



Remedial Design Update South River, VA

May 2015



Discussion Outline

- General design objectives
- Supplemental bank soil mercury sampling
- Bank management area (BMA) refinement
- Developing BMA conceptual designs
- Schedule



General Design Objectives

- General upstream-to-downstream sequence
 - Phase 1: first 2 river miles below plant
 - Phase 1A: City-owned bank management areas (BMAs)
- Developing BMA-specific designs addressing remedial objectives and stakeholder preferences
- Remedial objectives
 - Reduce mercury loading from banks
 - Enhance riparian and aquatic habitat
- Stakeholder preferences
 - Preserve high value habitat
 - Facilitate pedestrian access and greenway connectivity



Mercury Loading to the South River

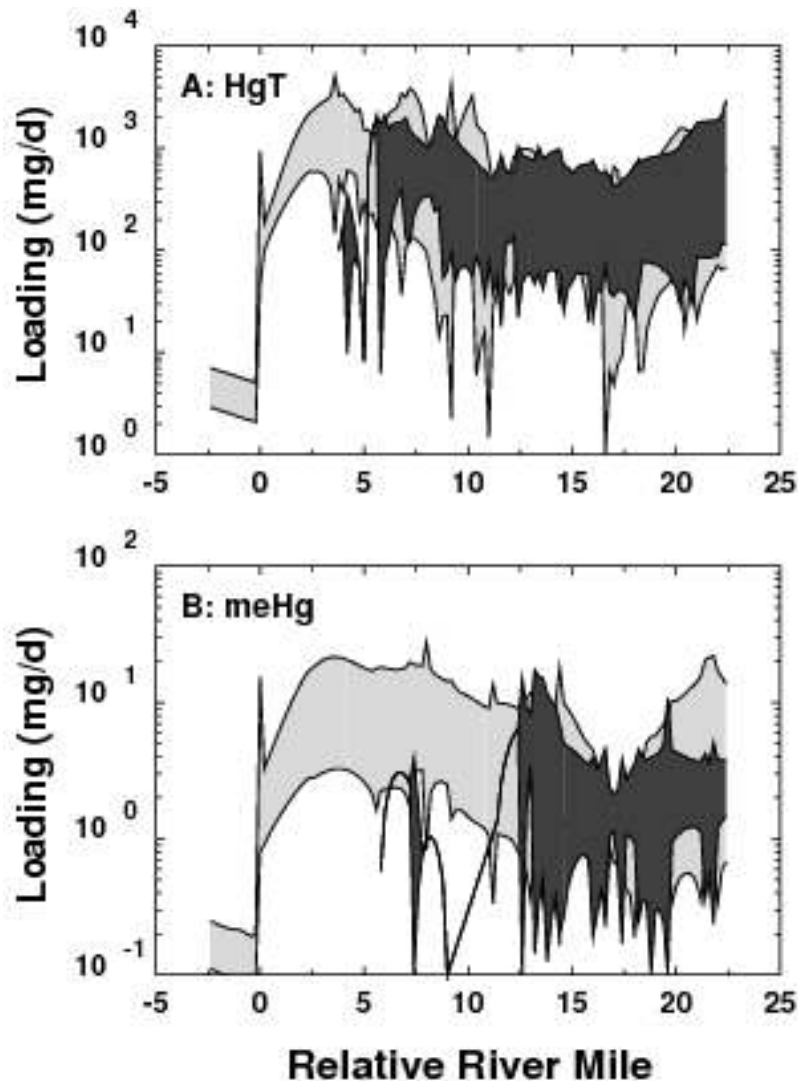
Mass Loading of Mercury to Fish Tissue *

3% to 5%	Plant site outfalls
40% to 60%	Eroding banks (historic deposits)
15% to 35%	In-channel sediments
5% to 20%	Other

*first 10 river miles downstream of plant

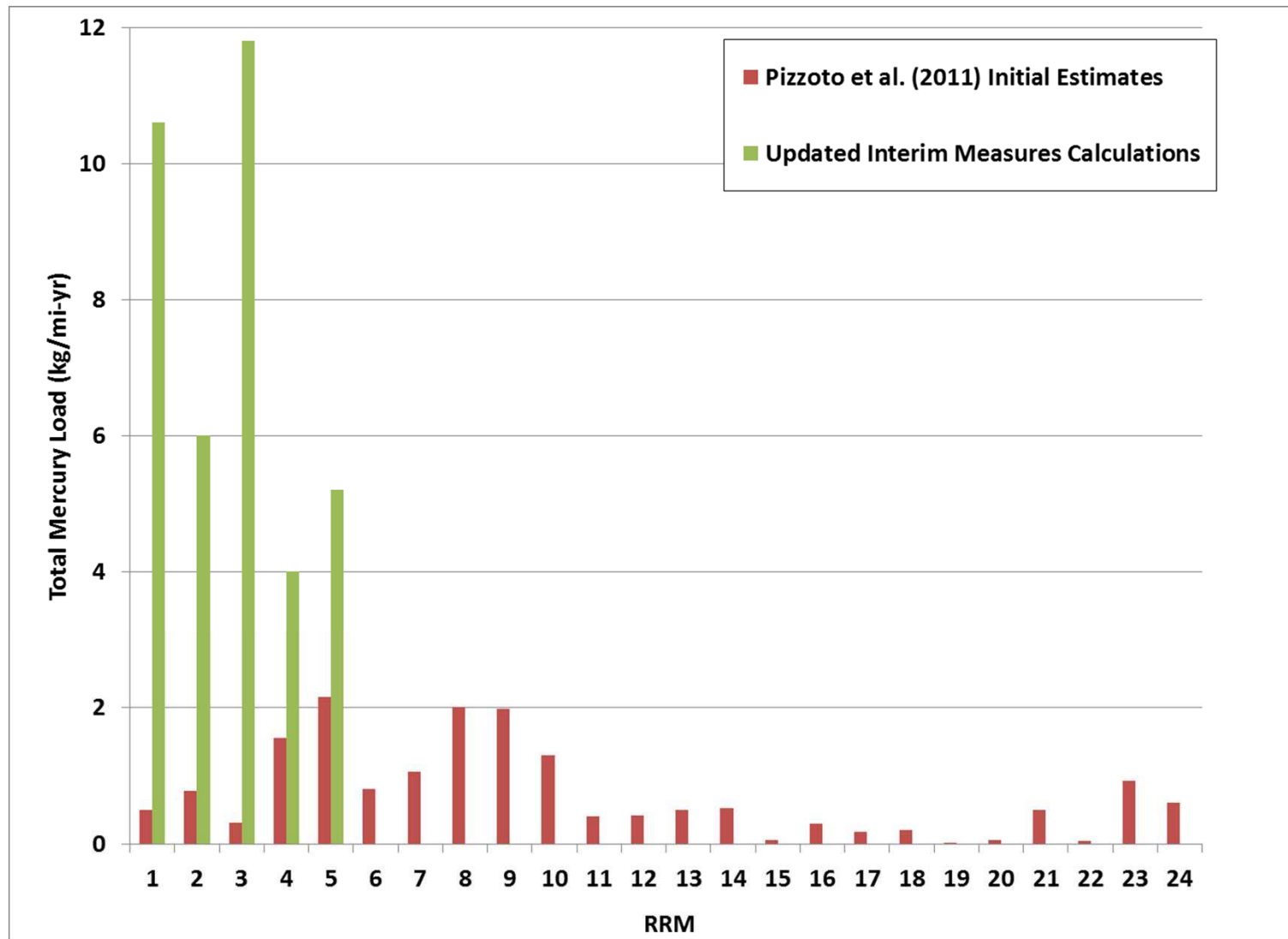


Incremental Mercury Loading to Water Column



- Largest incremental loading enters river immediately below plant (RRM 0 to 5)
- Light shaded polygons are positive loads
- Dark shaded polygons are negative loads
- Ranges represent one standard deviation
- From HydroQual (2009; unpublished)

Estimated South River Bank Total Hg Loading



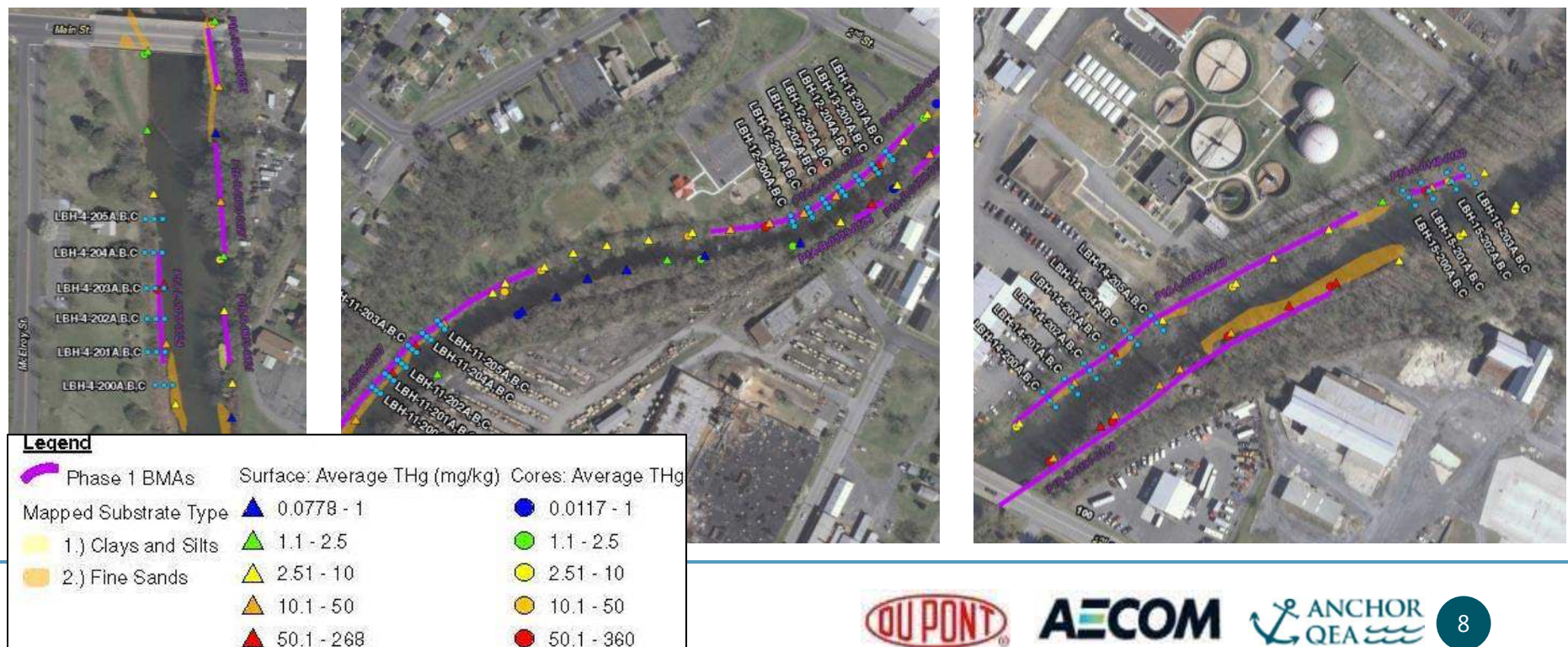
Delineation of Phase 1 Bank Management Areas

- Phase 1: RRM 0 to 2
- Bank erosion rates
 - Exposed tree roots
 - High resolution LiDAR surveys
- Mercury loading
 - Supplemental core sampling
- New BMA definitions:
 - **Primary** BMAs (contribute 50% of cumulative T-Hg bank load)
 - **Secondary** BMAs (contribute an additional 40% of T-Hg bank load)

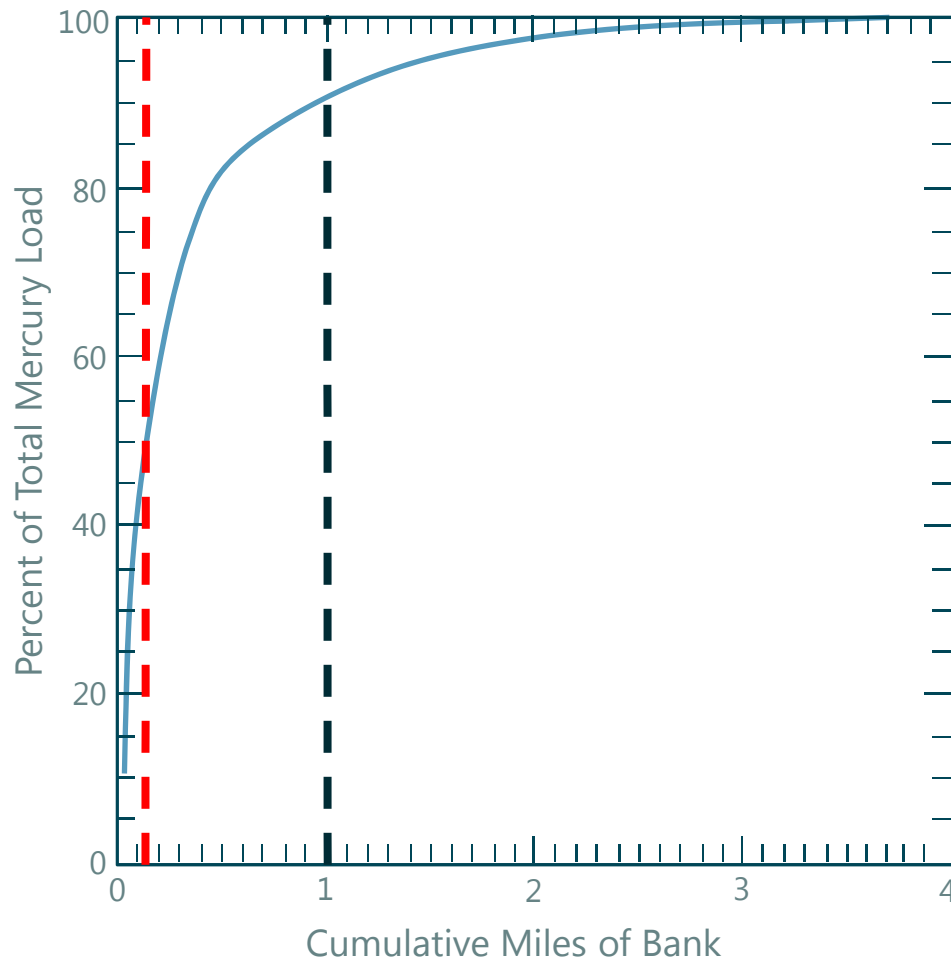


Supplemental Bank Core Sampling

- Constitution Park, North Park, and Wastewater Treatment Plant Phase 1 BMAs sampled in April 2015
- Mercury data used to refine BMA delineation and is being used to support site-specific remedy designs

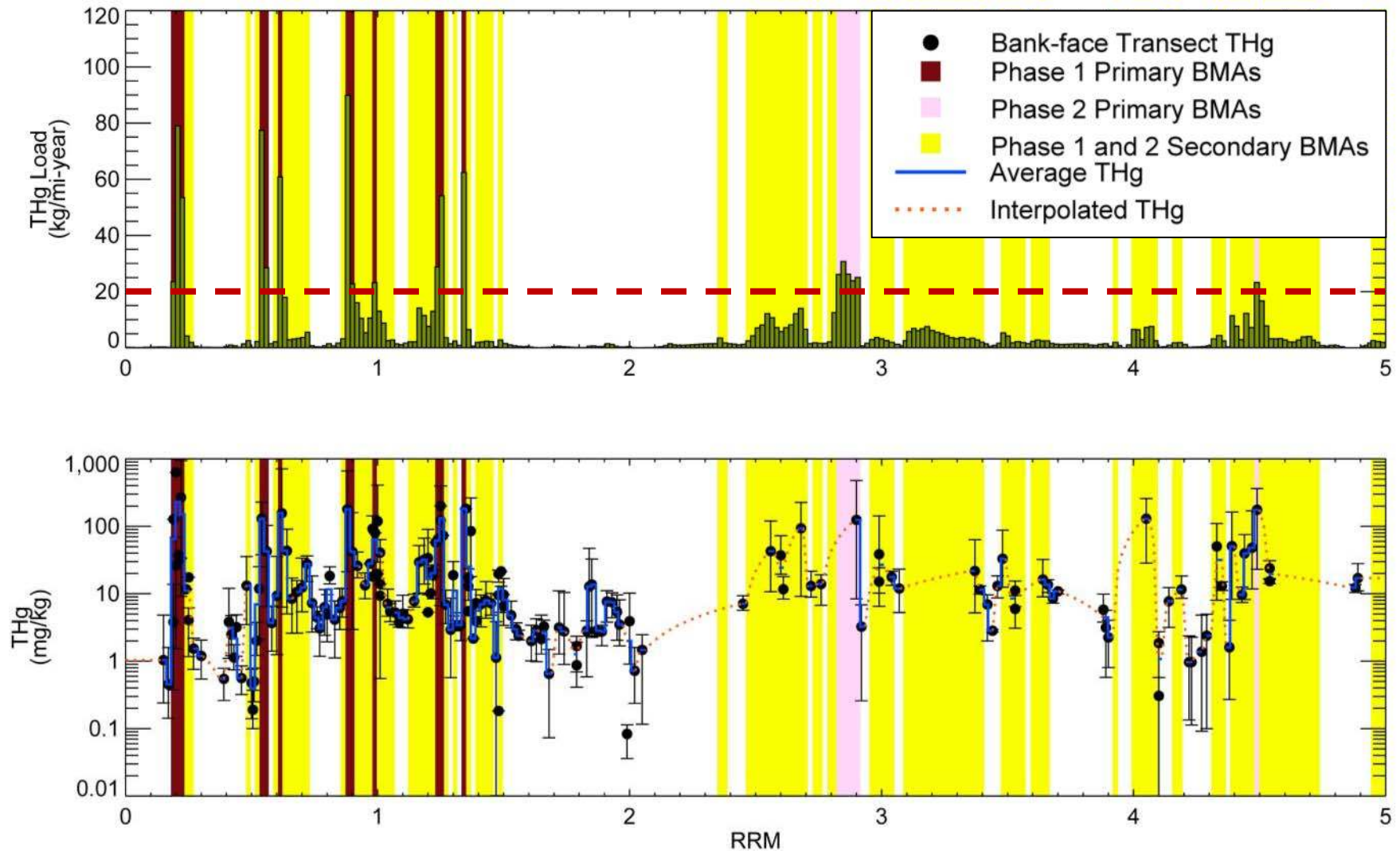


Cumulative Bank Mercury Loading: RRM 0 to 2

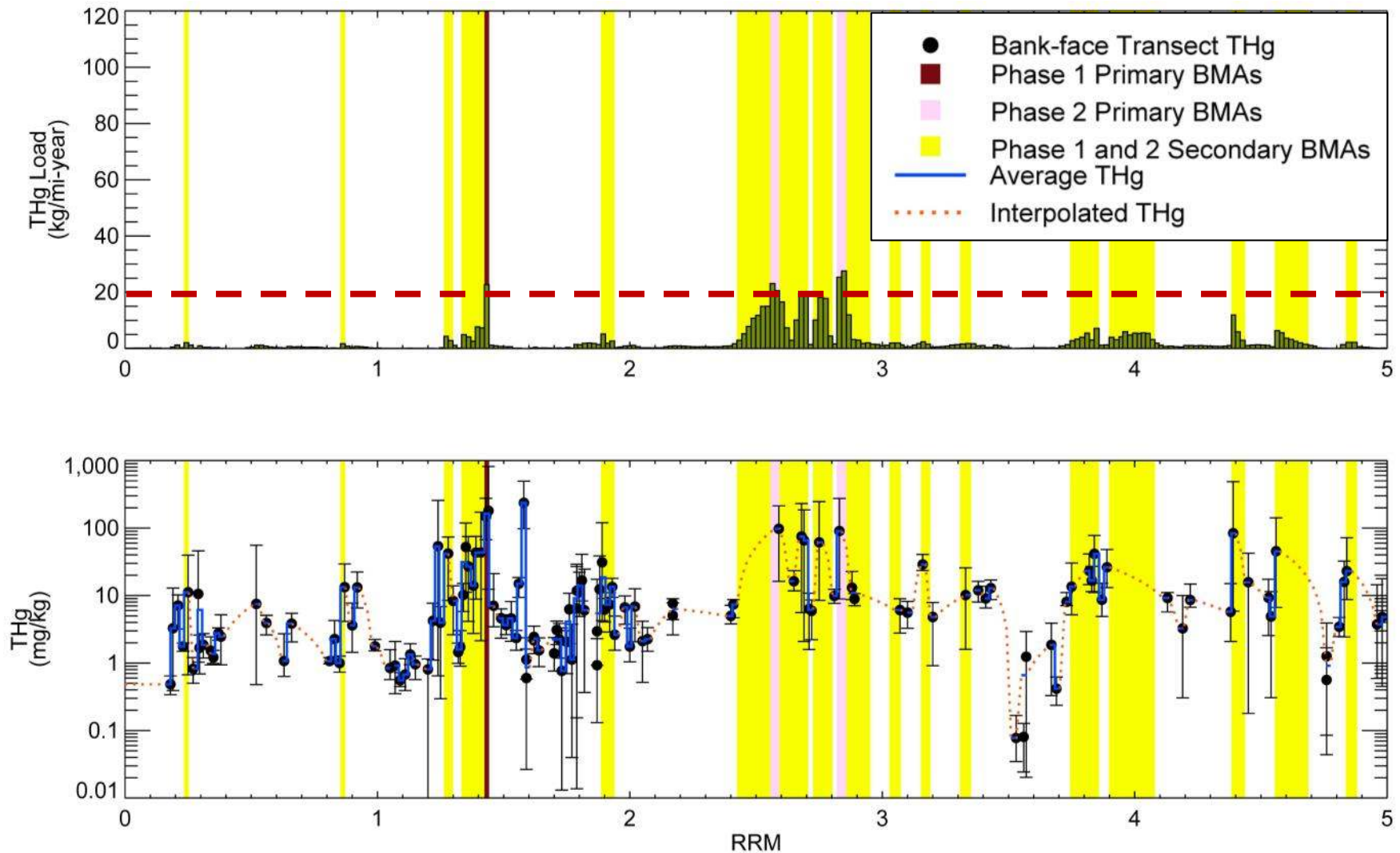


- 50% of cumulative mercury load is attributable to ~5% of banks (**Primary** Phase 1 BMAs; corresponds to unit loading >20 kg Hg/mi-yr)
- 40% of remaining mercury load is attributable to ~20% of banks (**Secondary** Phase 1 BMAs)

Left Bank Mercury Concentrations and Loading



Right Bank Mercury Concentrations and Loading



LEGEND

+ Relative River Mile

BMA's

— Phase 1 Primary BMA's

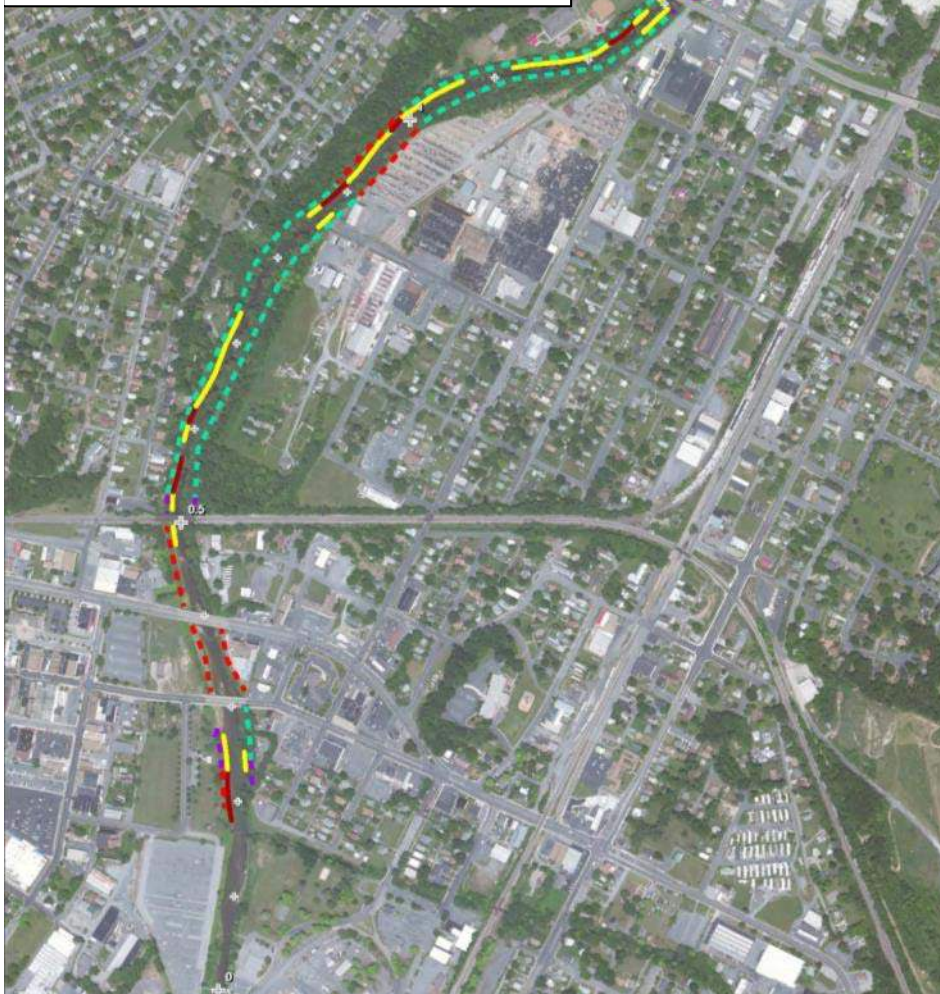
— Phase 1 and 2 Secondary BMA's

Habitat Assessment

— High Ecological Value

— Moderate Ecological Value

— Low Ecological Value



Phase 1 Bank Remediation Areas (RRM 0 to 2)

- Relatively few Phase 1 Primary BMA's
- Range of habitat conditions in BMA's (as determined by DGIF)

LEGEND

+ Relative River Mile

BMAs

Phase 2 Primary BMAs

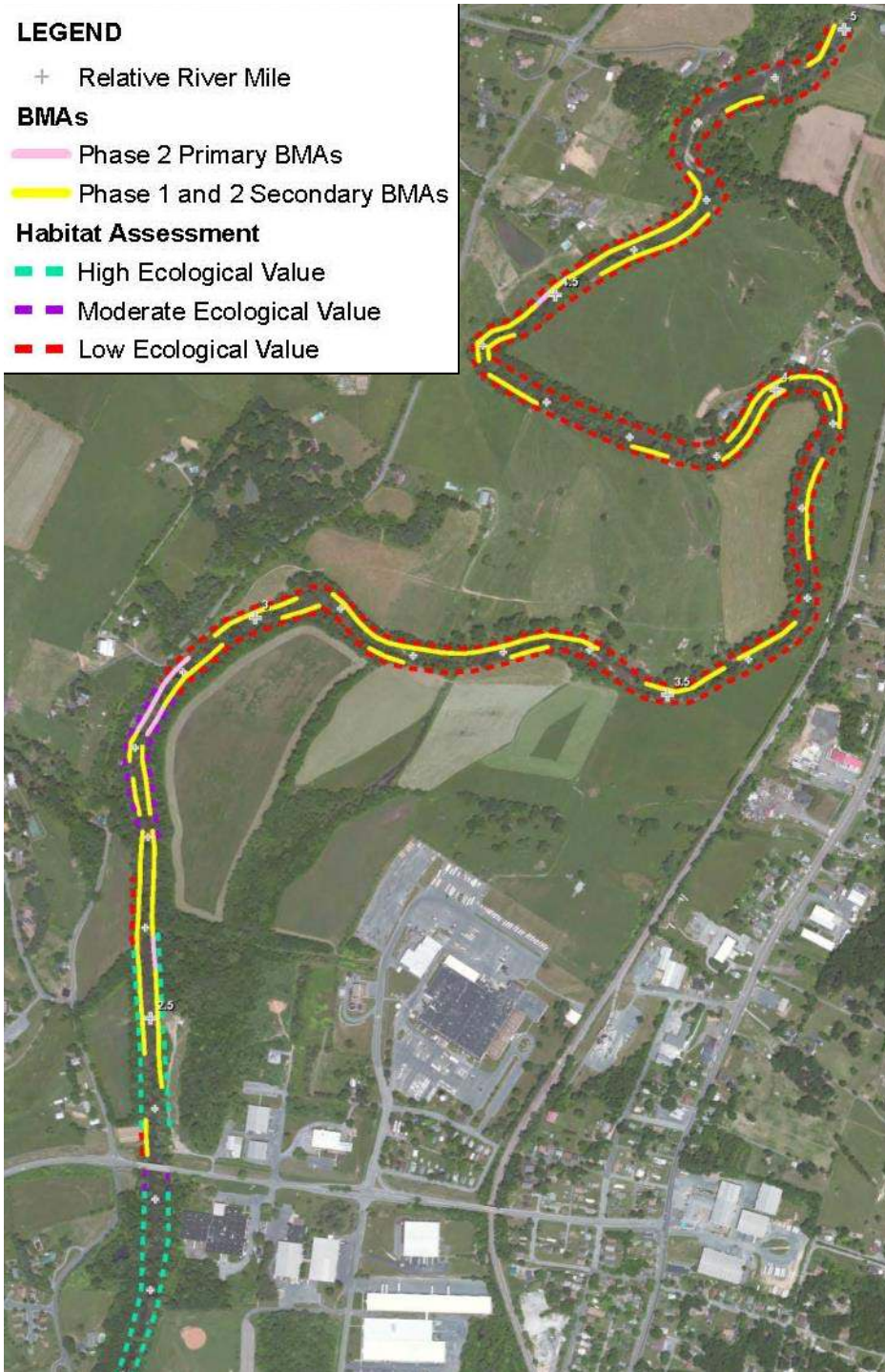
Phase 1 and 2 Secondary BMAs

Habitat Assessment

High Ecological Value

Moderate Ecological Value

Low Ecological Value



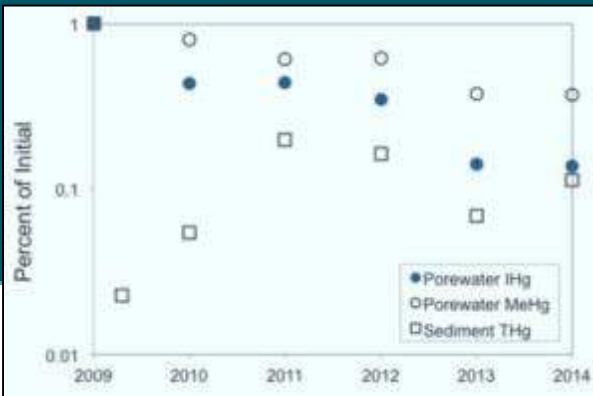
Phase 2 Bank Remediation Areas (RRM 2 to 5)

- Relatively few Phase 2 Primary BMAs
- Generally lower quality habitat in downstream Phase 2 BMAs (as determined by DGIF)

Bank Stabilization Concepts

- Remediation designs
 - Removal and disposal
 - Structural stabilization
- Habitat protection designs
 - Enhanced vegetative stabilization
- Conceptual designs still being developed with stakeholders

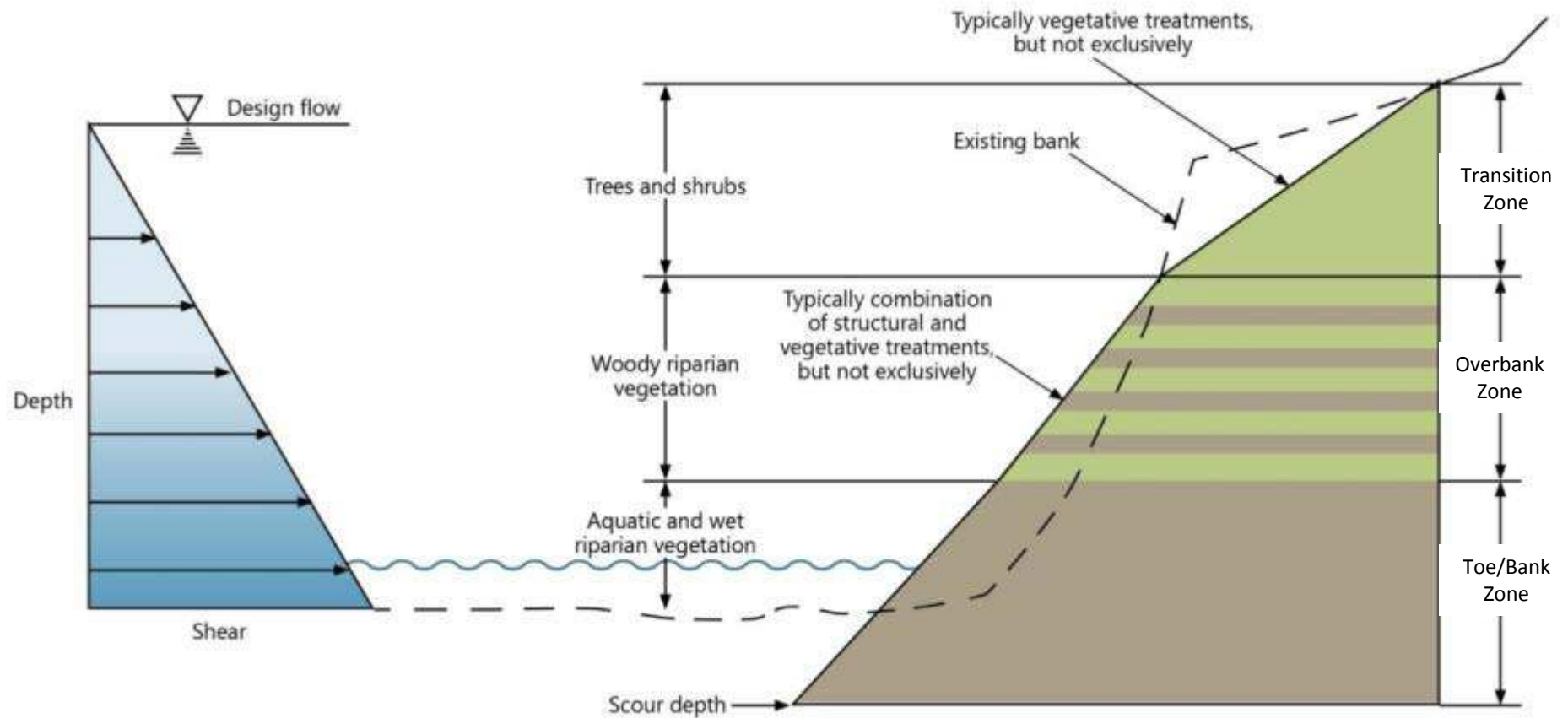




2009 Bank Stabilization Pilot Study

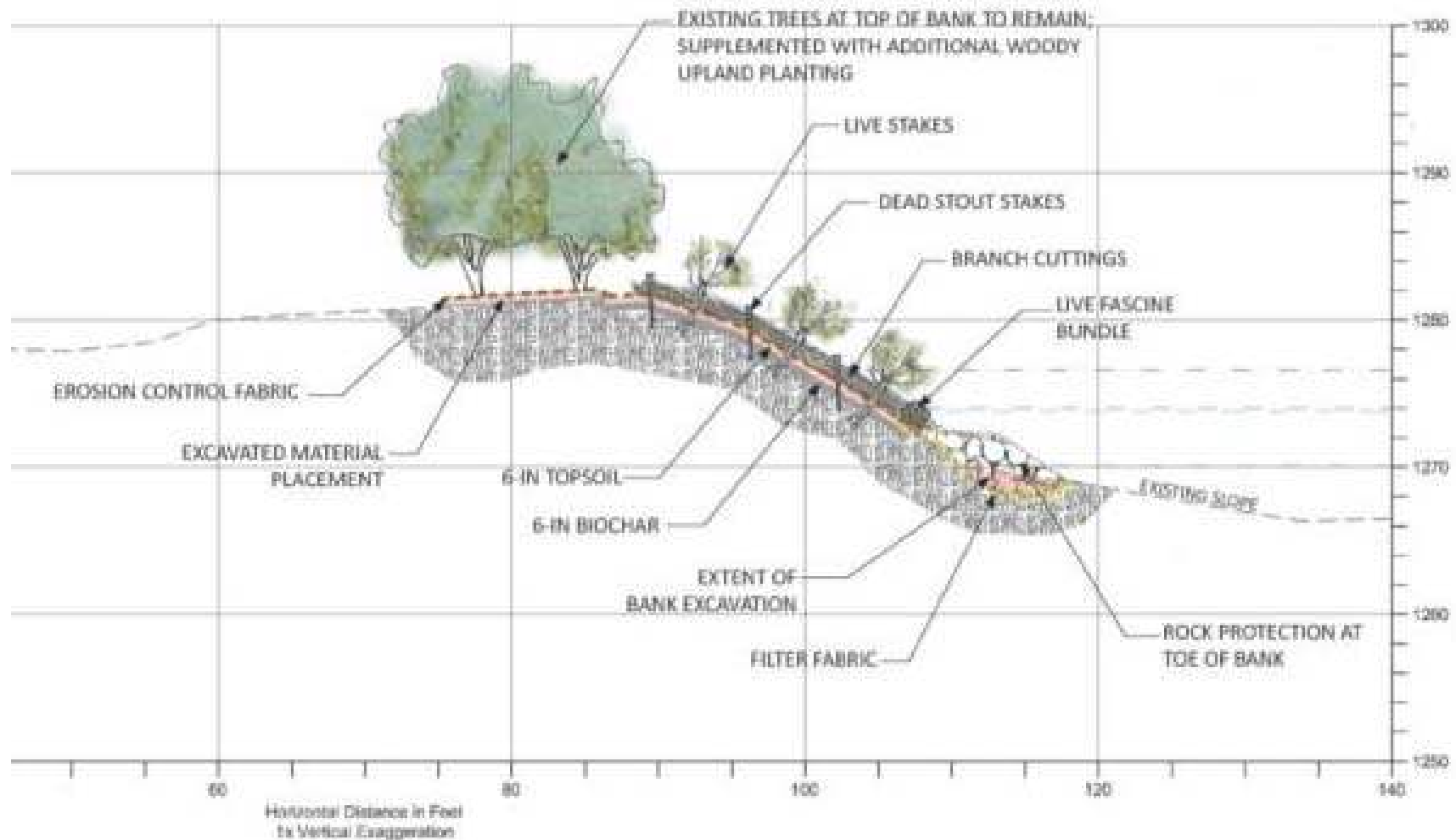
- Bank has remained stable (10-year storm event)
- Reduction in bioavailable mercury concentrations in channel sediments following bank stabilization
- Well-developed vegetation and other habitat improvements, but invasive species colonization

Bank Restoration/Stabilization Design Concepts

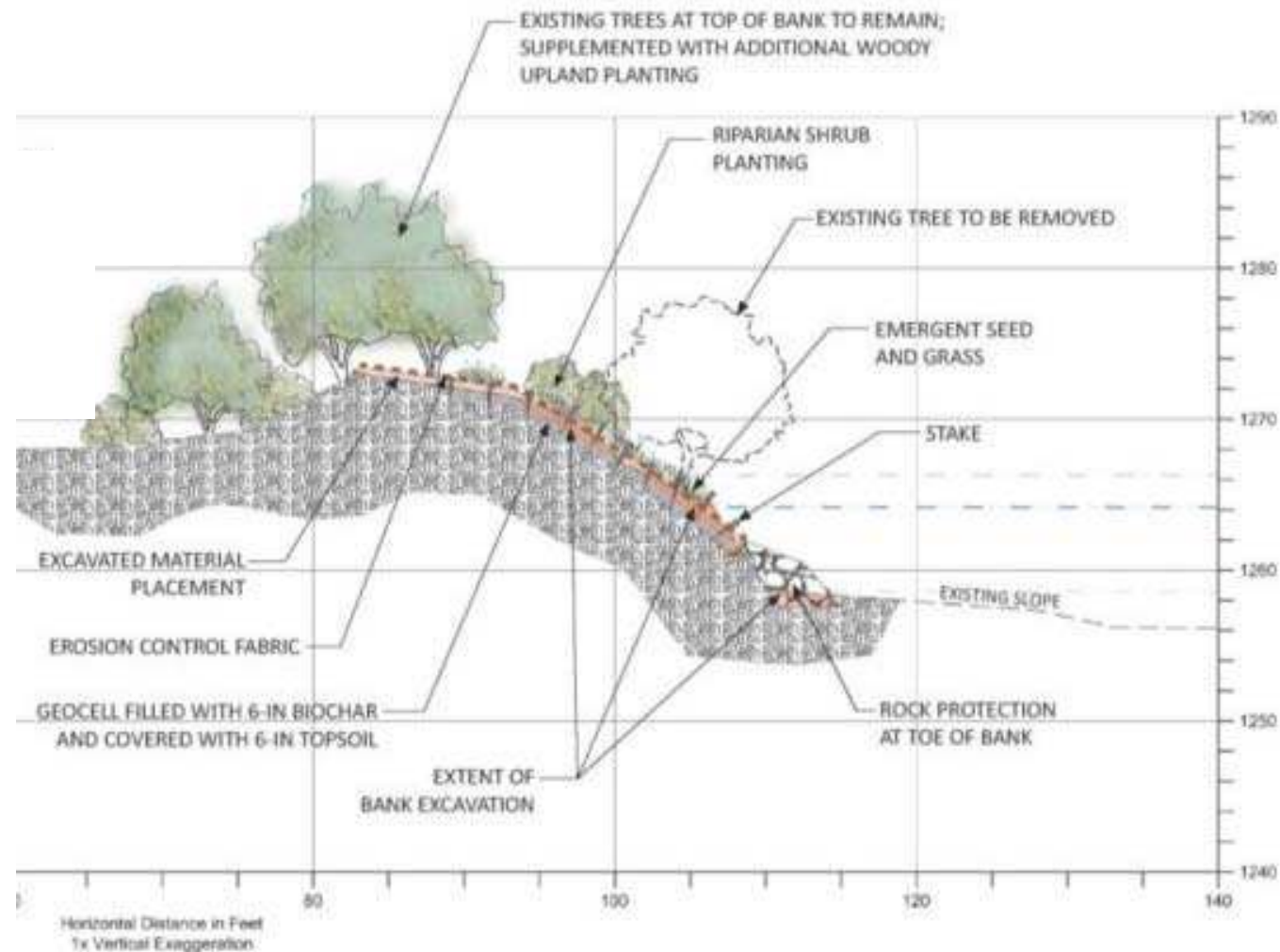


Source: Adapted from NRCS 2007. Stream restoration design process. Chapter 4, Part 654. National Engineering Handbook.

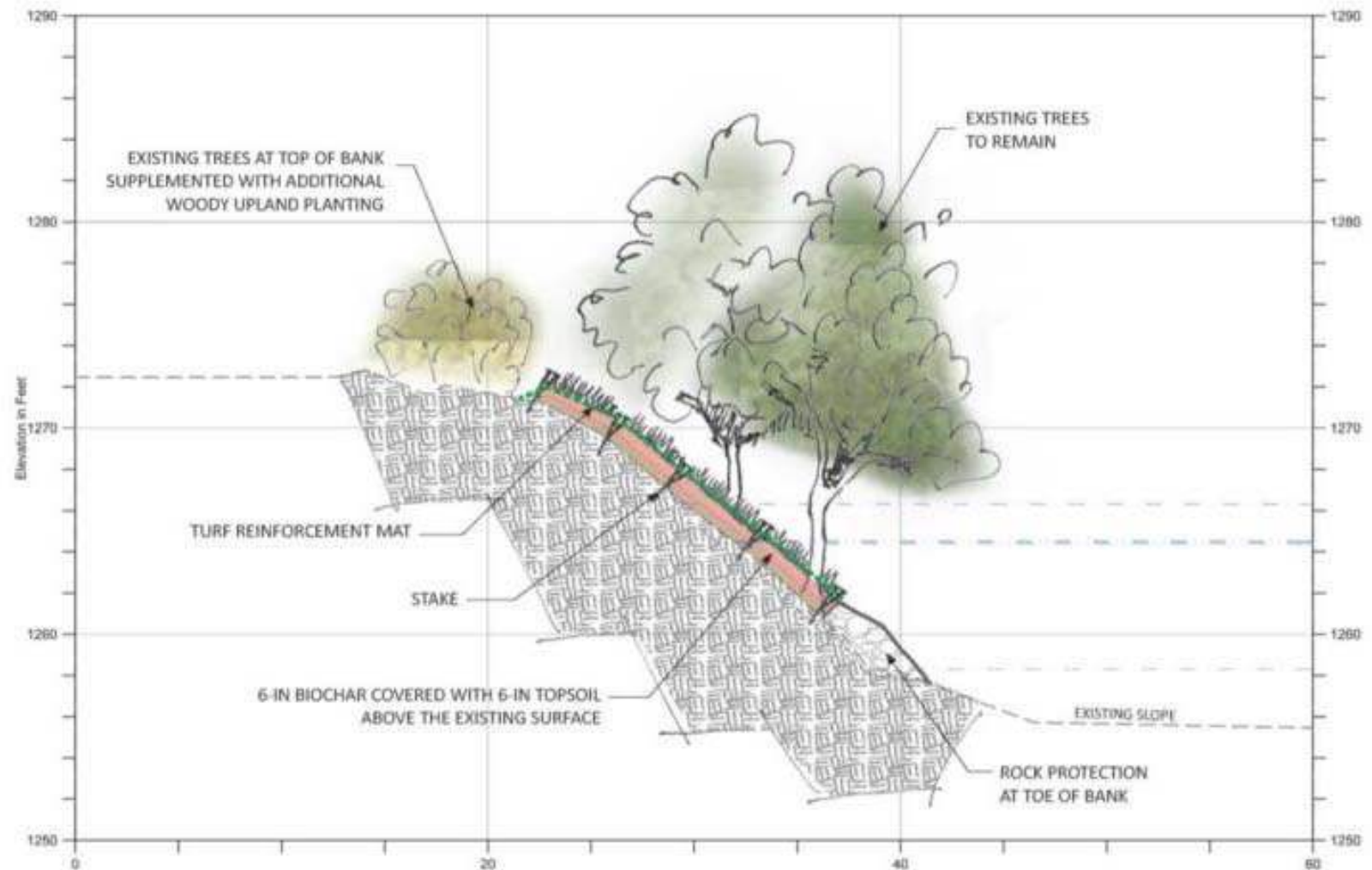
Potential Bank Remedy Design Concept: Primary BMA in Low Quality Habitat Area



Potential Bank Remedy Design Concept: BMA in Moderate Quality Habitat Area



Potential Bank Remedy Design Concept: Secondary BMA in High Quality Habitat Area



Schedule and Next Steps

- May – tree survey/marketing and supplemental core sampling
- May/June – conceptual design development with stakeholders
- Late June – pre-application permit meeting
- Early September – preliminary Phase 1A design report
 - Follow-on Agency reviews
- Early 2016 – final design, access agreements, and permitting

