

Preliminary Results South River Pilot Bank Stabilization Project

Expert Panel Meeting; October 5-6, 2010

Session: Remedial Options and Watershed Management

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Agenda



- Pilot Objectives & Process
- Comparison of Pre- vs Post- Stabilization THg Data
 - Soil
 - Sediment
 - Porewater
 - Asiatic Clam
- Findings

Pilot Bank Stabilization Objectives



- Primary Objectives

- Reduce river bank erosion
- Stabilize the bank
- Enhance existing aquatic and riparian ecosystems
- Reduce mercury (Hg) loads

- Secondary Objectives

- Understand groundwater/bank interactions
- Understand potential changes in the mercury methylation
- Evaluate river bank stability at adjacent locations





South River Bank Stabilization Pilot Site

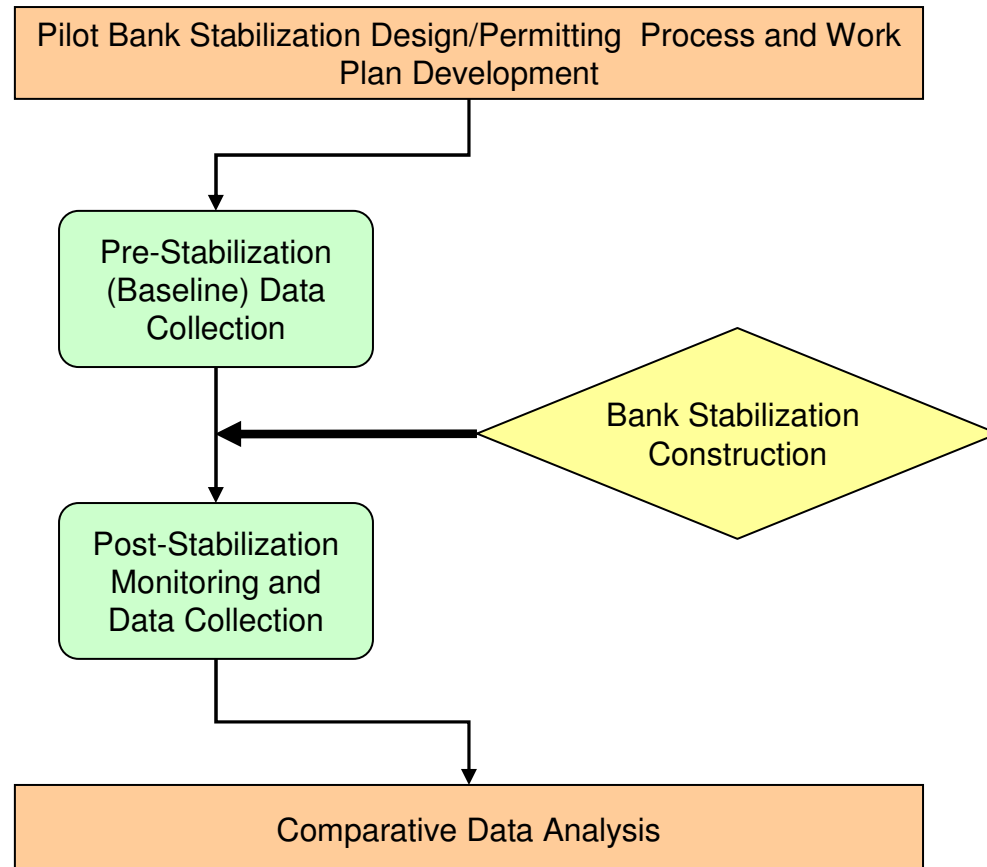


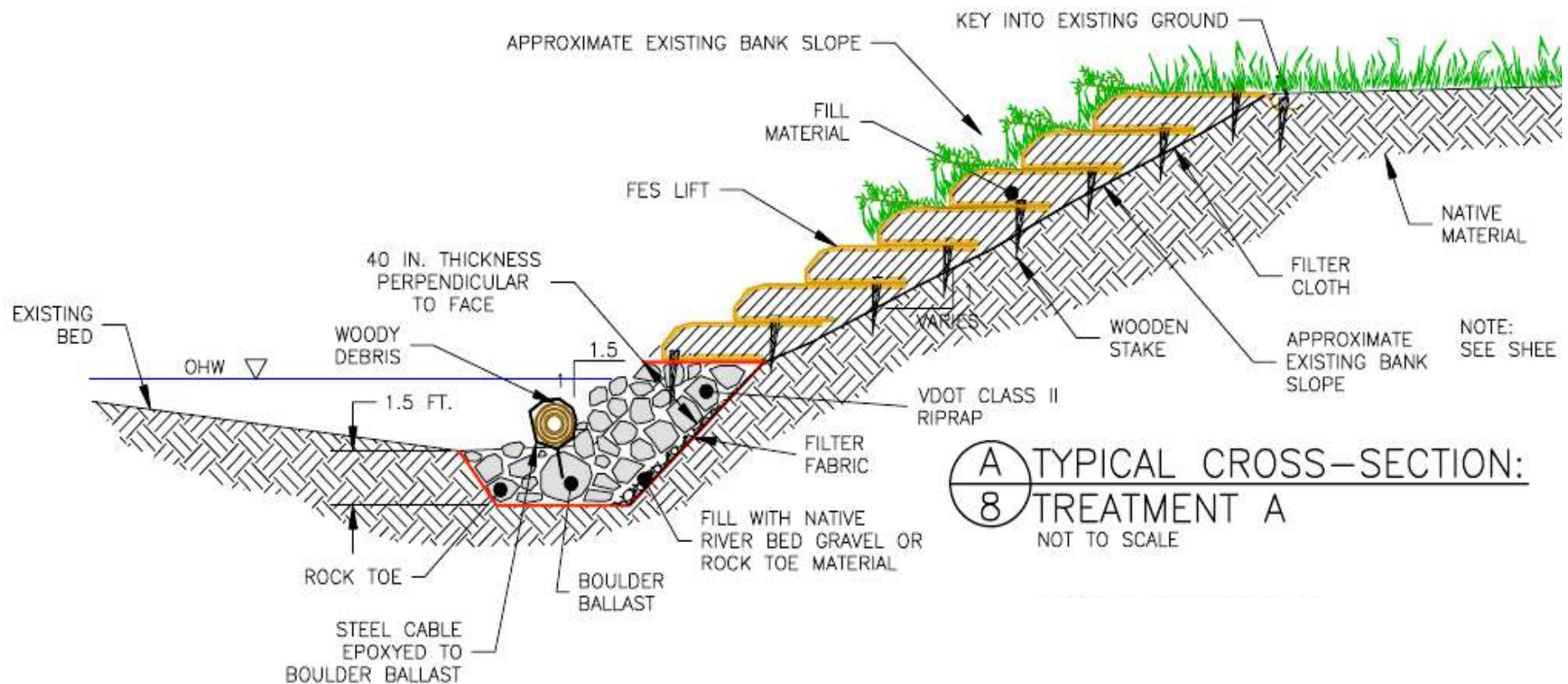
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Pilot Bank Stabilization Conceptual Process



- Study Objectives Linked with Quantitative Success Criteria
- Data Collections Integrated into SRST Studies
- Bank Stabilization Designed to Improve Riparian Habitat





**Bank Pilot –
Construction Sep 2009 to Dec 2009**

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Field Data Collection Summary

Monitoring Phase	Collection Date	Type of Data Collected	Completed
Baseline	Aug/Sept 2009	• Cross-section morphology • Grain size distribution • Flow • Habitat evaluation • Photographs • Erosion pins • Mercury characterization • Groundwater/river interactions	√
Implementation	Sept – Dec 2009	• Grading/FES installation oversight • Planting oversight • E&S inspection • As-built plan • Photographs	√
Performance	Mar 2010 (1Q) May 2010 (2Q) July 2010 (3Q)	• Cross-section morphology • Grain size distribution • Flow • Habitat Evaluation • Photographs • Erosion pins	Additional Collection during 4Q 2010
	March 2010	• Mercury Characterization	√
	Week of 6/7/2010	• Groundwater/River interactions	√
	Deployed 5/3/2010 Clam Harvest May & June 2010	• Clam Transplant Study	√
Storm Event	Jan 25, 2010 (5-yr storm) Mar 15, 2010 (2-yr storm)	• Inspection checklist • Photographs	√
Adaptive Management/ Maintenance	On-going	• Planting plan changes • Japanese knotweed • Groundhogs • Mulching	In progress

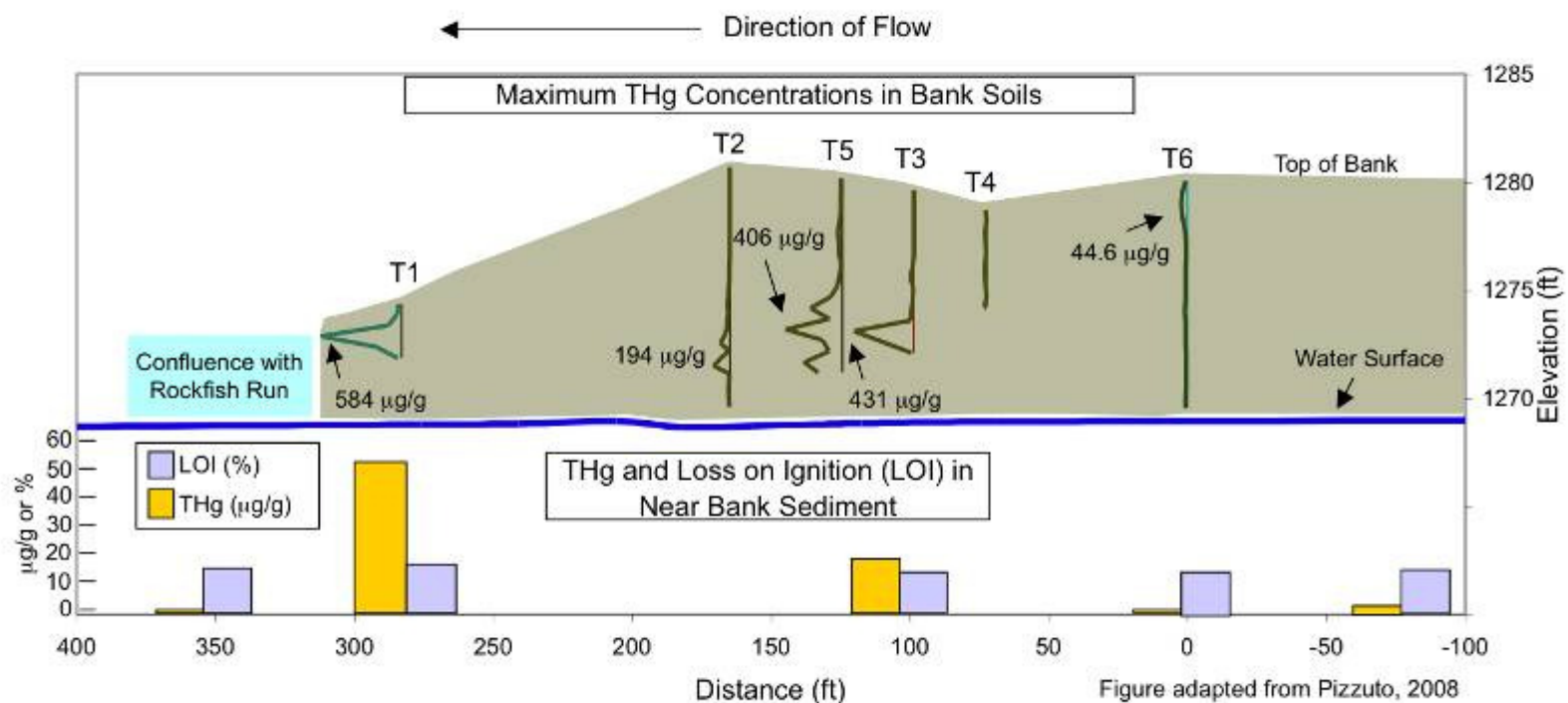
South River Bank Stabilization Study Sampling Stations



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Pre-Stabilization Soil/Sediment Conditions



Pre-stabilization THg sediment concentrations reflect THg soil concentrations

Pre- vs. Post-Stabilization Soil THg Concentrations



Sample Location	Soil THg (µg/g)			
	Pre-Stabilization		Post-Stabilization	
	Vertical Average	Maximum	Vertical Average	Maximum
E	3.1	4.1	--	--
D	0.3	0.7	--	--
C	60	277	0.14	0.3
B	7.4*	406*	0.11	0.3
A	1.5*	45*	0.20	0.4
Upstream	--	--	0.31	1.0

*Data collected by Pizzuto (2008)

Maximum and vertically averaged soil concentrations were lower in June 2010 after stabilization

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Pre- vs Post-Stabilization Sediment THg Concentrations



Sample Location	Sediment THg (µg/g)	
	Pre-Stabilization	Post-Stabilization
E	2.5	2.1
D	0.2	0.2
C	2.4	0.4
B	19	0.3
A	1.2	1.6
Upstream	2.6	1.9

Post-stabilization sediment concentrations reflect solids from river transport rather than solids from the bank storage zone:

- Maximum pre-stabilization THg concentration in sediment was 54 µg/g detected at C'.
- The average THg concentration on particles in surface water was 1.5 ± 1.2 µg/g THg at RRM 0.2.
- Post-storm interstitial sediment collected on bank surface was 0.58 µg/g.

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Porewater Sampling and Analysis Approach

Data sets:

- Pre-stabilization data collected in June, July and August of 2009
- Post-stabilization collected in June 2010

Samples grouped by current velocity and proximity to bank:

- Hydraulic storage vs. hydraulic transport zones



Inorganic Mercury (IHg) and Methylmercury (MeHg) in Porewater

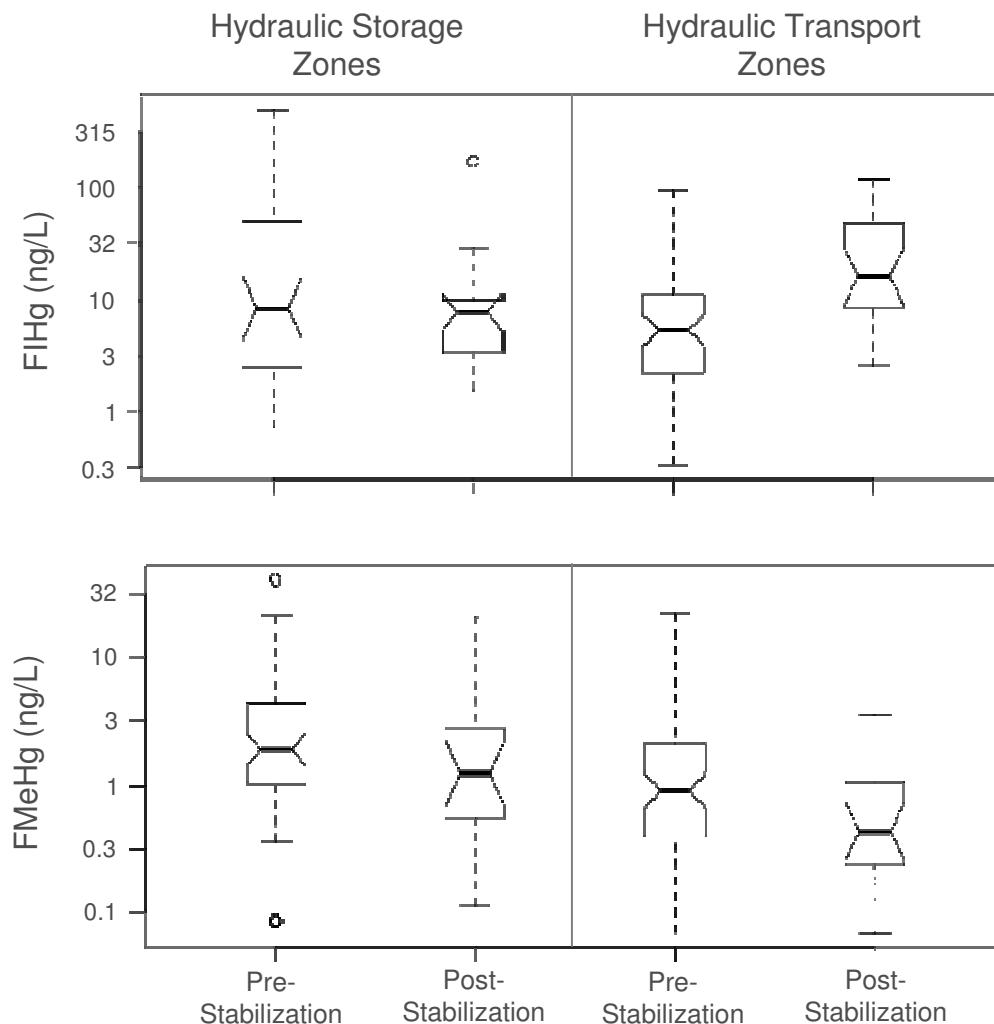
Previous data analysis showed porewater data reflected concentrations in soil and sediment

No significant decline in IHg concentration in storage or transport zones

Median MeHg concentration declined from June 2009 to June 2010 by a factor of 3

- Observed in both storage and transport zones, suggesting inter-annual variation
- No significant difference between pre- and post-stabilization in either storage or transport zones for MeHg

Porewater takes longer to respond to changes in soil



Uptake of IHg and MeHg by Asiatic Clam

Asiatic clam *Corbicula fluminea*
collected from North River, tagged and
released into storage and transport
zone habitats

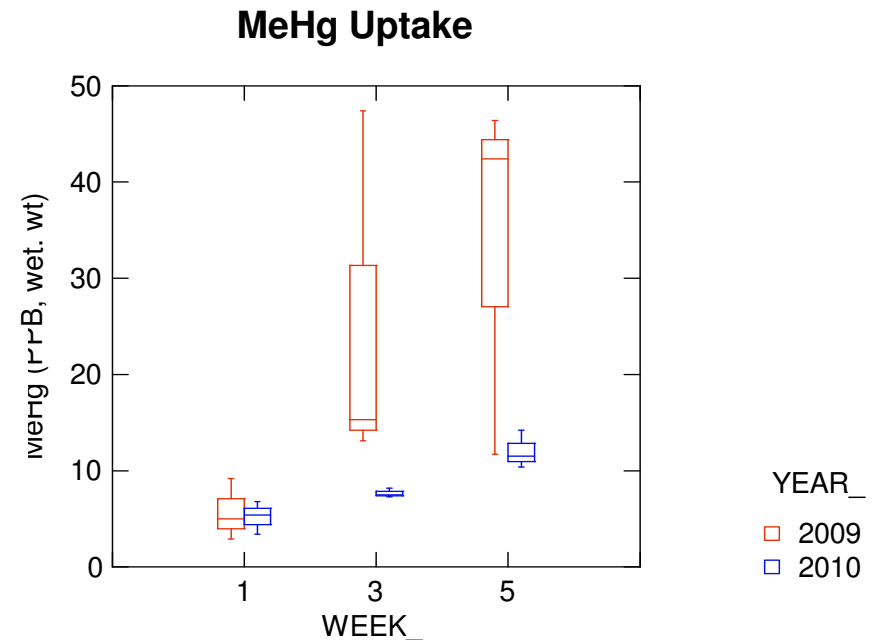
Clams feed on particles in sediment
and are exposed to porewater; surface
water appears to be lesser component
of exposure

Tissue samples collected and
analyzed for THg and MeHg after 1, 3,
and 5 week exposure



Clam pre- and post-stabilization comparison (2009 vs. 2010; storage zone habitat)

No statistical difference ($p>0.05$) in MeHg uptake in post-stabilization storage zone habitat tissue samples; though mean MeHg tissue concentration for week 5 was 63% lower

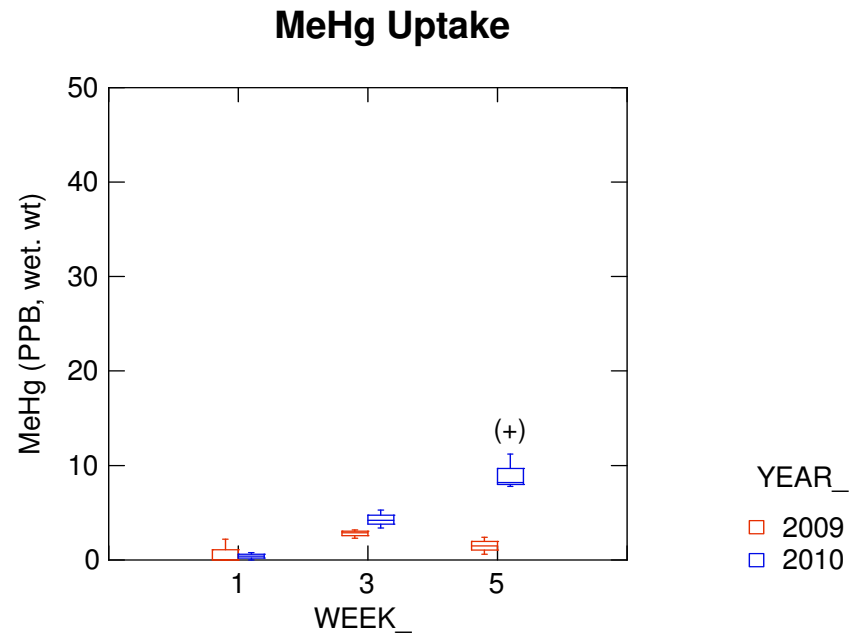


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Clam pre- and post-stabilization comparison (2009 vs. 2010; transport zone habitat)

Significantly higher
MeHg uptake in
transport habitat
tissue samples at
week 5 post-
stabilization
($p < 0.05$)



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Preliminary Findings

Soil & sediment concentrations decreased:

- Sediment THg concentrations reflect the THg concentrations on particles transported by the river rather than bank soil

Porewater IHg & MeHg concentrations did not change:

- Porewater likely influenced by 'older' soils
- IHg on particles may continue to be available for methylation for several years or more
- Porewater is heterogeneous spatially - movement of sample location might be a factor

Post stabilization clams differed in Hg uptake:

- Clams in storage zone habitat had decreased MeHg uptake
- Clams in transport habitat had increased MeHg uptake