

AOC 4 Monitoring Program Revisions

Former DuPont Waynesboro Site, Virginia

August 18, 2015

Agenda

- Background
- Short-term Monitoring
- Long-term Monitoring
- Status of 2015
Monitoring
- Schedule & Path
Forward

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)

Summary of Short-Term Monitoring Program Revisions

- Discussions with Stakeholders During Design Review
- Enhanced Habitat Metrics
- Implementation in 2015



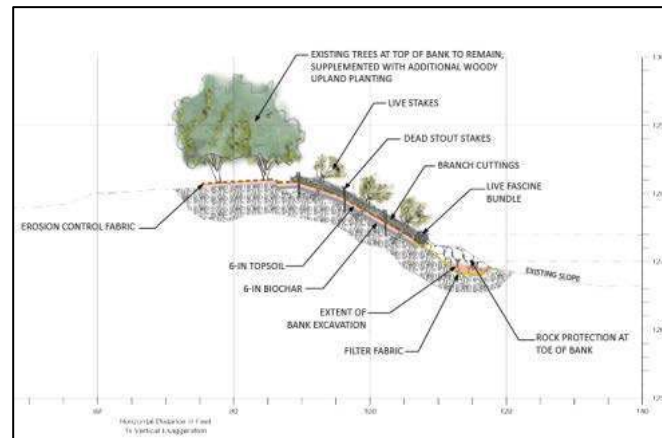
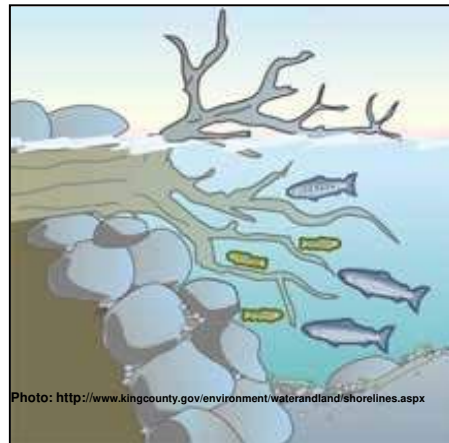
Key Focus Areas for STM Plan Revisions

Riparian Area Ecological Values

- Bank Stability
- Stream Shading
- Aquatic and Terrestrial Food Web Inputs
- Cover and Refuge for Aquatic Species

Societal Values

- Connectivity to the Greenway and River



Revised STM Plan Summary

Short-Term Remedial Action Objectives			Monitoring Plan Designs			Adaptive Management Outcomes	
Performance Objective	Measurable Metric	Preliminary Success Criteria	General Station Locations	Monitoring Frequency	Analytical Parameters	Contingency Actions	Decision Analysis
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	Twice 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 (Near-shore)	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 (Near-shore)	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
Improve Bank Vegetation	Vegetation	>80% Cover; <10% Invasives	Vegetation Plots at Each BMA	Twice 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	Each BMA Assessed Independently	Quarterly for the First Year and Semi Annually (Q1/Q3) for years 2-10	Rapid Bioassessment Protocol Scores	NA	Refine Effectiveness Estimates
Maintain Detrital Input/Stream Shading	Canopy Cover	Achievement of Baseline Canopy Coverage	Transects Spaced ~100-200' at each BMA	Annually for First 3 Years	Percent Canopy Coverage (Spherical Densitometer)	Additional Vegetation Enhancement	Refine Effectiveness Estimates
Maintain Stream Substrate Condition	Wolman Pebble Counts	Maintenance / Improvement of Baseline Conditions	Transects Spaced ~100-200' at each BMA	Annually for First 3 Years	Particle Size Analysis	Structural and/or Vegetative Stabilization	Refine Effectiveness Estimates
Maintain In-stream Habitat Features	# of In-stream Habitat Features	Maintenance / Improvement of Baseline Conditions	Each BMA Assessed Independently	Twice Annually for First 3 Years	# of In-stream Habitat Features	Structural Stabilization	Refine Effectiveness Estimates
Habitat Function and Ecological Value	EPW & USM	Maintenance / Improvement of Baseline Conditions	Each BMA Assessed Independently	Annually for first 3 Years	USM Methodology & EPW Non-tidal Stream - Fish FCI	Structural and/or Vegetative Stabilization	Refine Effectiveness Estimates
Maintenance of Benthic Community	Benthic Invertebrate Metrics	Maintenance / Improvement of Baseline Conditions	Four Locations Within the Interim Measures Area (RRM 0.5, RRM 1.0, RRM 1.5, RRM 2.0)	Twice Annually for First 3 Years	300 Organism Sub-count	NA	Refine Effectiveness Estimates
Provide Stable River Access Points	Stable Access Points	Maintenance / Improvement of Baseline Conditions	Each BMA Assessed Independently	Twice Annually for First 3 Years	# of Stable and Improvised Access Points	Structural Stabilization	Refine Effectiveness Estimates

Notes:
 NA, Not applicable
 IHg - Inorganic Mercury
 MeHg - Methylmercury
 CSM - Conceptual Site Model
 BMA - Bank Management Area
 Enhanced Habitat Metrics
 Duplicative metric to be removed from STM Plan

EPW - Evaluation for Planned Wetlands
 FCI - Functional Capacity Index
 USM - Unified Stream Methodology
 RRM - Relative River Mile

STM Program Revisions – Physical Elements

- Stream Shading / Canopy Cover
 - Spherical Densiometer
- Substrate Condition
 - Wolman Pebble Counts
- In-stream Habitat Assessment
 - Large Woody Debris
 - Undercut Banks/Rootwads
- Unified Stream Methodology (USM)
 - Replaces EPA RBP
- Documentation of Stable Access Points

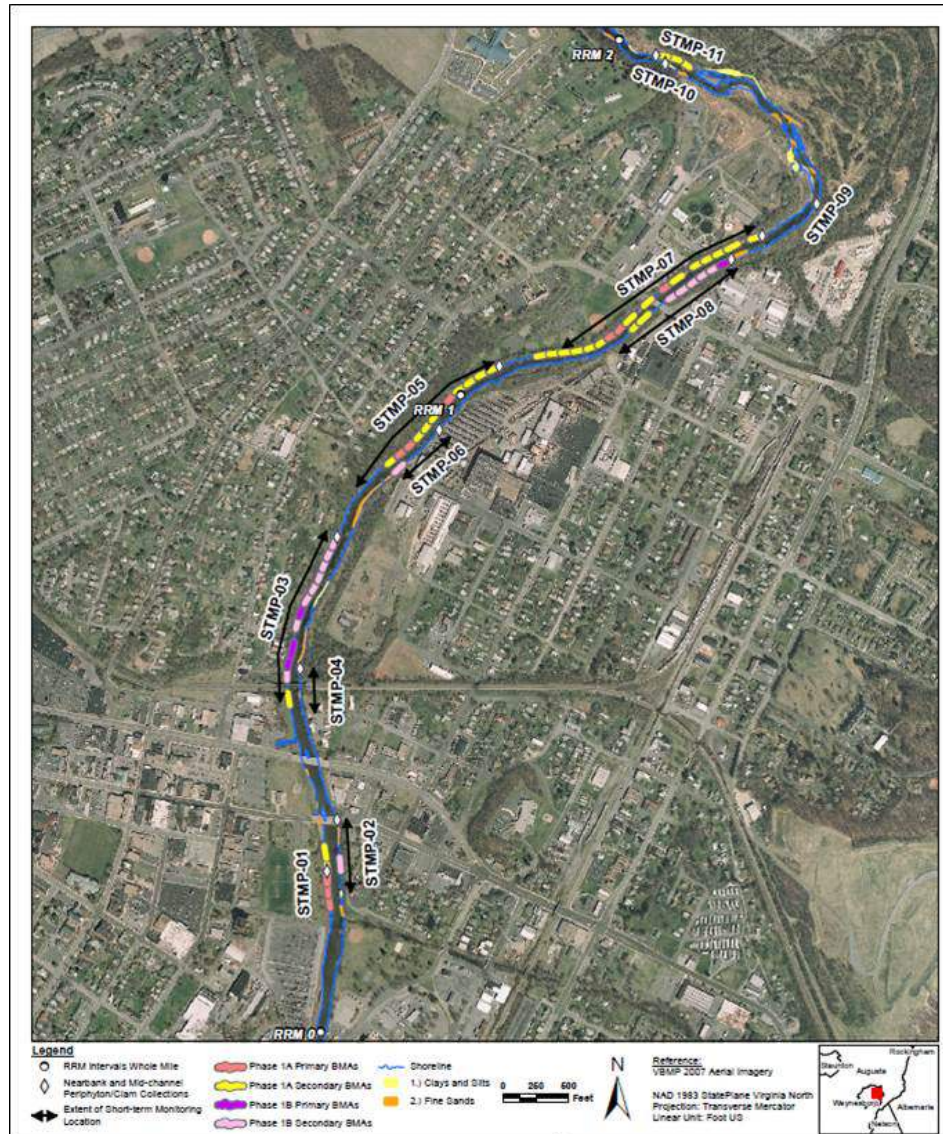


STM Program Revisions – Biological Metrics

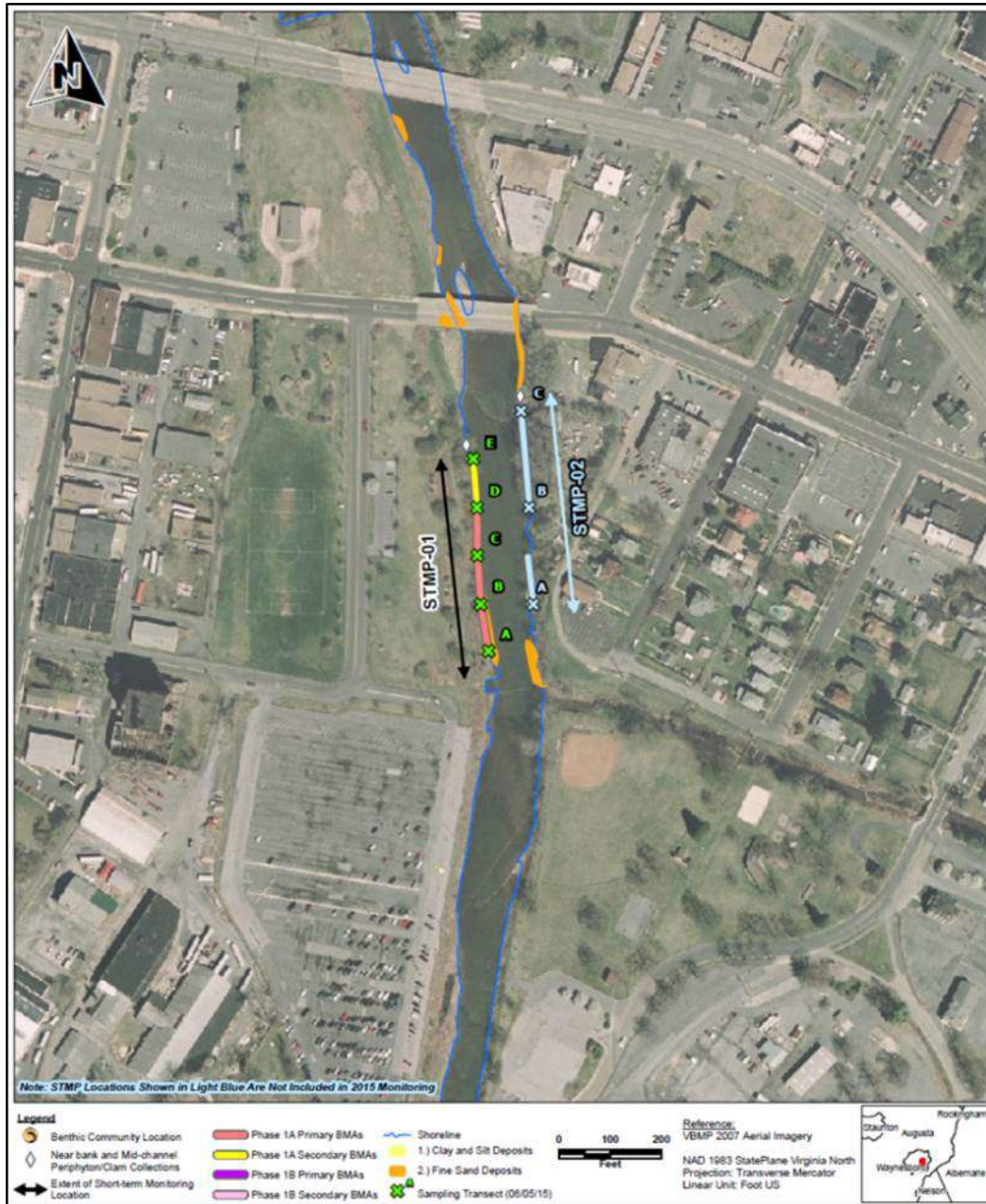
- Benthic Community
 - 300 organism sub-count
- EPW Non-tidal Fish Assessment
 - Evaluates Limiting Factors, Food/Cover, Reproduction and Water Quality



Short-Term Monitoring Implementation

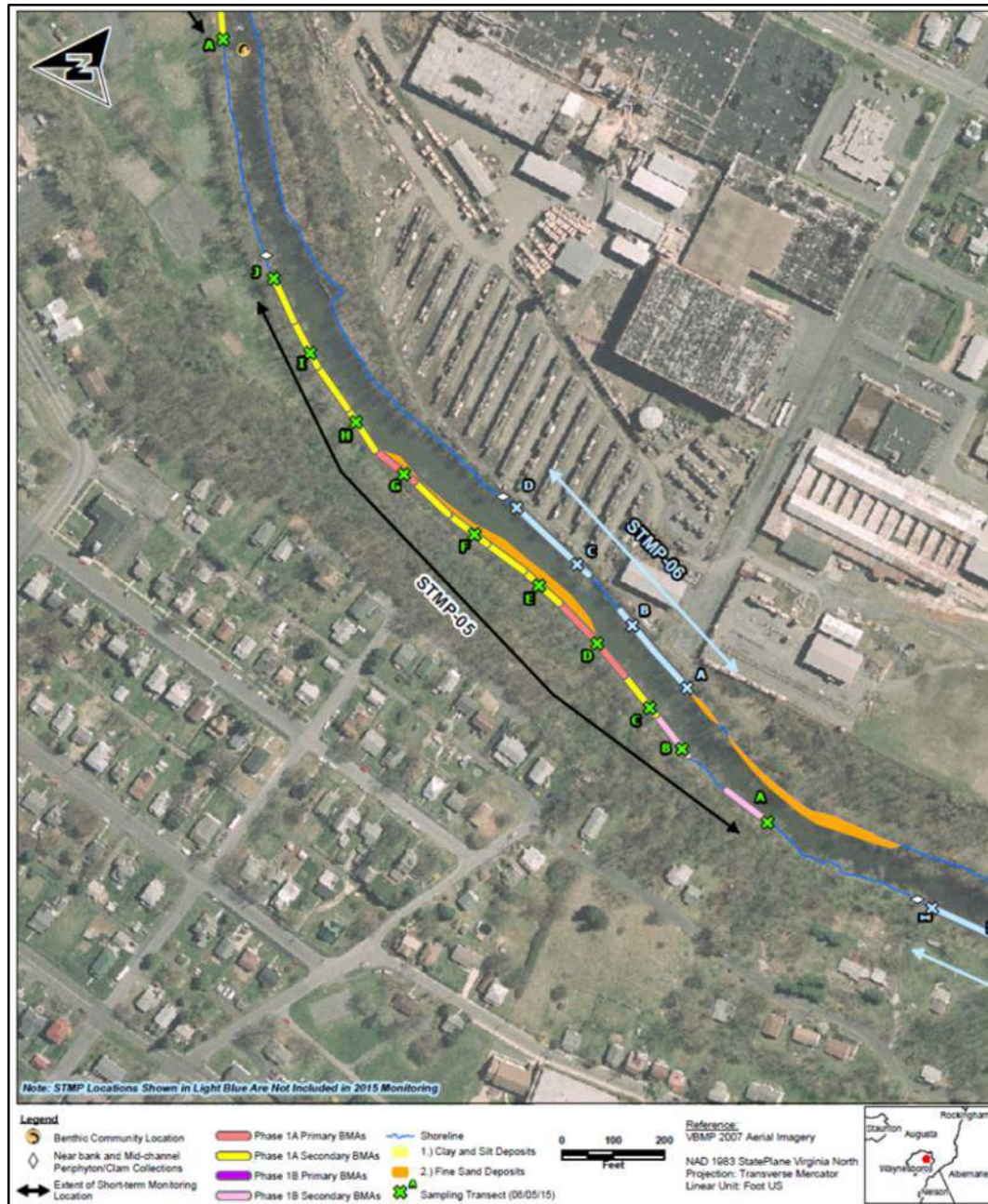


STMP - 01



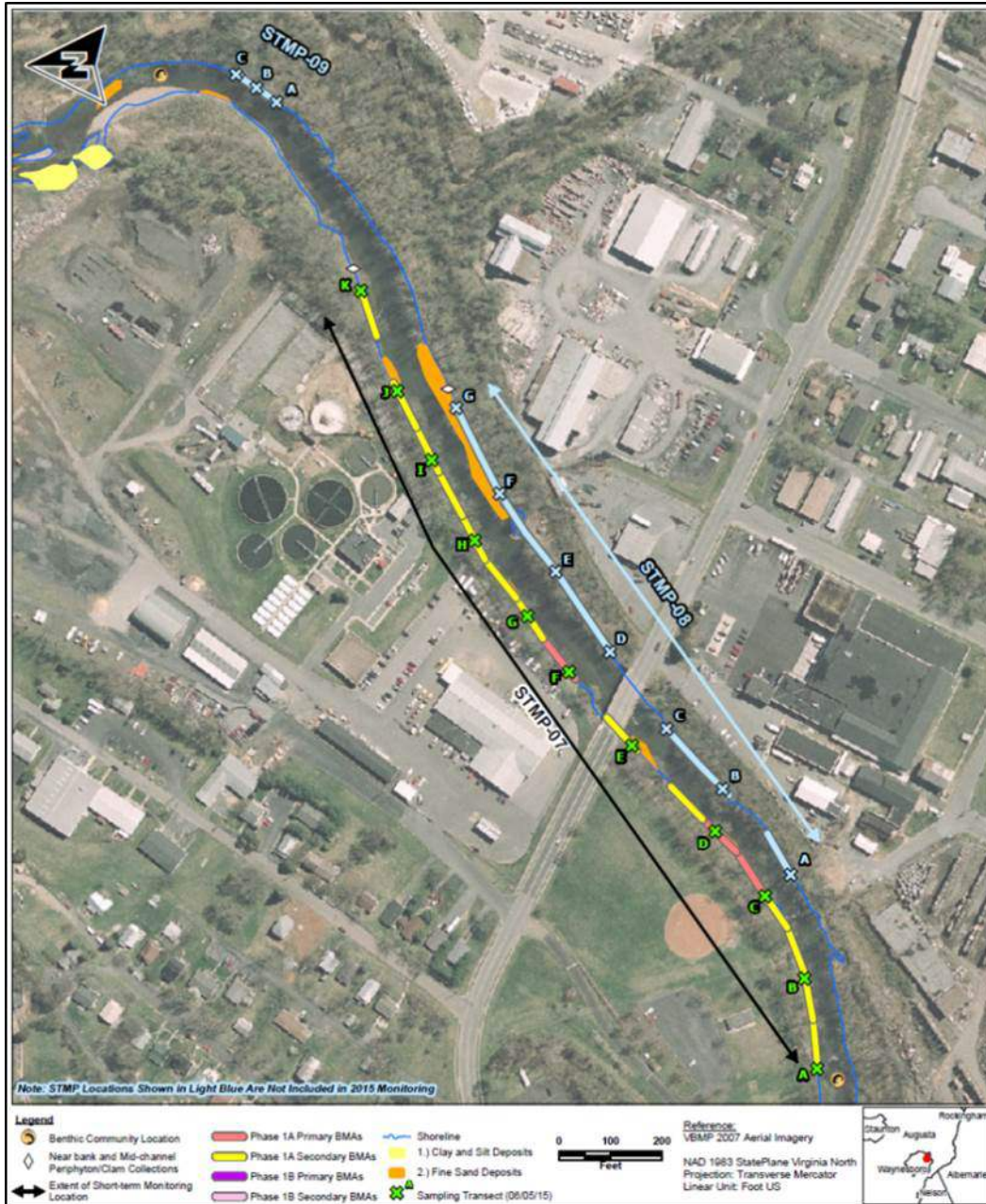
- Includes
 - Phase 1A Primary & Secondary BMAs
- Approximately 400'
- 5 Transects Spaced ~ 75' Apart

STMP - 05



- Includes
 - Phase 1A Primary & Secondary BMAs
 - Phase 1B Secondary BMAs (tentative)
- Approximately 1326'
- 10 Transects Spaced ~ 125' Apart

STMP - 07



- Includes
 - Phase 1A Primary & Secondary BMAs
- Approximately 1,500'
- 11 Transects Spaced ~ 135' Apart

Short-Term Monitoring Summary

- STM Plan Revised with Enhanced Habitat Metrics
 - Enhanced metrics included in spring/summer event
- Stations Included in 2015 Monitoring:
 - STMP-01
 - STMP-05
 - STMP-07
- Fall Monitoring
 - Week of 10/5/15



Long-Term Monitoring Program Revisions

Summary of Long-term Monitoring Program Revisions

- Station Modifications
- Fish Tissue Sampling Approach
- Mallard Duck Sampling



LTM Station Location Modifications

- Goal to Establish Viable – Long-Term Monitoring Stations
 - Safety
 - Appropriate Habitat
 - Accessibility
- Human Exposure Monitoring
 - Shifting Station SF 26.6 (Lynnwood) to SF 31 (Island Ford)
- Terrestrial Exposure Monitoring
 - Shifting SR 8.9 to SR 11.8

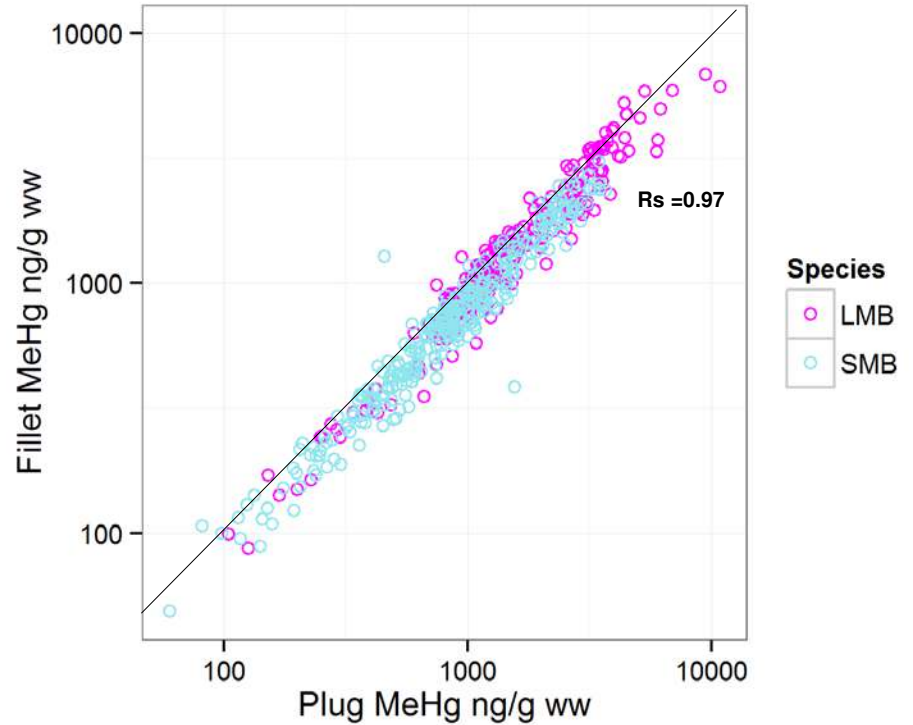
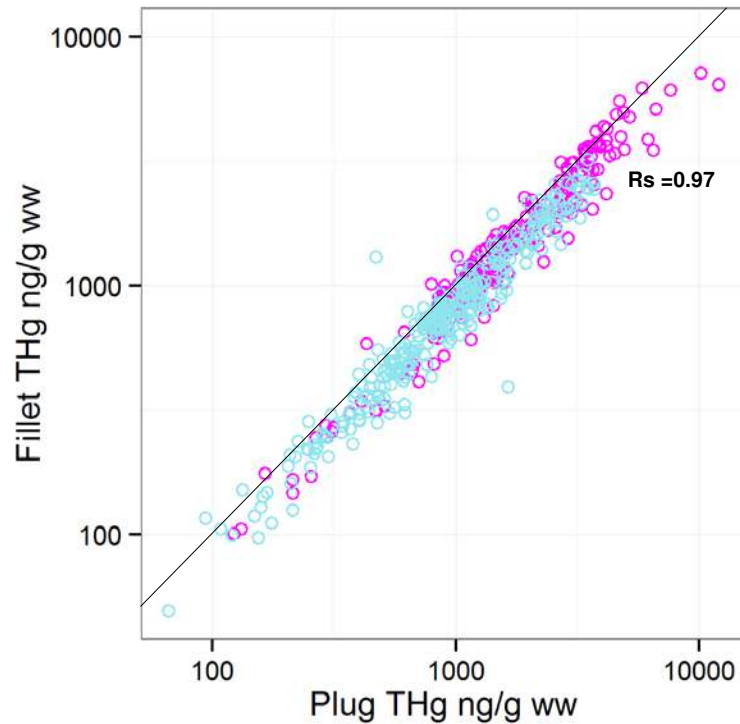


Evaluation of Plug to Fillet Relationship

- Robust Dataset of Paired Plug/Fillet Hg Concentrations ($n=548$)
- Performed Spearman Rank Correlation
- Strong Relationship Across Species and Sex ($R_s = 0.94 - 0.97$)
- Evaluated THg & MeHg Relationship in Fillets and Plugs ($R_s = 0.99$)

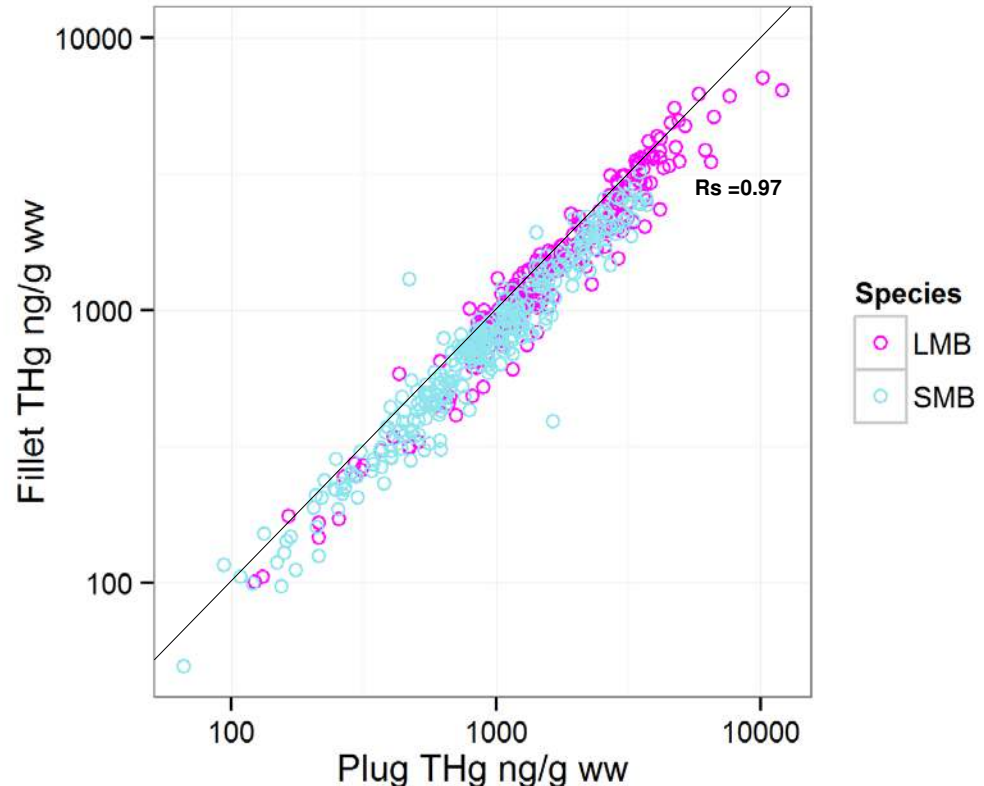


Summary of Linear Regression Results



Summary of Plug to Fillet Analysis

- Plugs are Conservative Indicators of THg and MeHg in Bass Fillets
- Recommend Transition to Non-lethal Sampling Techniques for THg Only in Fall 2015
- Conduct Plug/Fillet Validation Sampling in Coordination with VDEQ 100-Yr Monitoring Program



Waterfowl Monitoring Activities

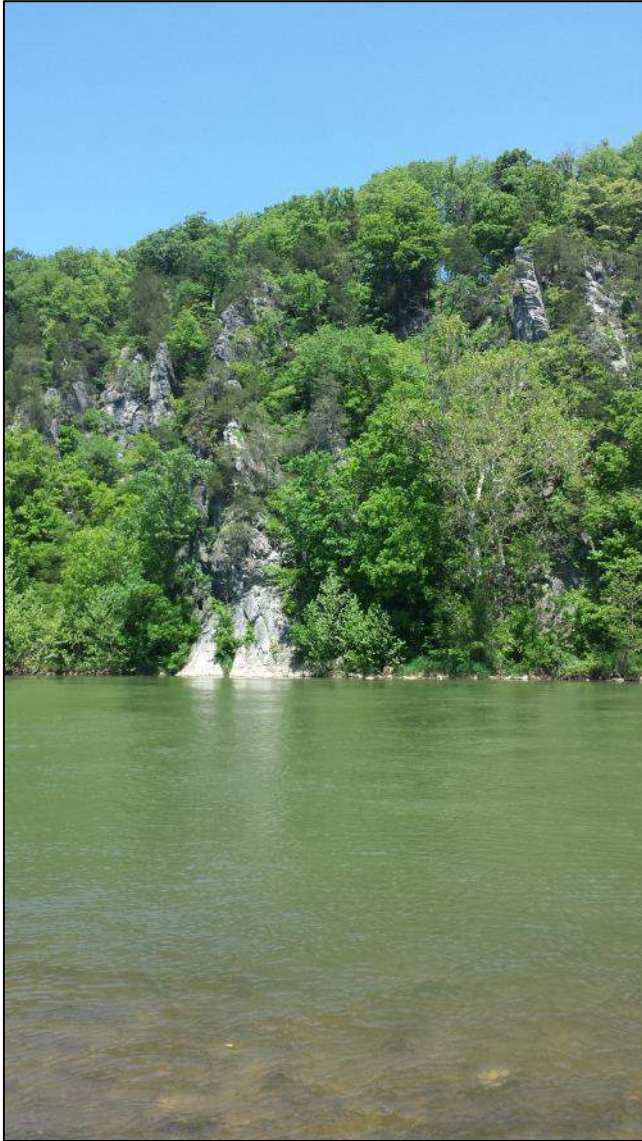
- 2014 Hunter Outreach
- Academic Input
- Alternate Sampling Methods
- Representative Data
- Path Forward



Status of 2015 Monitoring Effort

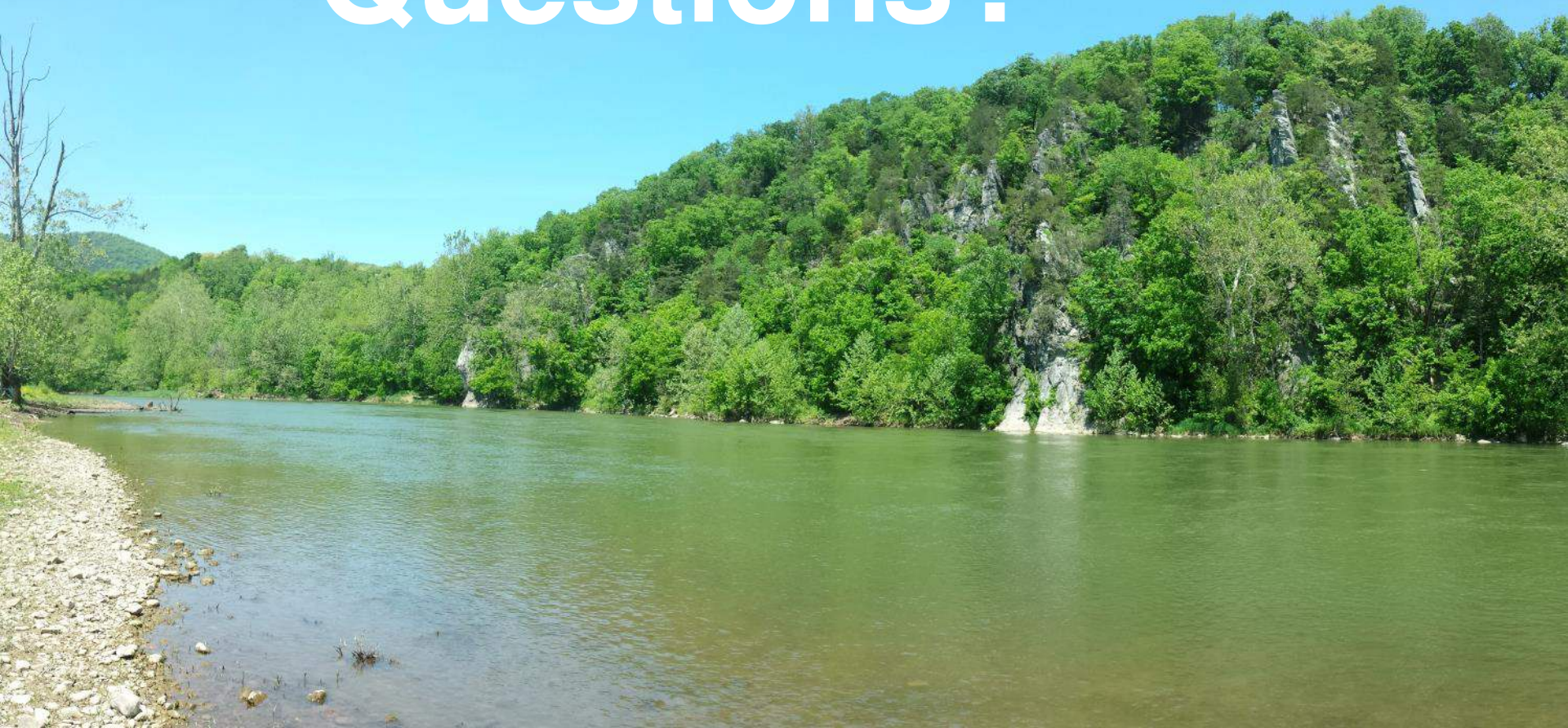
Reach Code	Description	Human Exposure			Aquatic Ecological Exposure		Terrestrial Ecological Exposure	Terrestrial Station ID
		Adult Bass	Snapping Turtles	Mallard Ducks	Sediment, Benthic Inverts, Periphyton, Asiatic Clam, YOY Fish, Benthic Community		Carolina Wren, Wolf Spiders, Earthworms	
SR-6.2	Waynesboro Nursery						●	SR-6.2
SR-2.7	Existing SR-01 located at Lyndhurst Ave. to Ridgeview Park	● ●	●	●	● ●		●	SR-2.7
SR0.1	Constitution Park/Waynesboro Reach	● ●	●	●	● ●		●	SR2.0
SR3.5	Shifflet Property				● ●			
SR11.8	Dooms to Crimora Reach	● ●	●	●	● ●		●	SR11.8
SR23.5	Hariston to Port Republic Reach	● ●	●	●	● ●		●	SR22
SF26.6	SFS @ Lynwood				● ●			
SF31	SFS @ the Power Dam	● ●	●	●			●	SF31
SF48	SFS @ Shenandoah (above dam)	● ●	●	●	● ●			
SF50	Shulers Island						●	SF50
SF63	Newport Landing	● ●	●	●				
SF66	Long Bend Farm						●	SF66
SF72	Hamburg, VA near Rt. 211 Bridge	● ●	●	●				
SF85	Bealer's Ferry						●	SF85
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	● ●	●	●				
MR01	Middle River Reference				● ●			

STM and LTM Programs – Path Forward

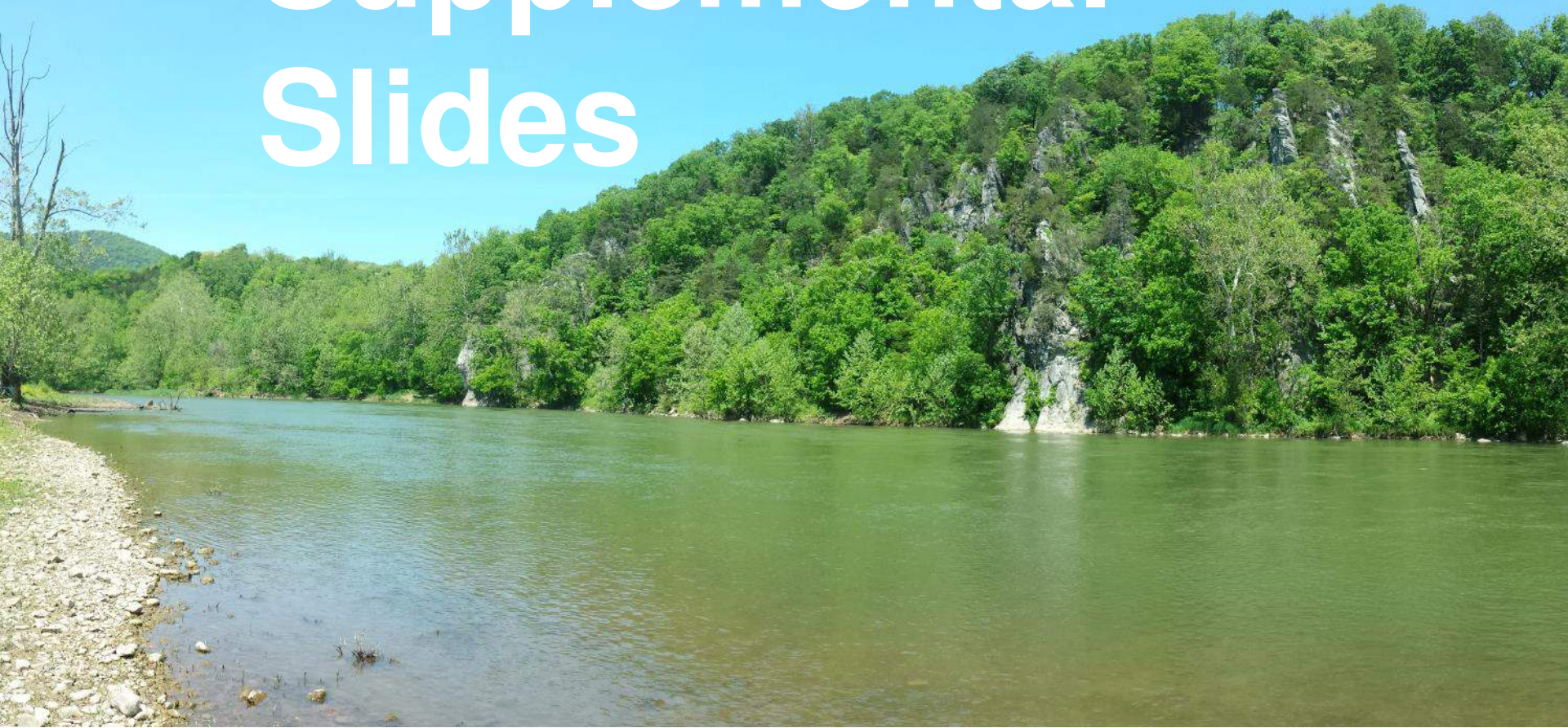


- Complete 2015 Data Collection Activities
- Fish Tissue Sampling Approach Memo
- Mallard Monitoring Alternatives
- Data Analysis for October SRST Meeting
- Year-End Reporting

Questions?



Supplemental Slides



SUPPLEMENTAL LINEAR REGRESSION SLIDE

Species	Sex	Regression of Fillet and Plug Tissue	N	Slope	Intercept	Rs
Largemouth Bass	M	THg	104	0.64	370.1	0.95
	M	MeHg	104	0.67	305.8	0.96
	F	THg	125	0.84	56.1	0.95
	F	MeHg	125	0.86	52.1	0.97
	All	THg	229	0.75	210.9	0.96
	All	MeHg	229	0.78	172.5	0.97
Smallmouth Bass	M	THg	160	0.75	64.5	0.94
	M	MeHg	160	0.77	44.8	0.94
	F	THg	153	0.74	62.5	0.97
	F	MeHg	153	0.75	56.6	0.97
	All	THg	313	0.75	64.3	0.96
	All	MeHg	313	0.76	51.4	0.96
All Bass	All	THg	548	0.77	95.6	0.97
	All	MeHg	548	0.79	68.7	0.97