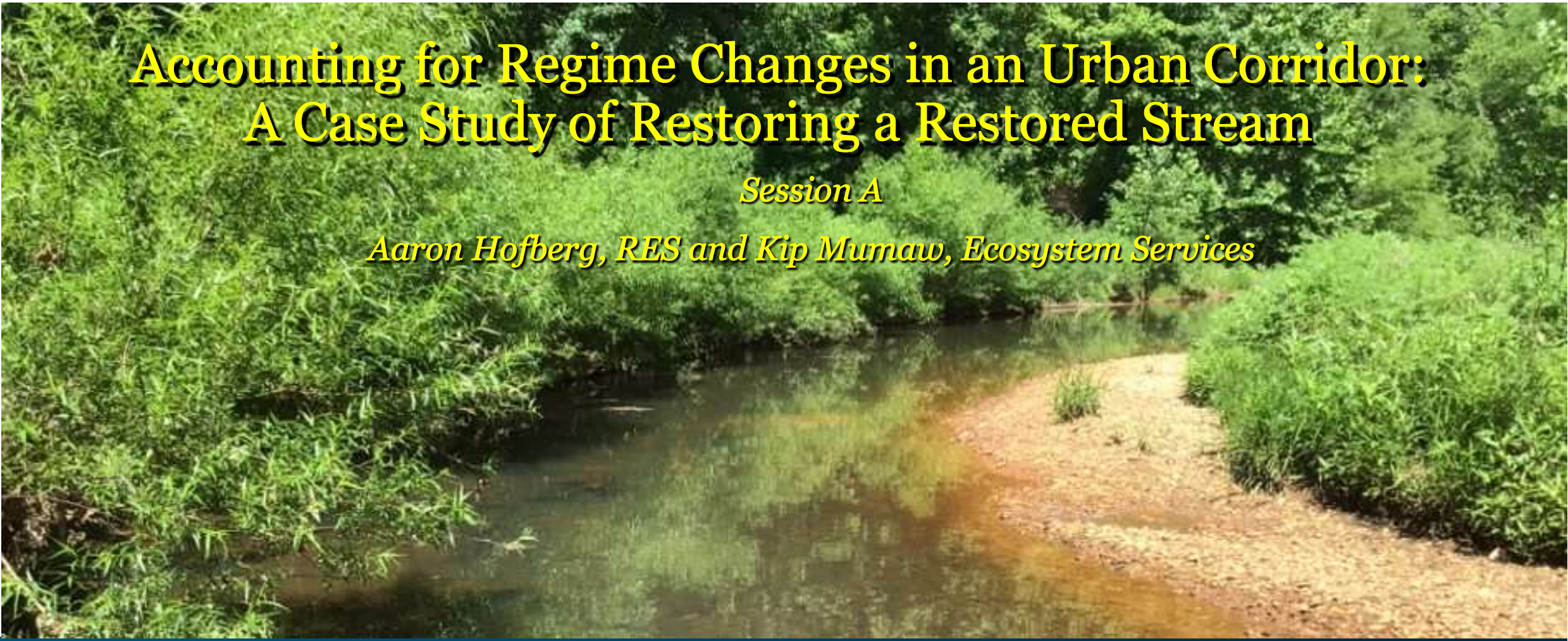


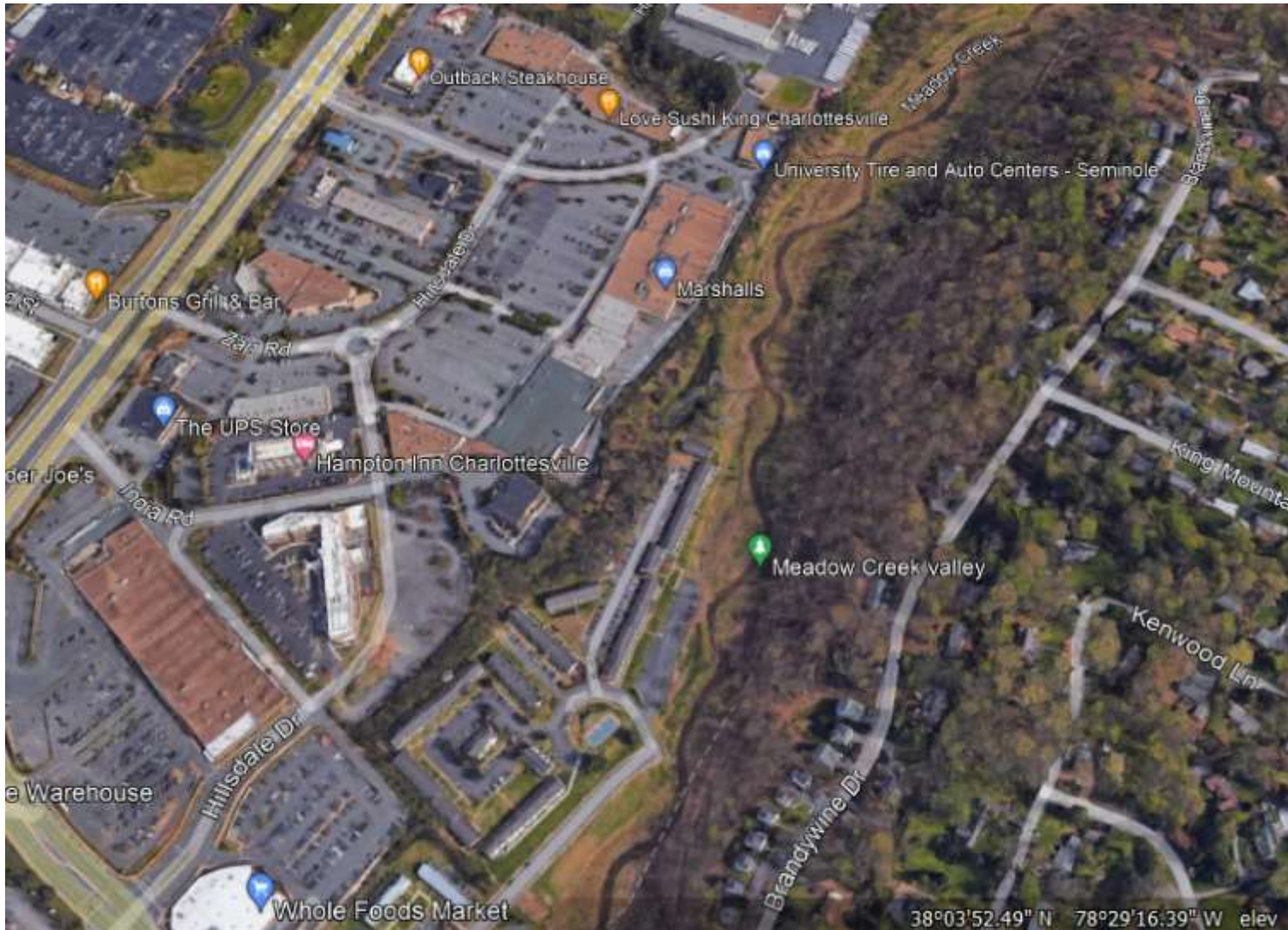
Accounting for Regime Changes in an Urban Corridor: A Case Study of Restoring a Restored Stream

Session A

Aaron Hofberg, RES and Kip Mumaw, Ecosystem Services



Urban Restoration – 2013



7,372 LF OF RESTORATION

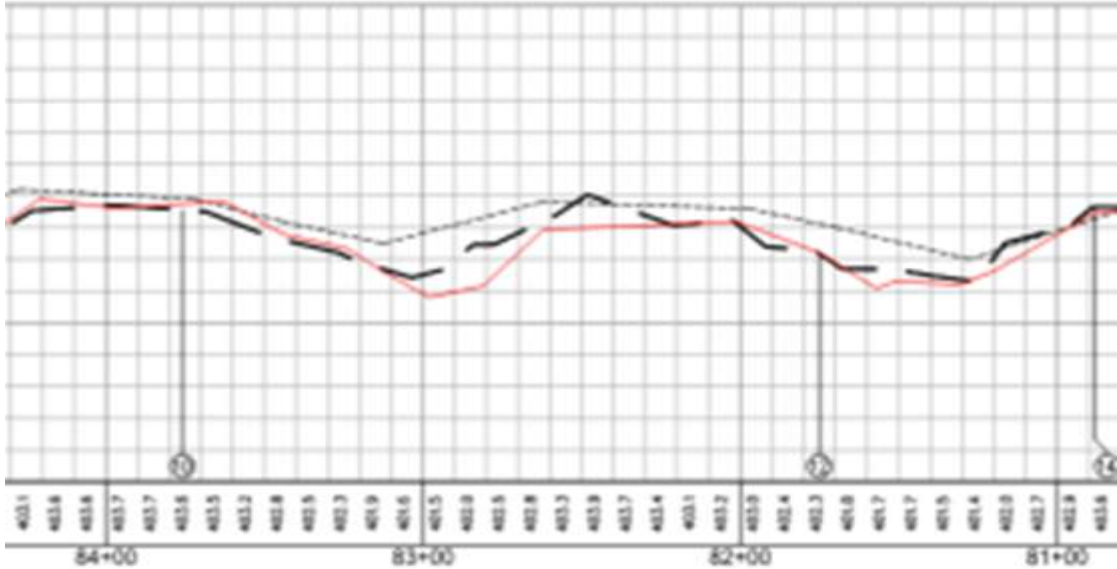
4.5 SQ MI DRAINAGE AREA

CONSTRAINTS:

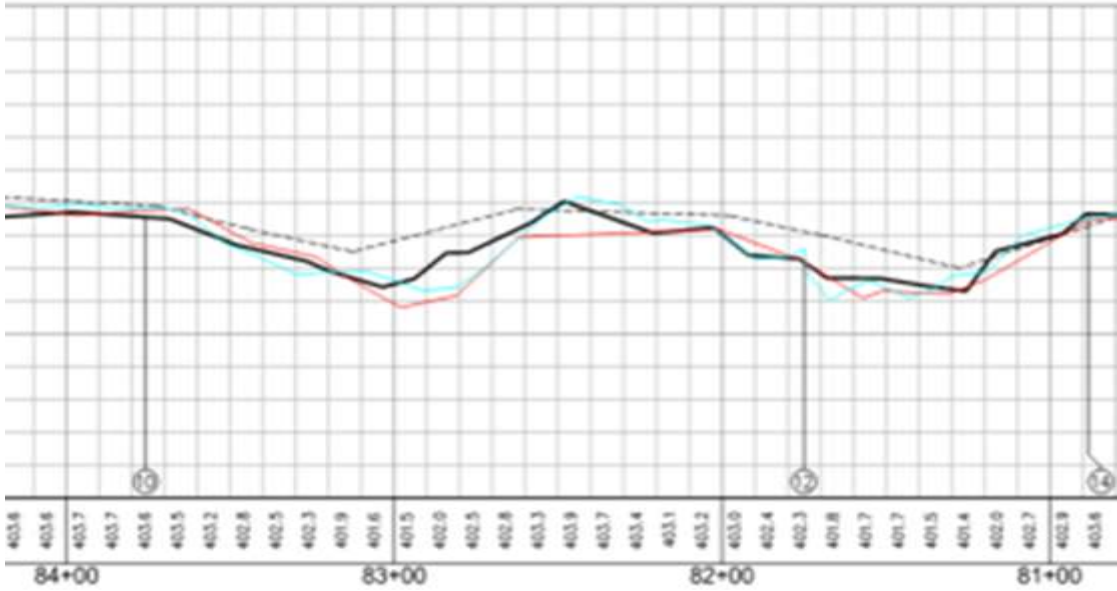
- VALLEY WALLS
- UTILITIES
- DEVELOPMENT
- SW OUTFALLS



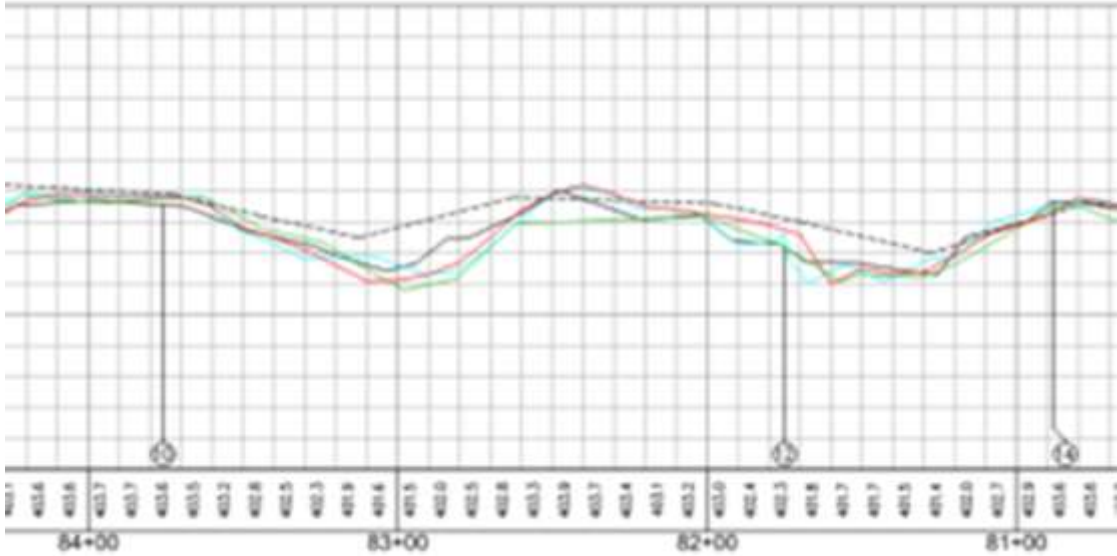
Monitoring Year 1



Monitoring Year 2



Monitoring Year 3



Adaptive Management

EXCESSIVE OUTER BANK SHEAR STRESS LED TO:

- DEEPENING POOLS
- UNDERCUTTING BANK STRUCTURES
- REMOVAL OF OUTER BANK VEG MATERIAL AND DEPOSITING MORE OF THIS MATERIAL ON RIFFLE INNER BERMS AND POINT BARS
- ULTIMATELY BANK EROSION FOLLOWING STRUCTURE FAILURE
- LACK OF FLOODPLAIN CONNECTIVITY AT MEANDER BENDS

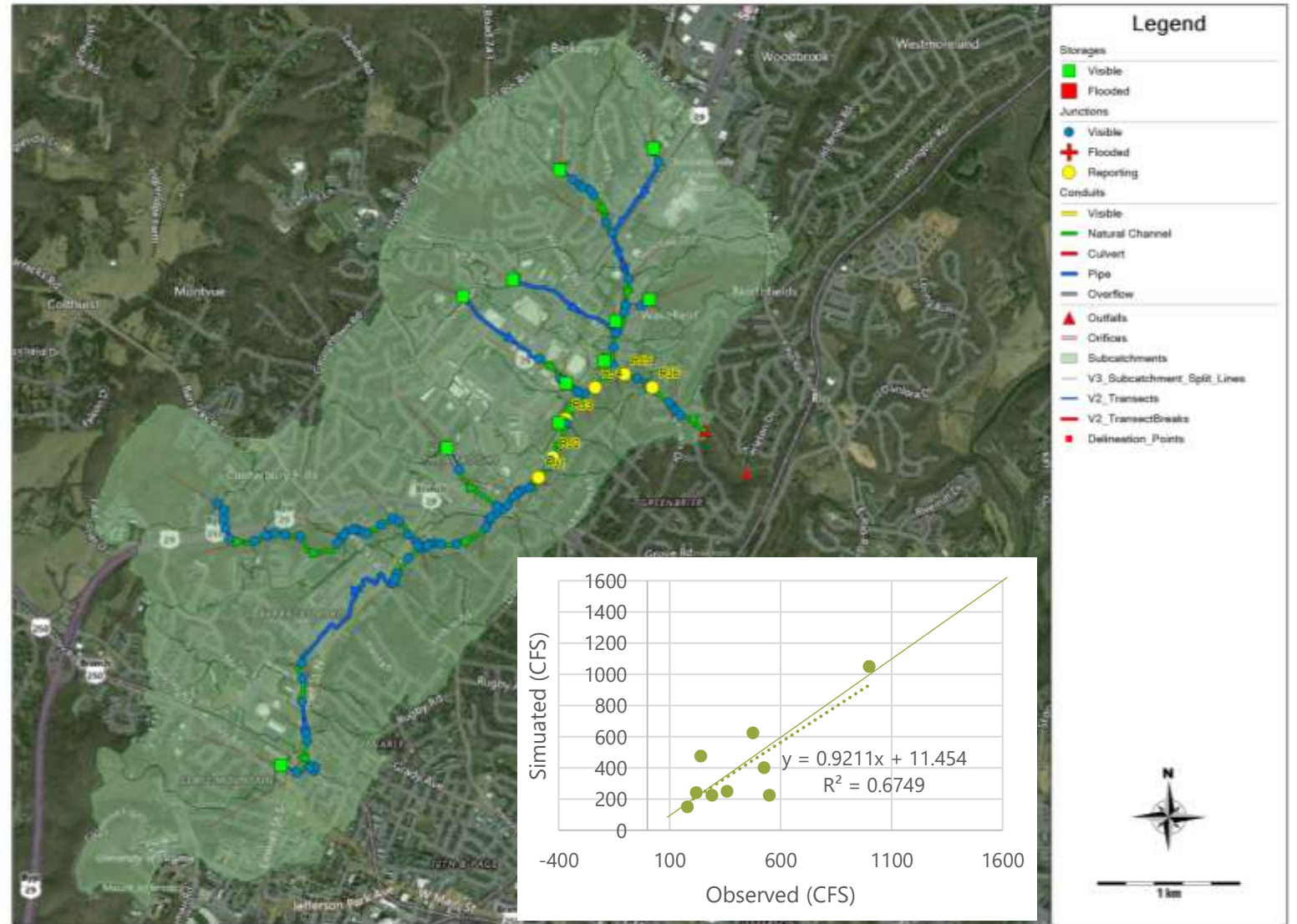


PRIOR RESTORATION SUCCESS:

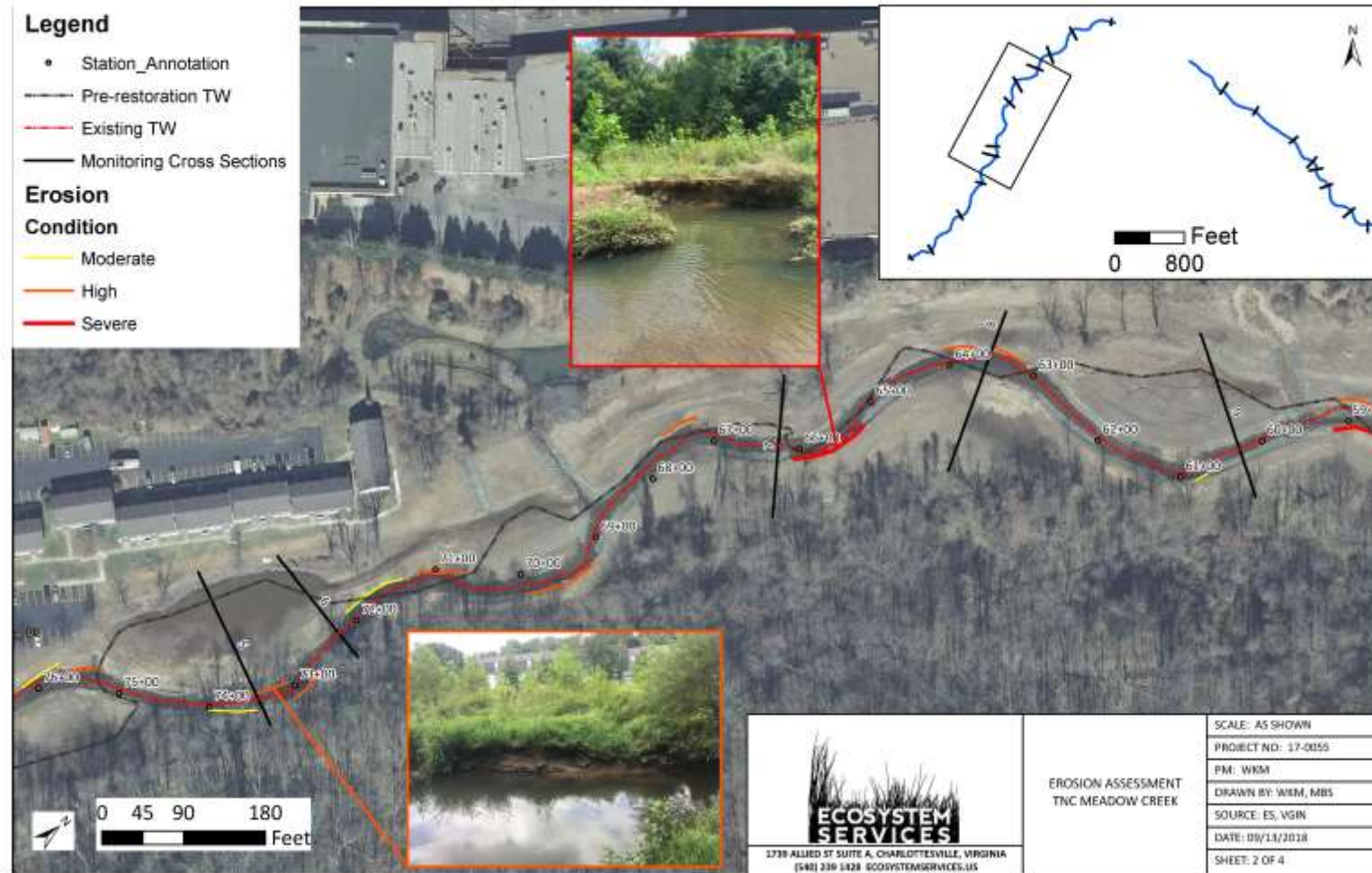
- RIFFLES IN GOOD STABLE CONDITION
- VEGETATION ESTABLISHED EARLY ALONG RIFFLES AND IN FLOODPLAIN
- IMPROVED HABITAT
- REDUCTION OF INVASIVES
- IMPROVED PUBLIC SAFETY

All models are wrong, but some are useful.

-George E. P. Box

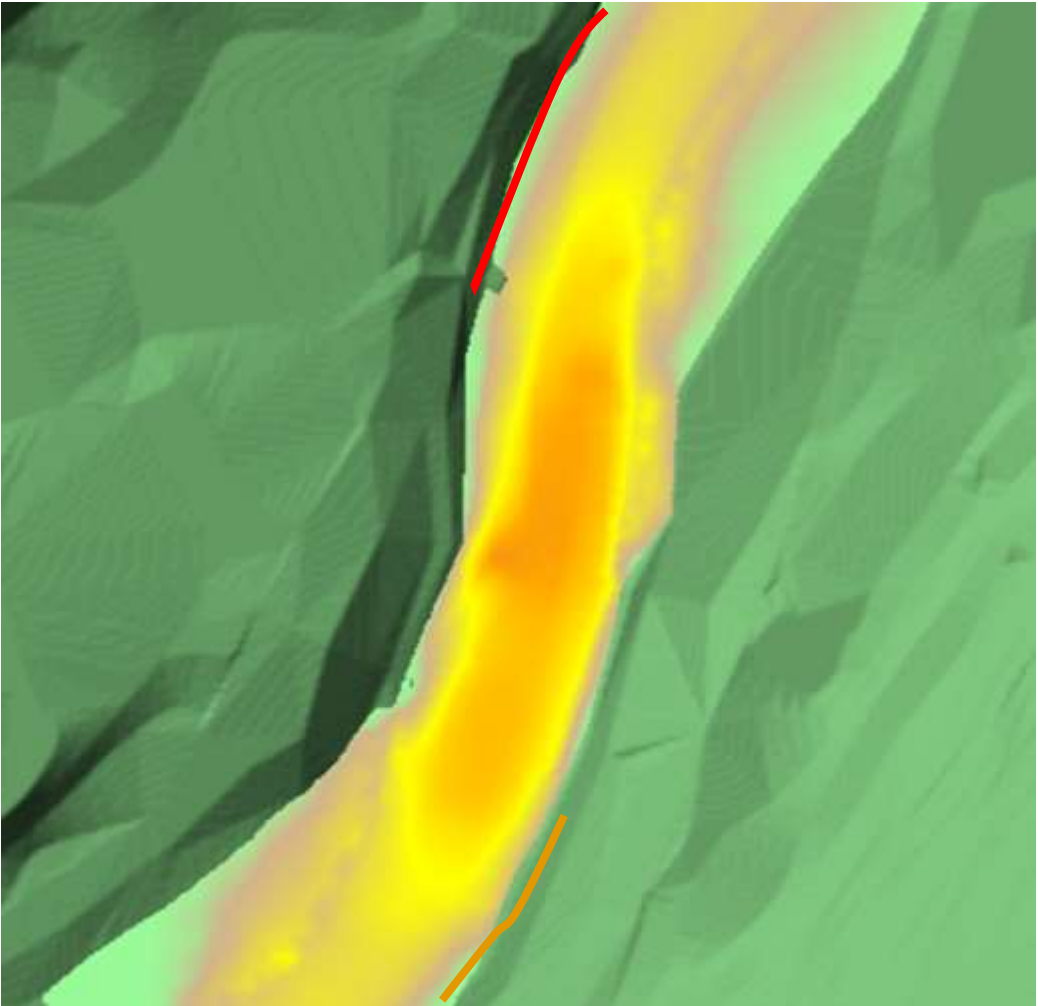


Observations of Excessive Erosion



Hydraulic Assessment

2-D Model Analysis

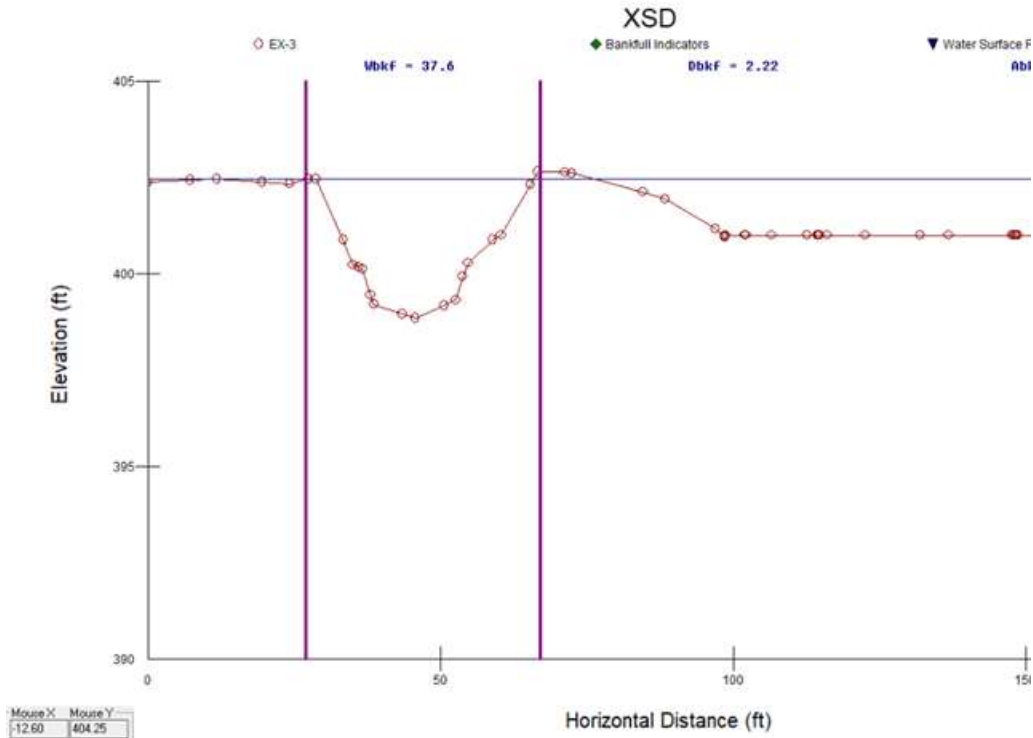


Outer Bend Erosion

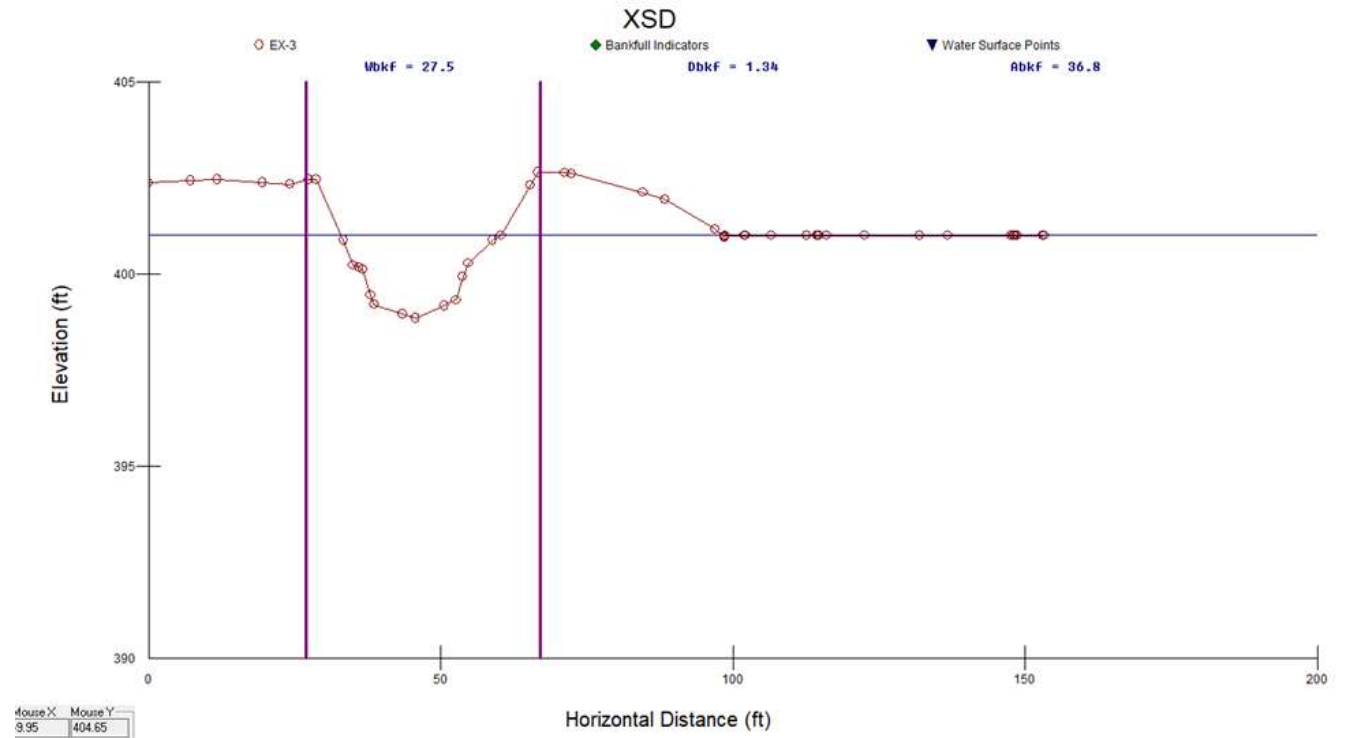


Hydraulic Geometry

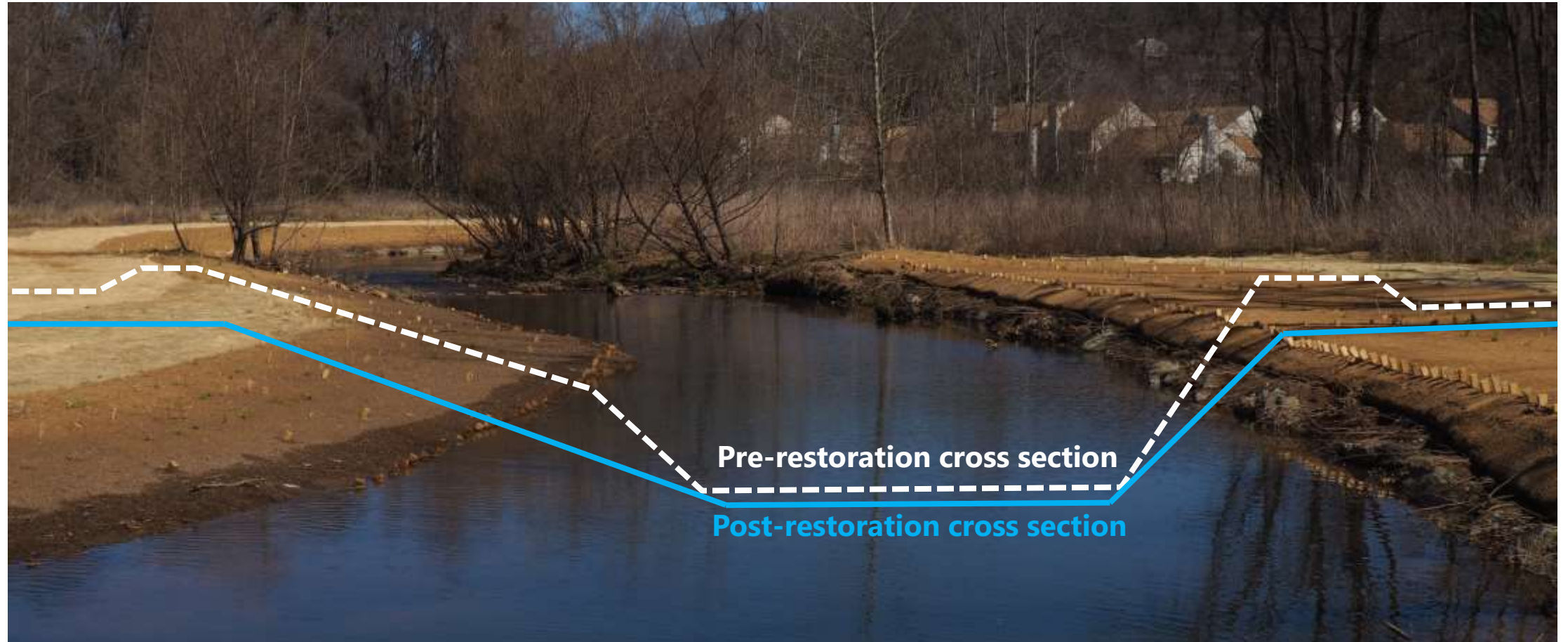
Original Design Geometry



Proposed Geometry



Floodplain Connectivity



Shear Comparison

Pre-Restoration



Post-Restoration



Sediment Transport

Immediately post-construction



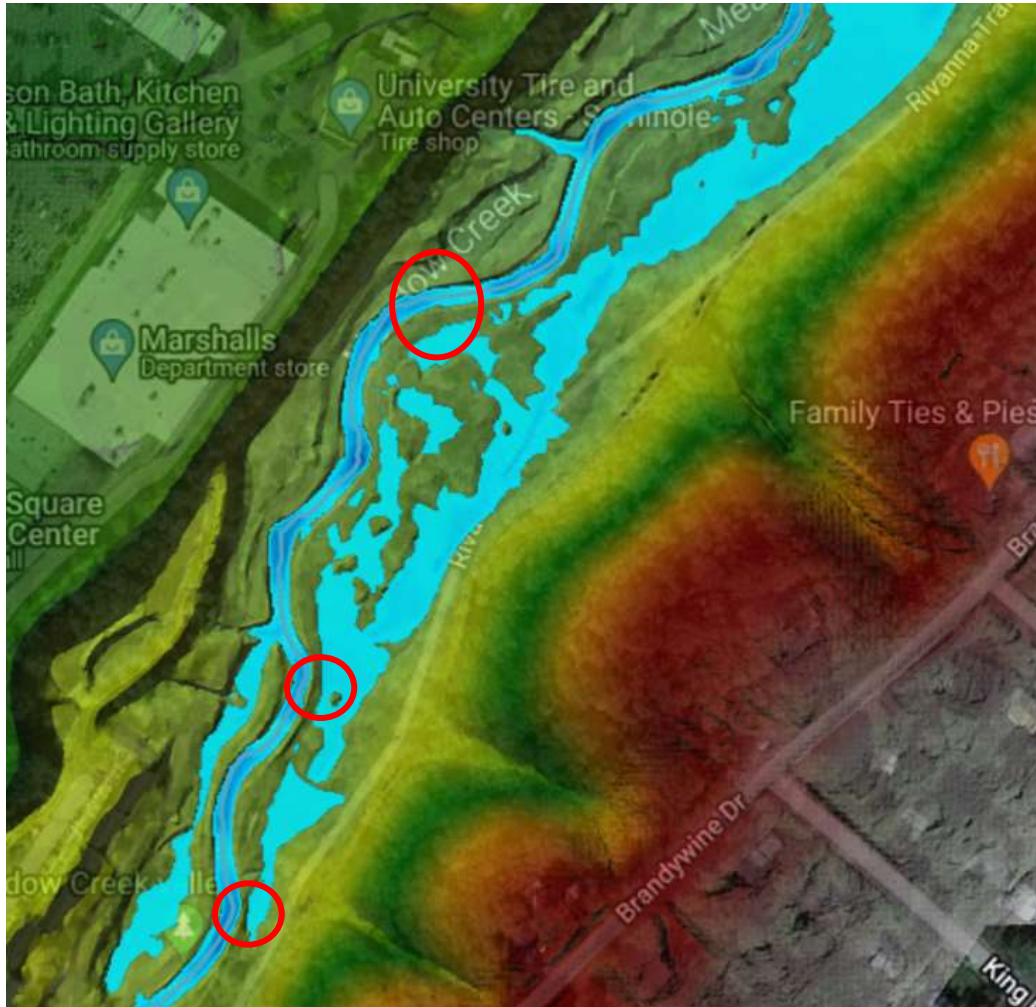
Sediment Transport

5 months post-construction

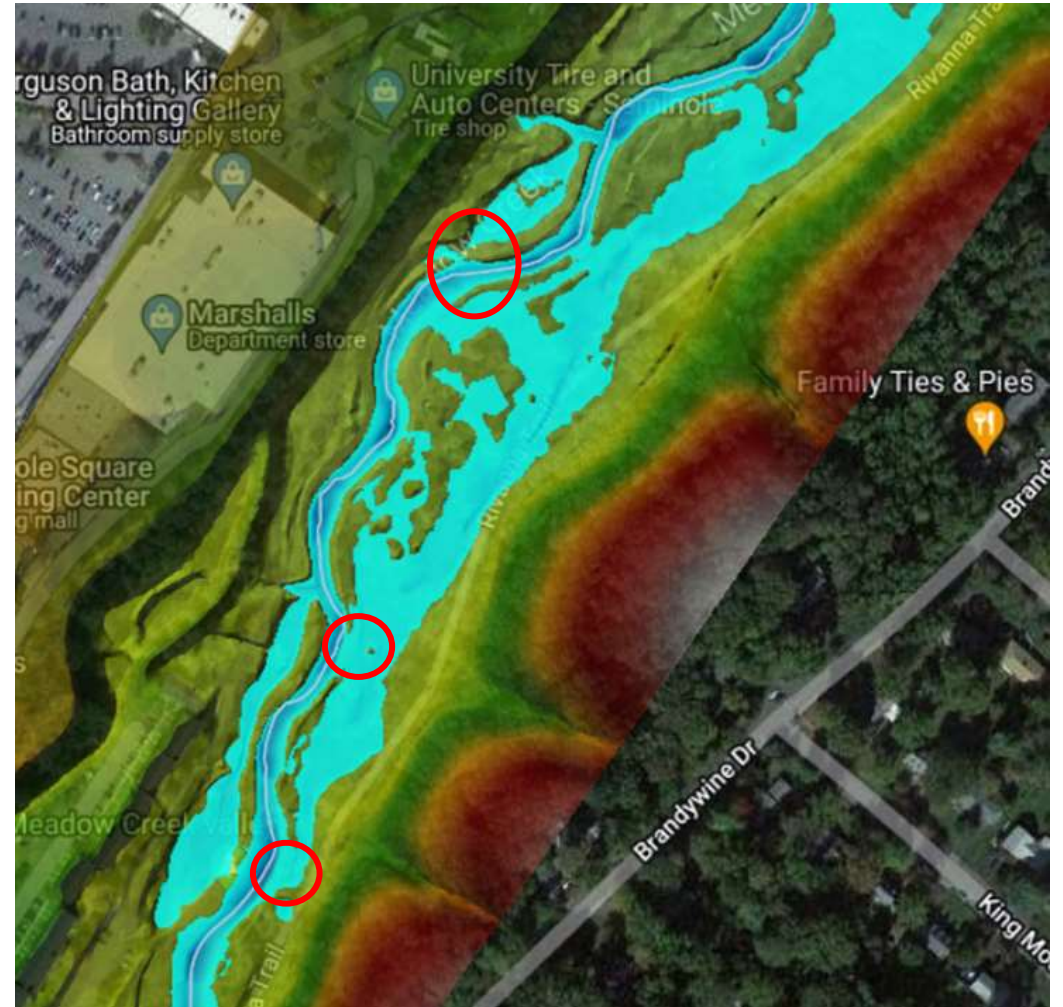


Floodplain Connectivity

Pre-Restoration

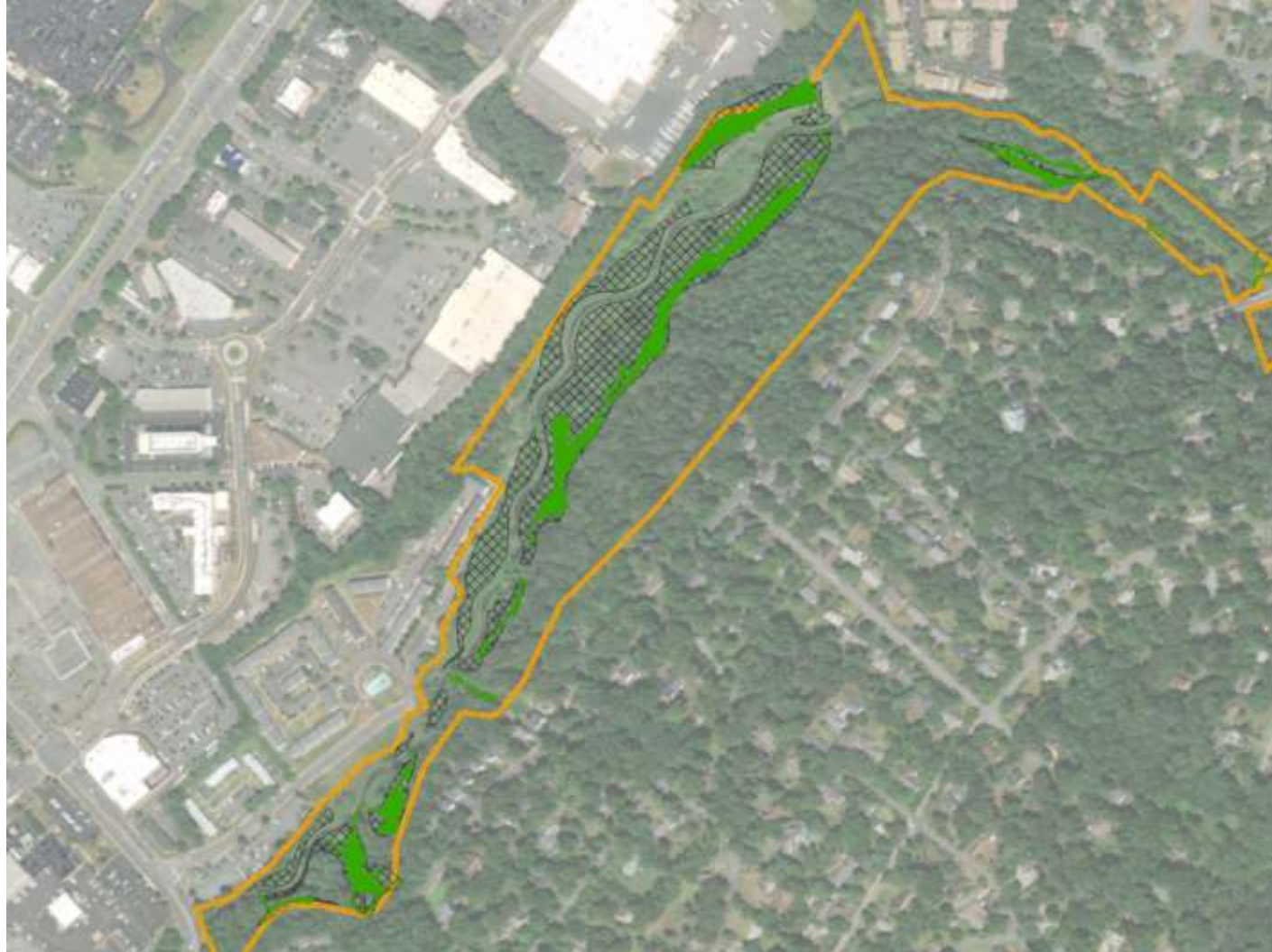


Post-Restoration



Increase to Restored Wetlands

(cross-hatch shows post-restoration wetlands and green hatch shows pre-restoration wetlands)



Implementation



Year-2 Post Repair

Replacing Boulders with Wood



Live Branch Layering



Year-2 Post Repair

Alignment Adjustments with Kicker Logs



Point Bar Creation



Year-2 Post Repair

J-hook with Log Vane



Log Vane with Existing Boulder Toe



Immediate and Year 2 Post Repair - Drone



Questions & Answers

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