BMAs (Channel)	Annually for First 10 Years	IHg and MeHg Concentrations	NA	Refine CSM
		Asiatic Clam Sampling	>50% Mercury Concentration Reduction	Downstream of Representative BMAs (Channel)	Annually for First 10 Years	IHg and MeHg Concentrations	NA	Refine CSM
Maintain or Improve Riparian and Aquatic Habitat	Improve Bank Vegetation	Vegetation	>80% Cover; <10% Invasives	Vegetation Plots at Each BMA	Annually for First 3 Years	Cover and Species Composition	Additional Vegetation Enhancement	Refine Effectiveness Estimates
	Improve In-Stream Habitat	Rapid Bioassessment Protocols	Visual Stream Classification	Downstream of Representative BMAs	Quarterly for the First Year and Semi Annually (Q1/Q3) for years 2-10	Rapid Bioassessment Protocol Scores	NA	Refine Effectiveness Estimates

VDEQ 100-Yr. Monitoring Program



**VIRGINIA DEQ
100-YEAR MERCURY MONITORING PLAN
SOUTH RIVER / SOUTH FORK SHENANDOAH RIVER**

	1990	92	93	96	97	99	2002	05	07	12	17	22	27	32	37	42	47	52	57	62	67	72	77	82	87	92
FISH	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SEDIMENTS					X				X		X		X		X		X		X		X		X		X	
WATER		X			X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FLOOD PLAIN									X				X				X				X				X	
CONSULTANT*					X				X		X		X		X		X		X		X		X		X	

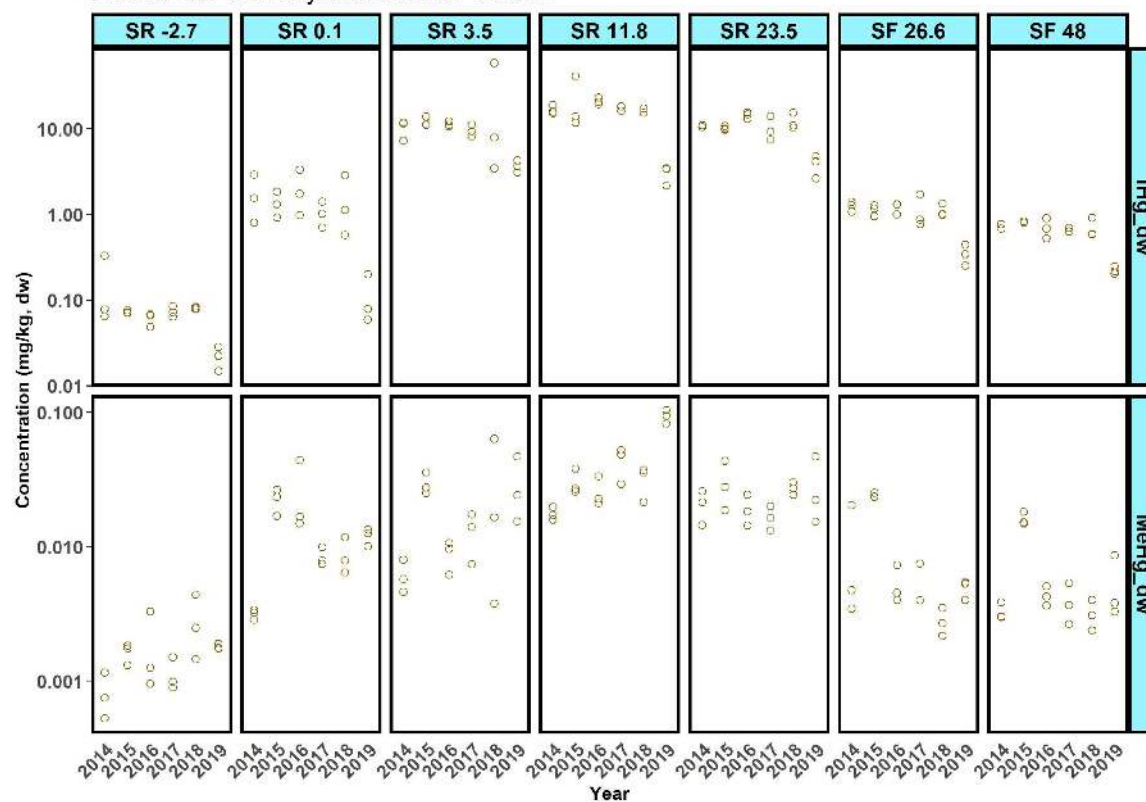
* A consultant's report will be prepared every 10 years to address data and trends from water, sediments and fish over the life of the project to date.

At some point during the project a special review of data following a 100-year flood event will be conducted.

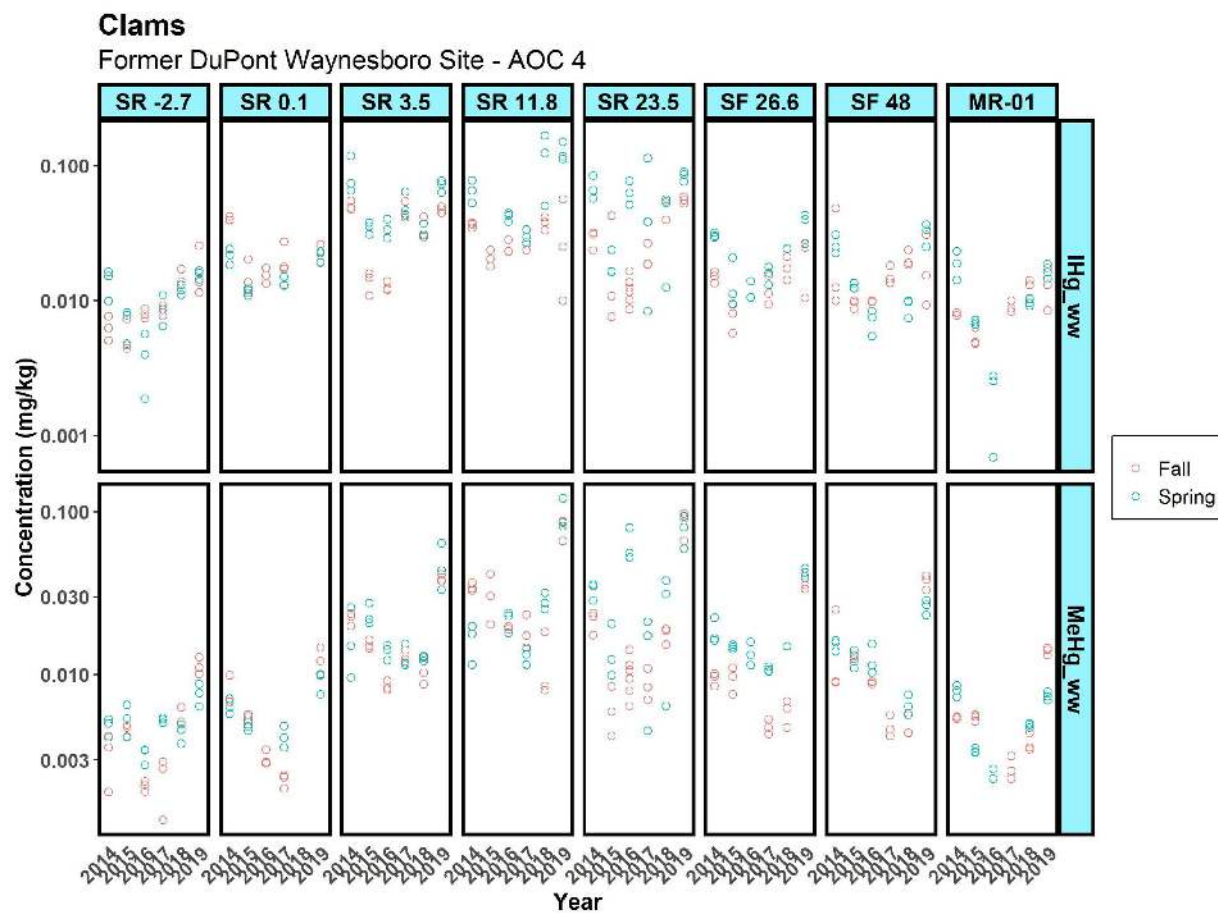
LTM Data

Sediment

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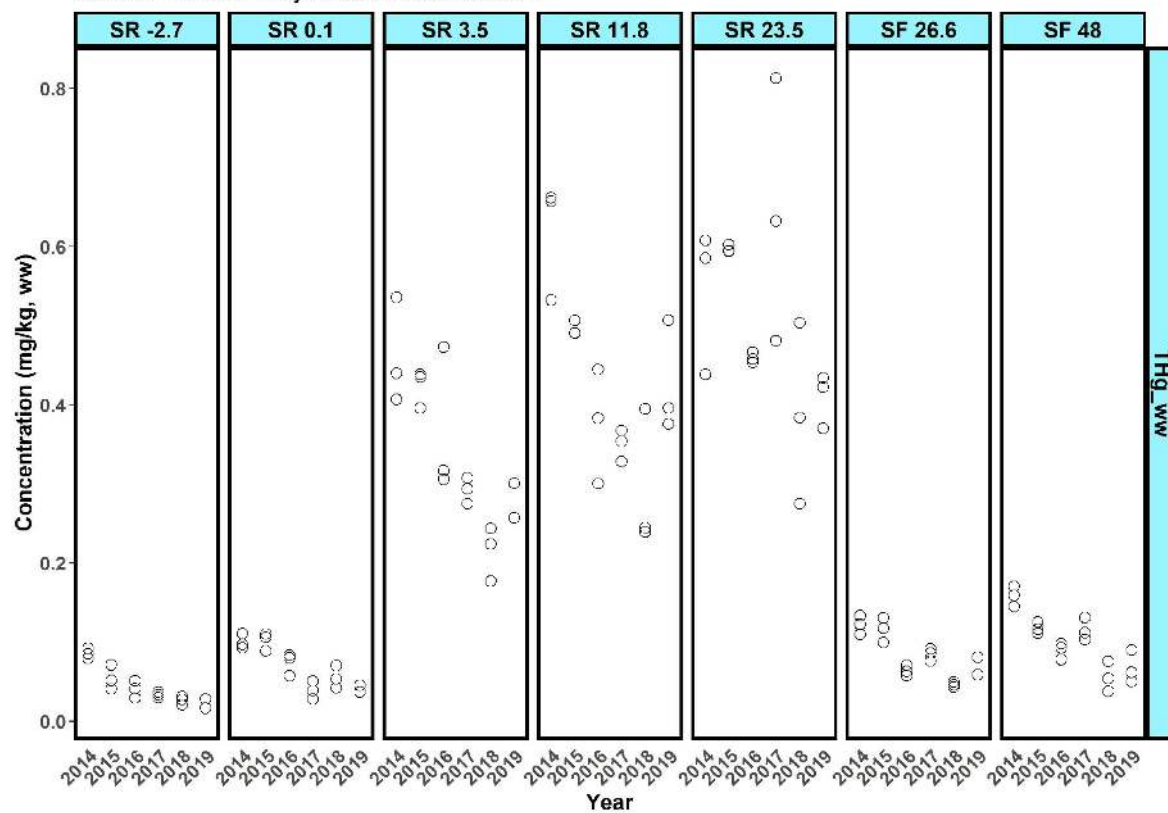
LTM Data



LTM Data

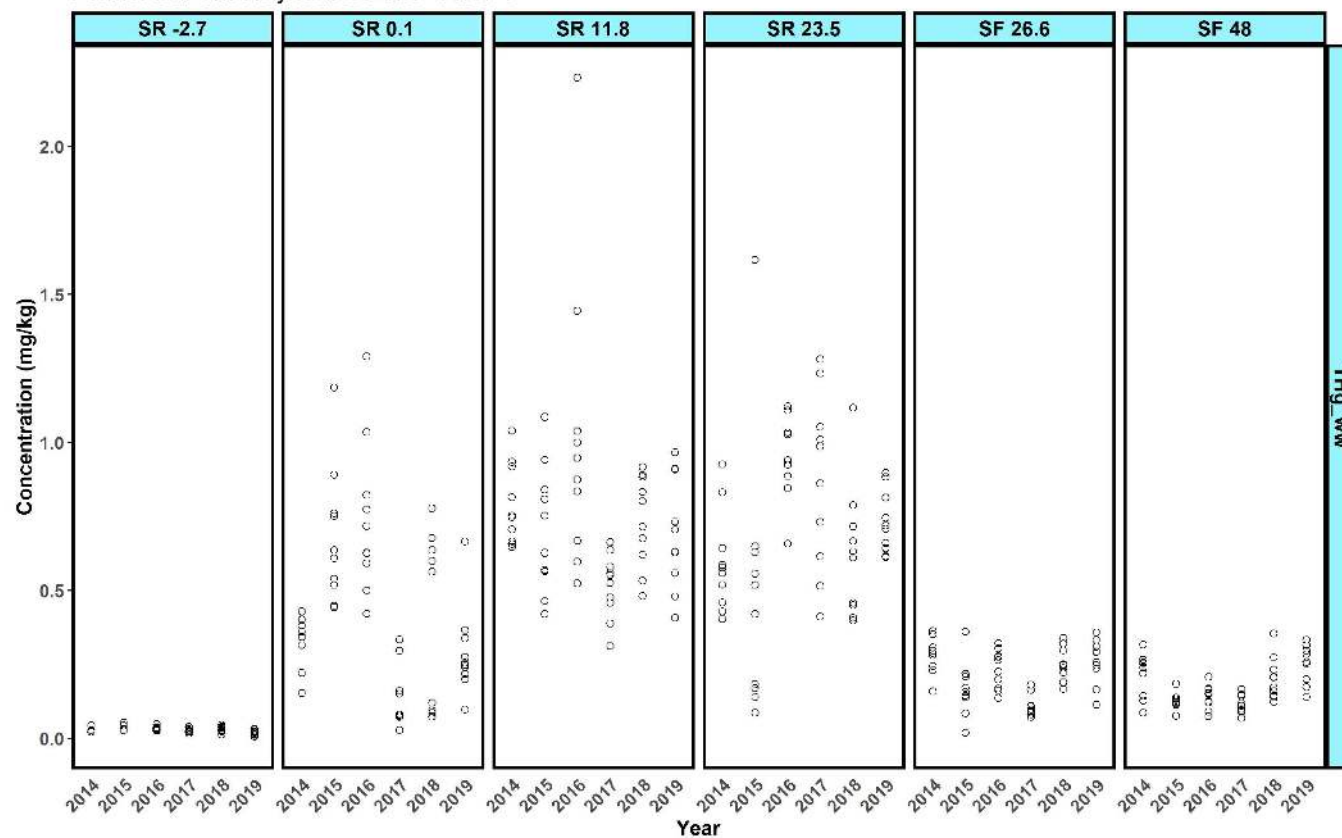
Mayfly

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LTM Data

YOY - Smallmouth Bass
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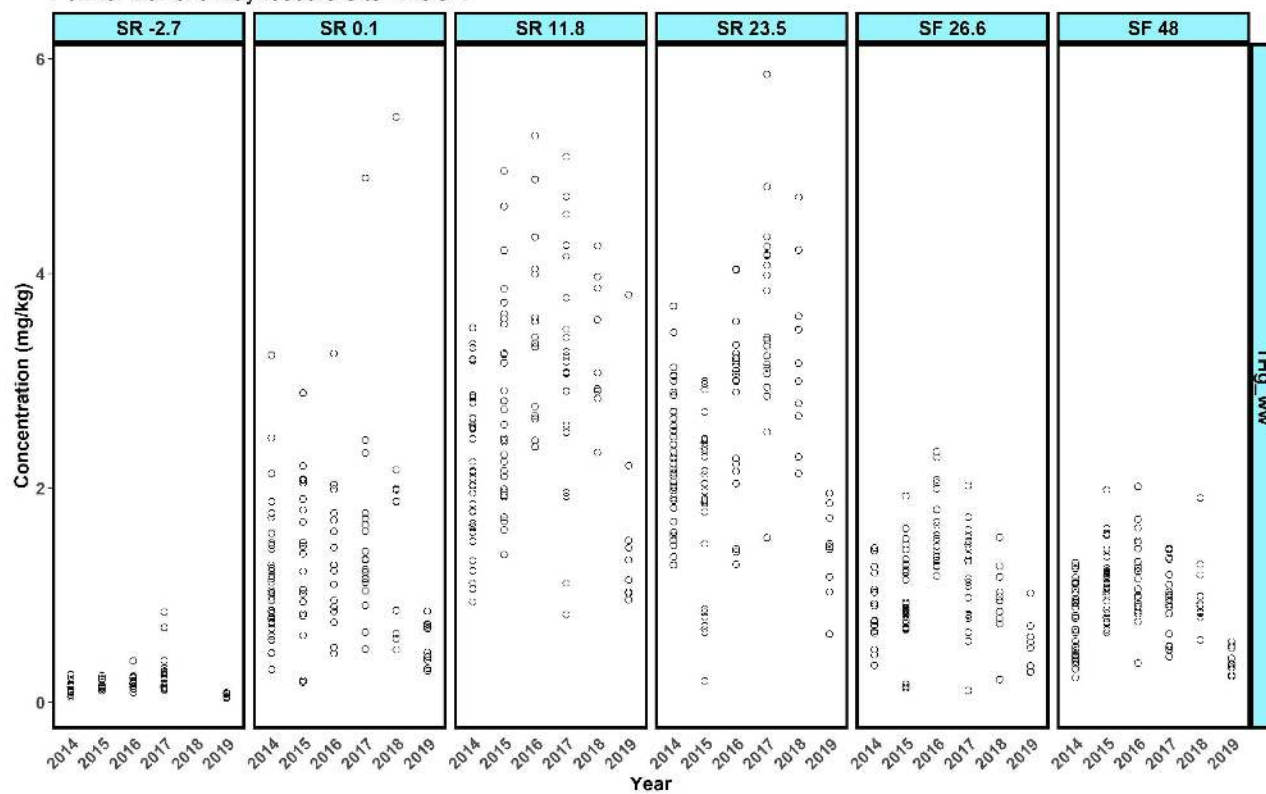


LTM Data



Smallmouth Bass

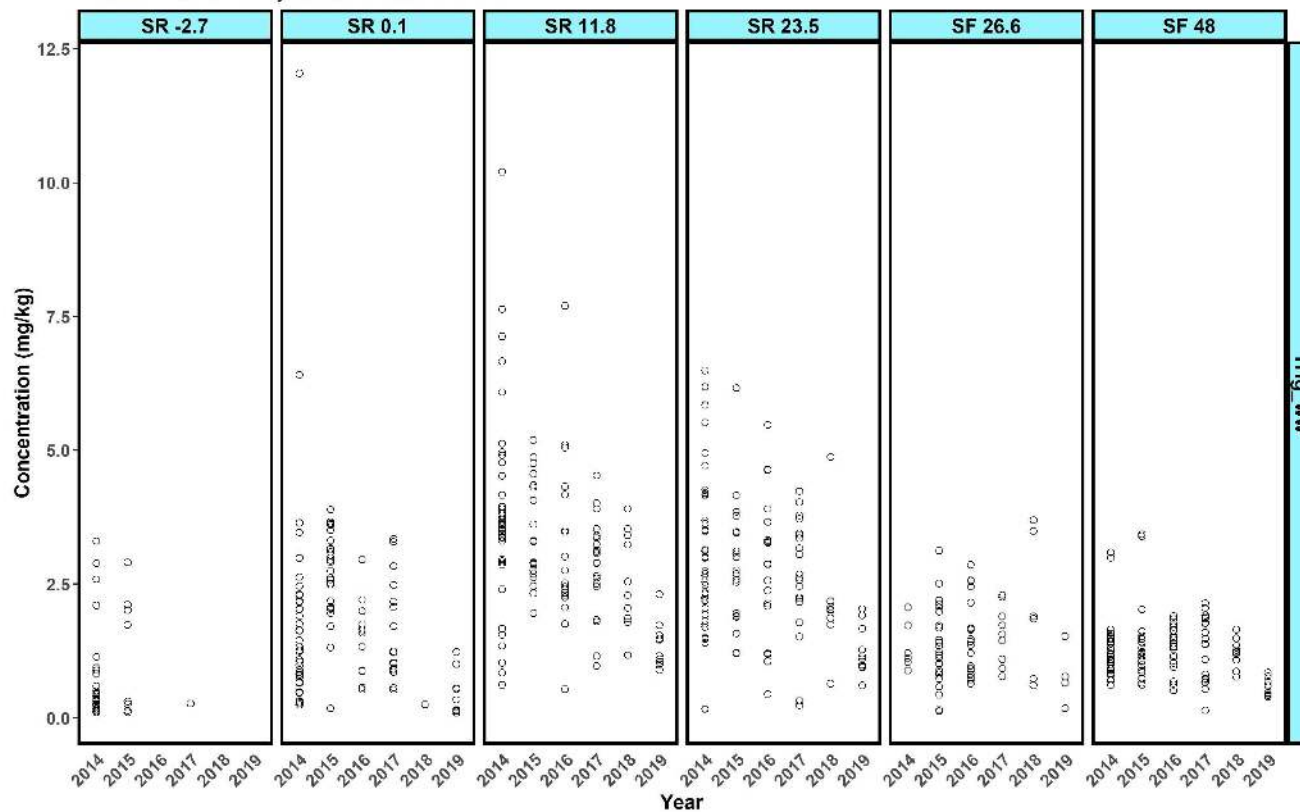
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LTM Data

Largemouth Bass

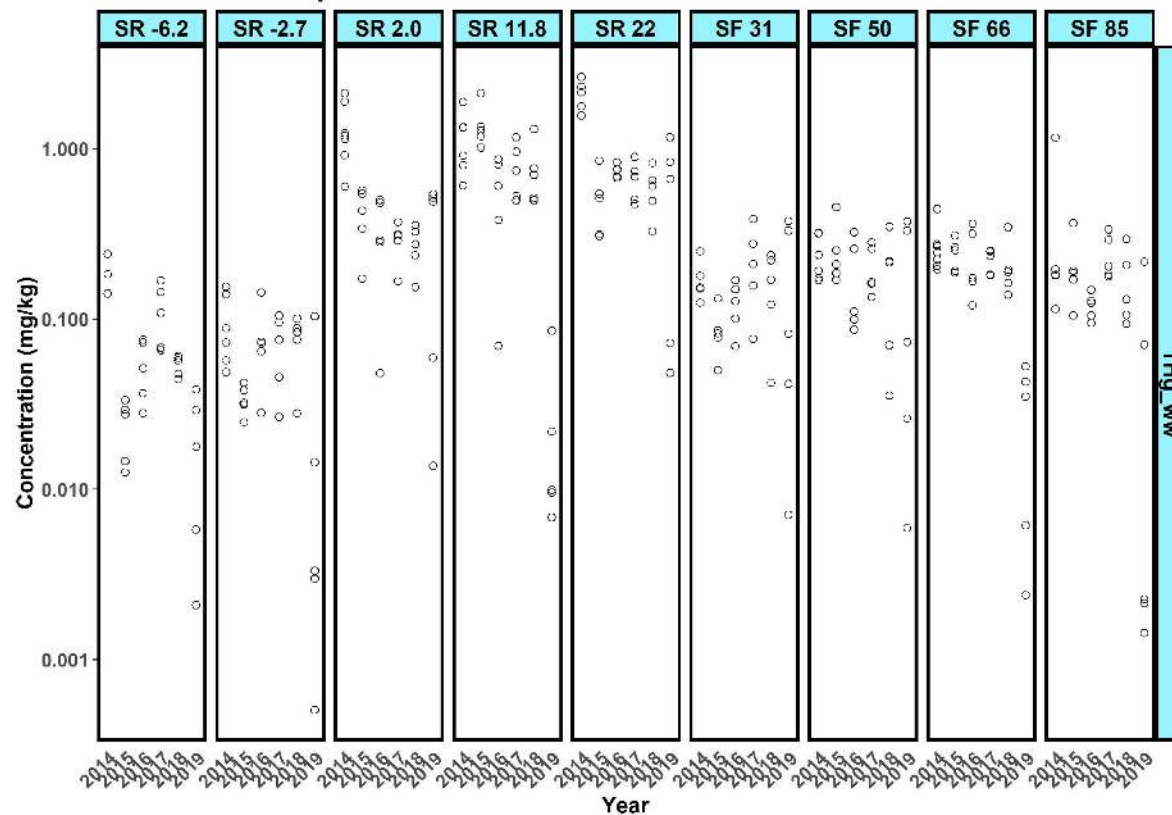
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LTM Data

Wolf Spiders

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LTM Data

