

# Unintended Consequences of Wetland Creation / Restoration

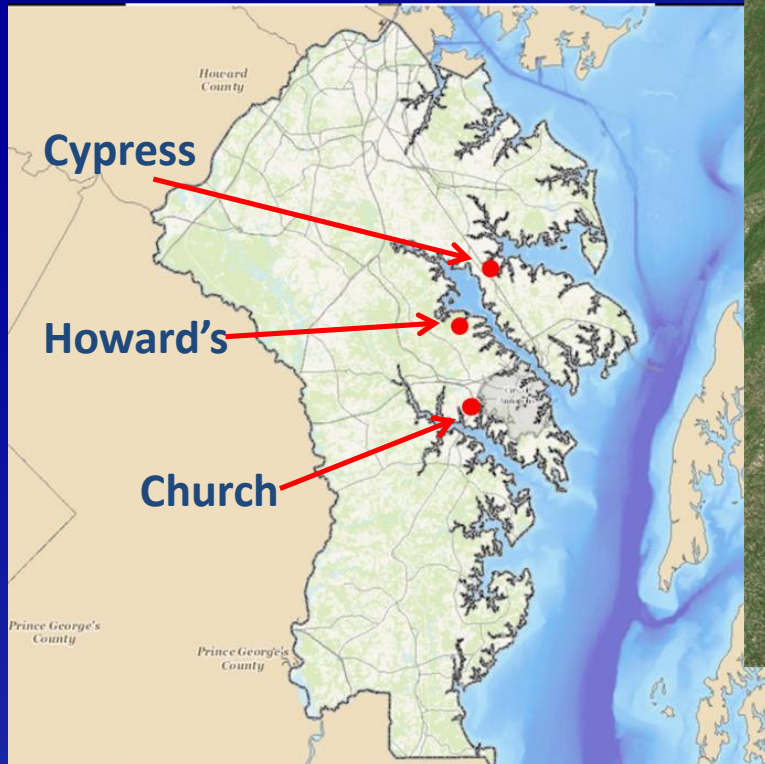
A photograph of a wetland area. In the foreground, a stream flows over rocks, with small green plants growing along the banks. The middle ground is dominated by a large area of lily pads on the water, with some pink flowers visible. The background is filled with dense green trees and bushes. The overall scene is lush and green.

Michael Williams  
University of Maryland

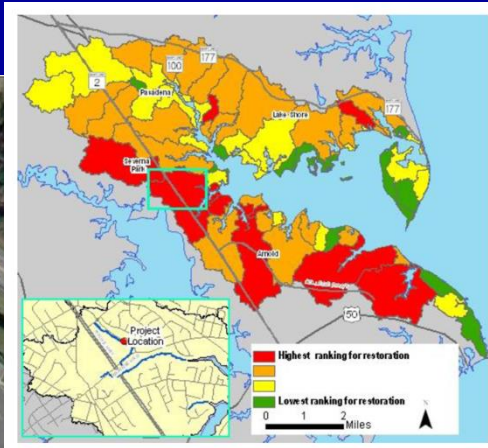
# Case Studies

- Cypress Creek – Magothy River - Degraded urban stream to Stream Wetland Complex (SWC)
- Church Creek – South River - Degraded urban stream to SWC
- Howard's Branch – Severn River - Degraded stream to SWC
- Delmarva Bay – Prior agricultural land converted to wetland

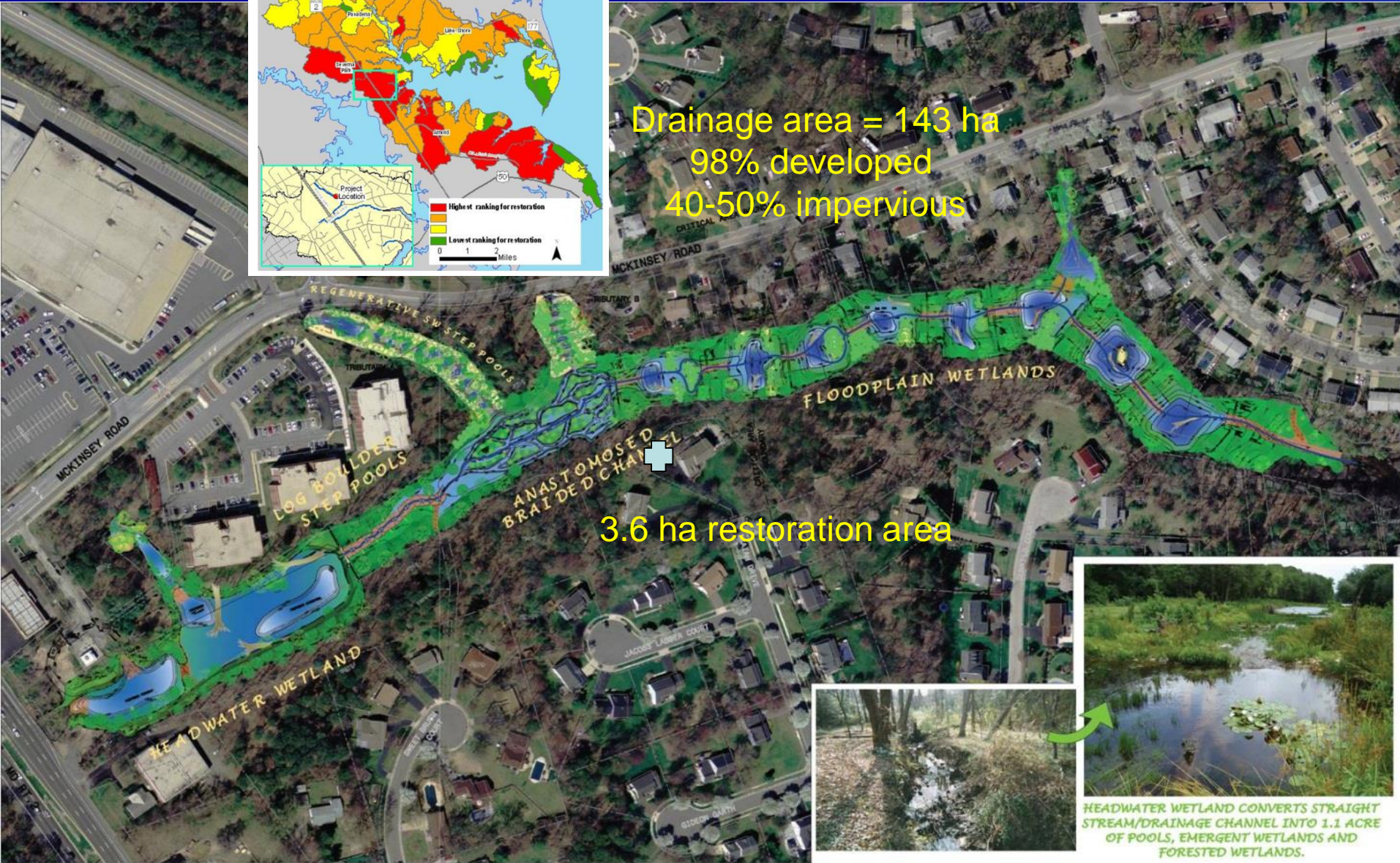
## Anne Arundel County



# Magothy River - Cypress Creek



Drainage area = 143 ha  
98% developed  
40-50% impervious



3.6 ha restoration area



HEADWATER WETLAND CONVERTS STRAIGHT STREAM/DRAINAGE CHANNEL INTO 1.1 ACRE OF POOLS, EMERGENT WETLANDS AND FORESTED WETLANDS.

# Stream-Wetland Complex (SWC)

Pre-construction



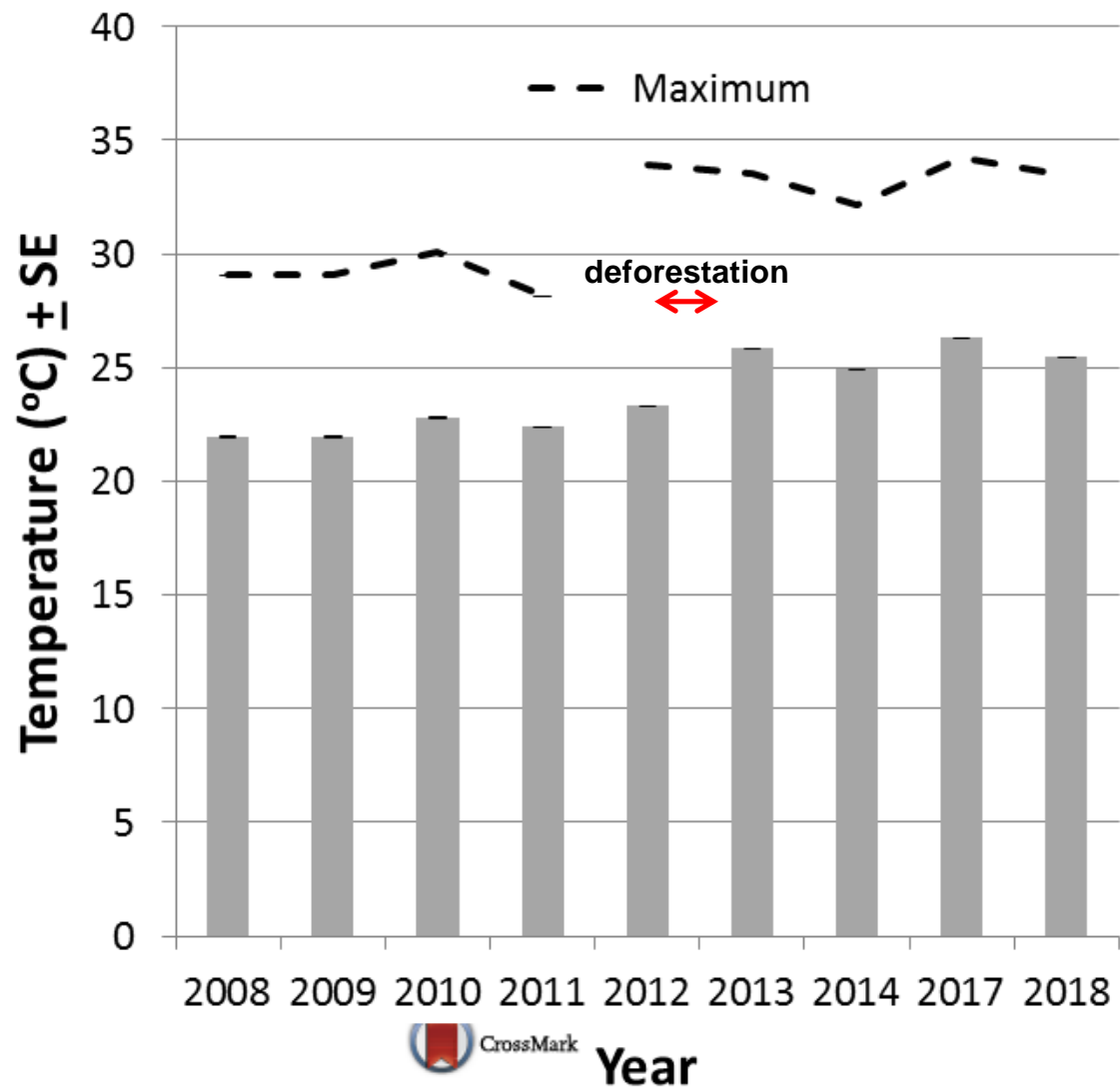
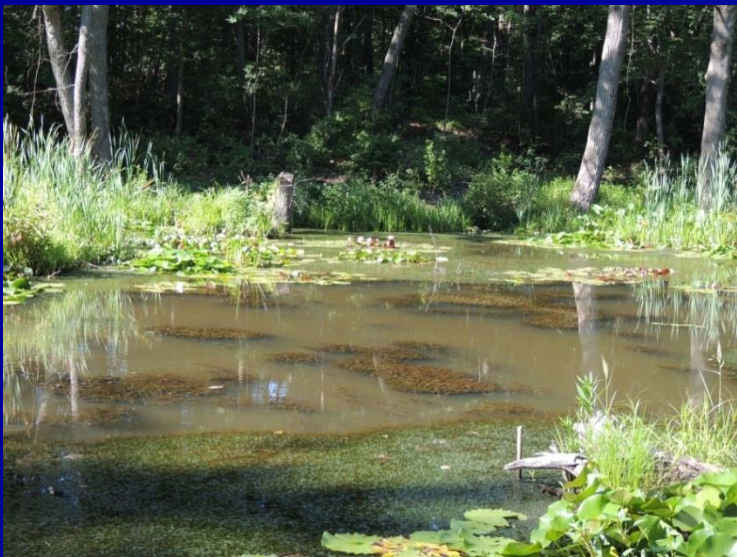
Construction phase



Post-construction



# Cypress Wetland Water Temperature



Estuaries and Coasts (2017) 40:1227–1246  
DOI 10.1007/s12237-017-0226-1



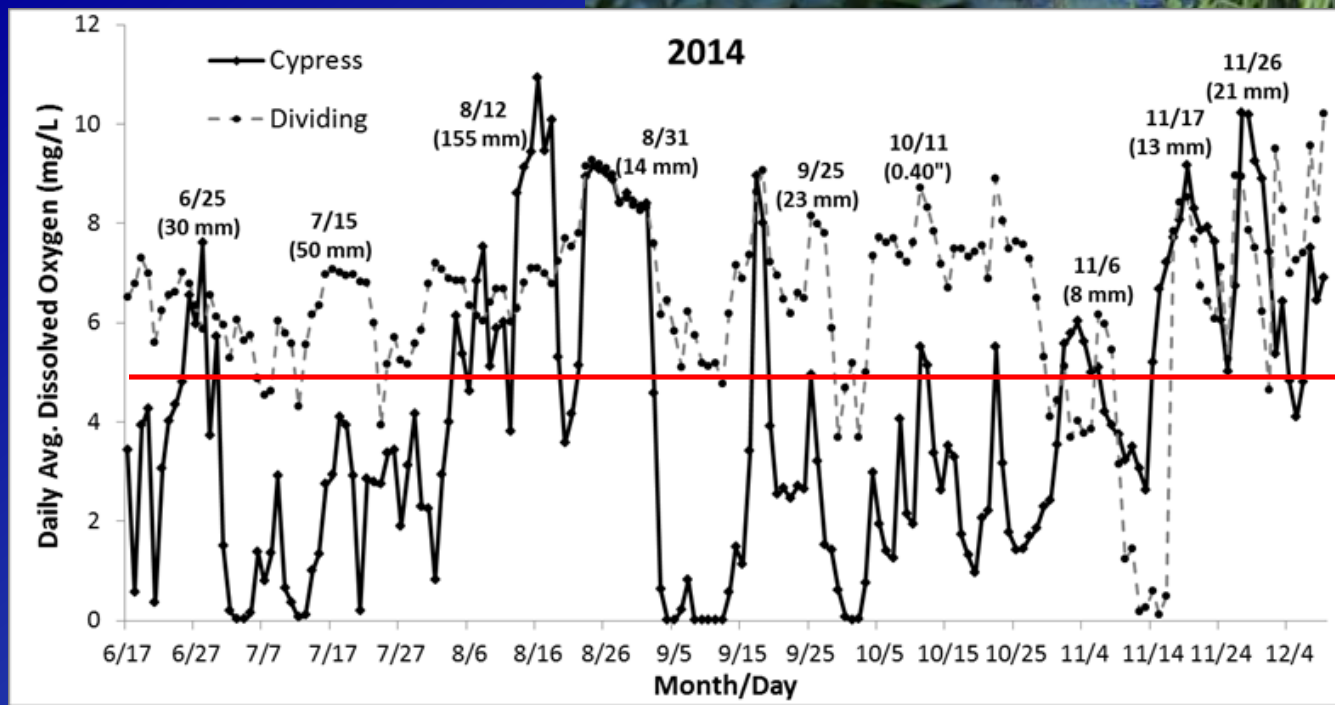
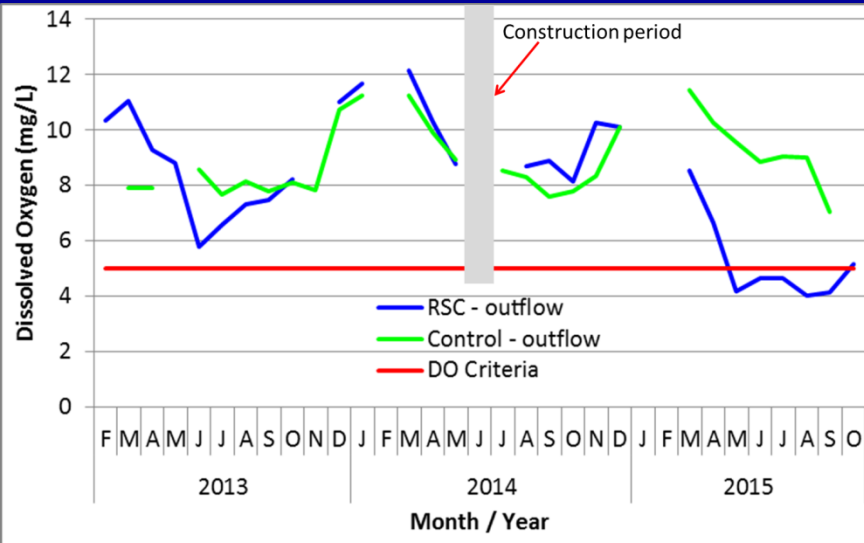
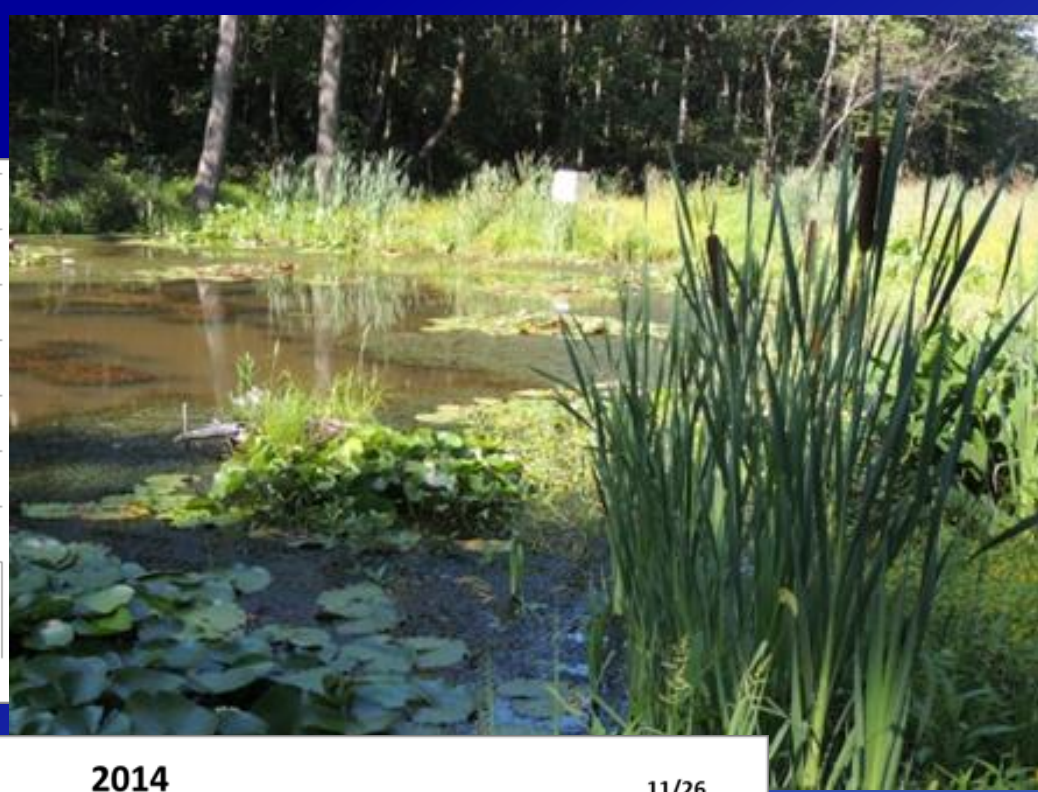
CrossMark

Year

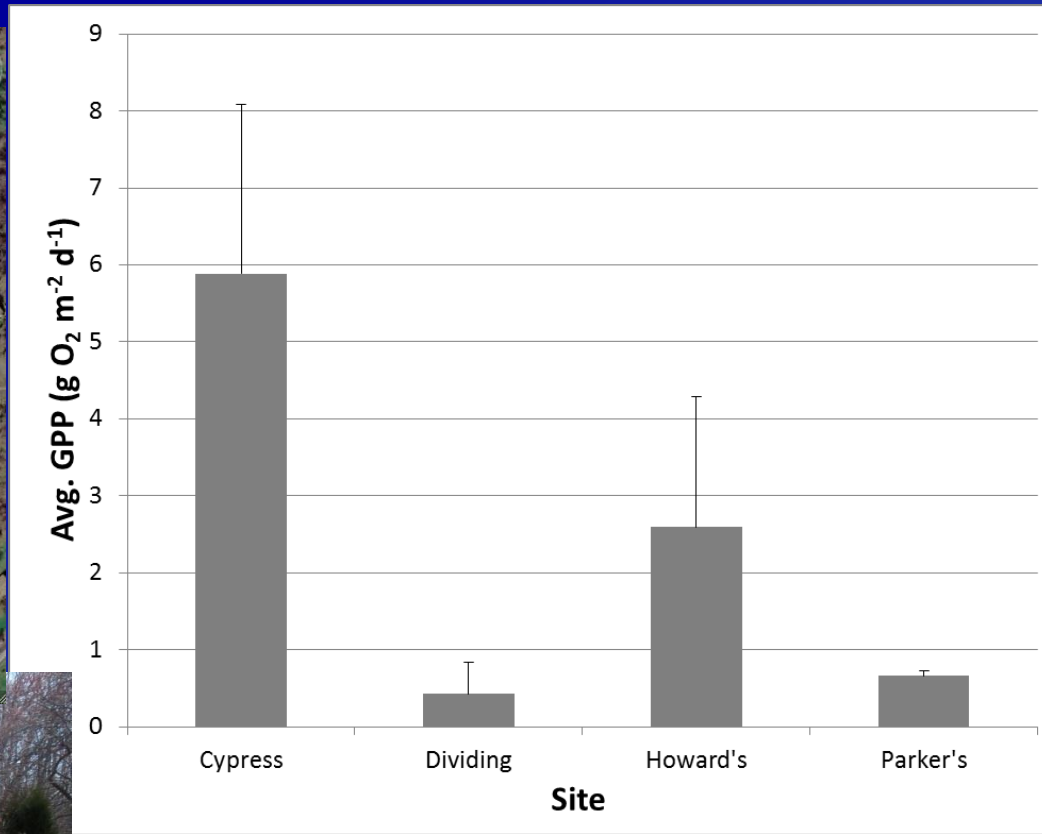
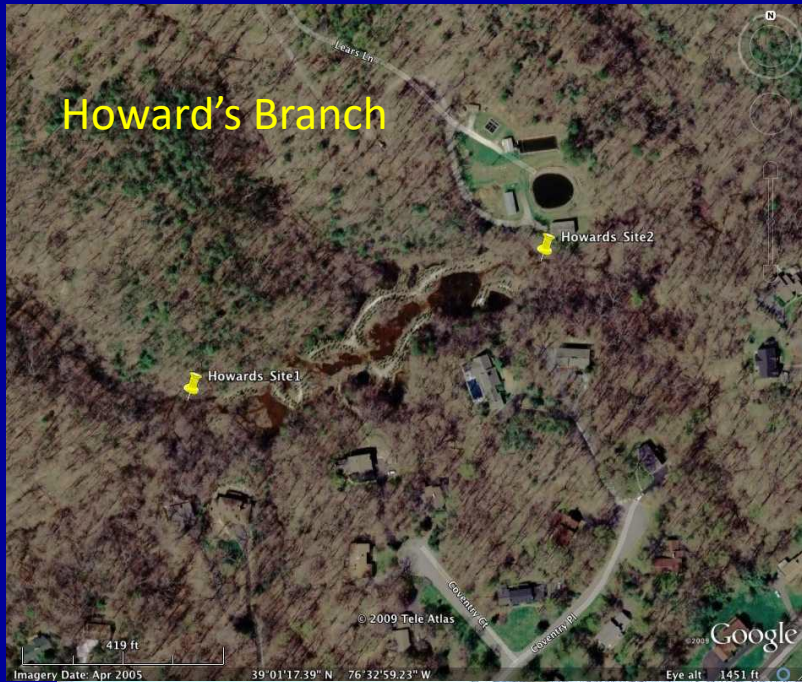
**Stream Restoration Performance and Its Contribution  
to the Chesapeake Bay TMDL: Challenges Posed by Climate  
Change in Urban Areas**

Michael R. Williams<sup>1,3</sup> · Gopal Bhatt<sup>2</sup> · Solange Filoso<sup>1</sup> · Guido Yactayo<sup>2,4</sup>

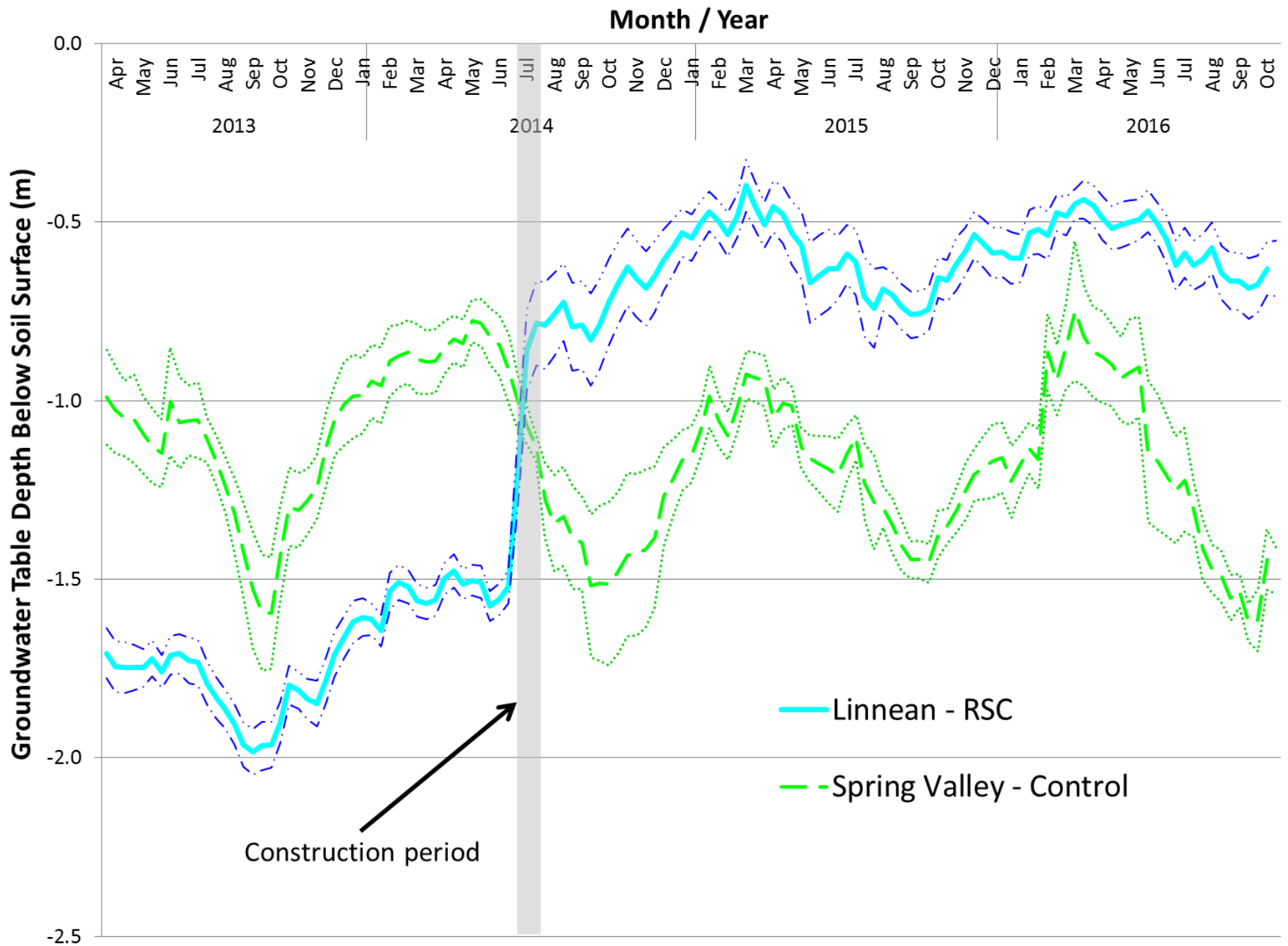
# Dissolved Oxygen



# Gross Primary Production (GPP)



# Groundwater Recharge





# Lateral Groundwater Seeps

Ecological Engineering 95 (2016) 723–737

Contents lists available at ScienceDirect

Ecological Engineering

journal homepage: [www.elsevier.com/locate/ecoleng](http://www.elsevier.com/locate/ecoleng)



ELSEVIER

Sources of iron (Fe) and factors regulating the development of flocculate from Fe-oxidizing bacteria in regenerative streamwater conveyance structures

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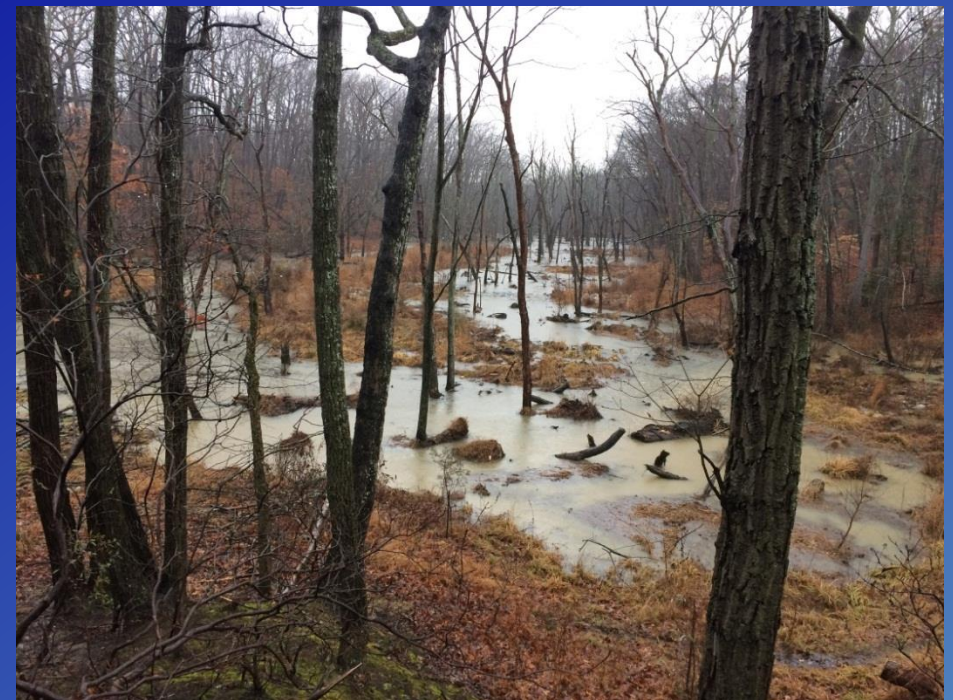
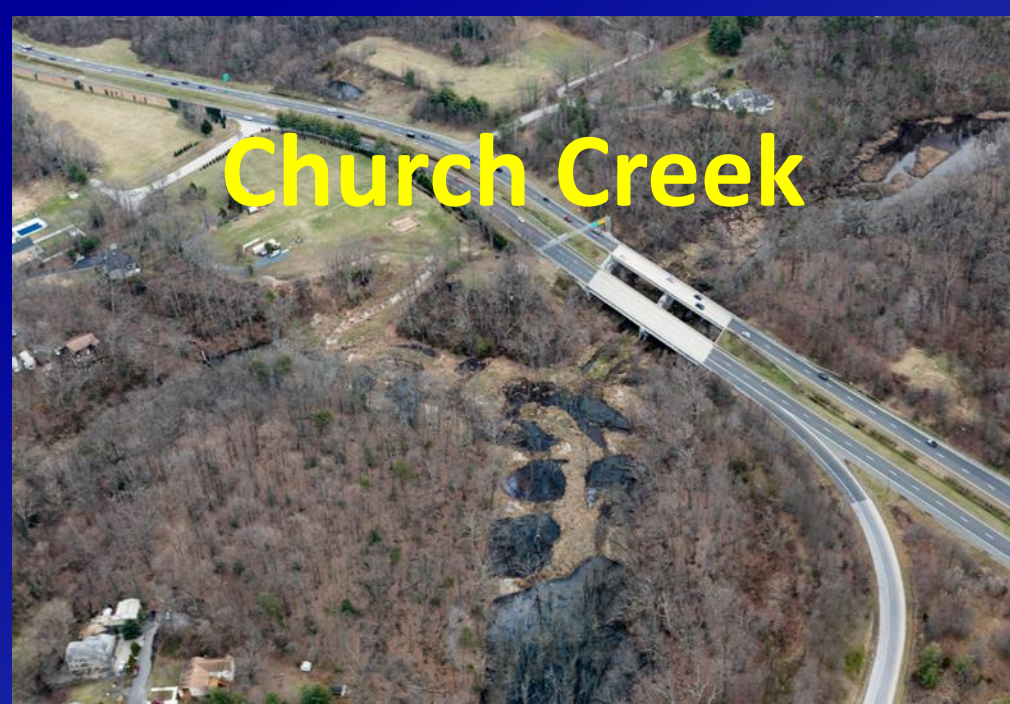
<sup>b</sup> University of Maryland, Department of Environmental Science and Technology, College Park, MD 20742, United States



*Leptothrix ochracea*  
chemolithoautotrophic



# Tree Removal and Subsequent Loss – Destruction of Mature Riparian Zones

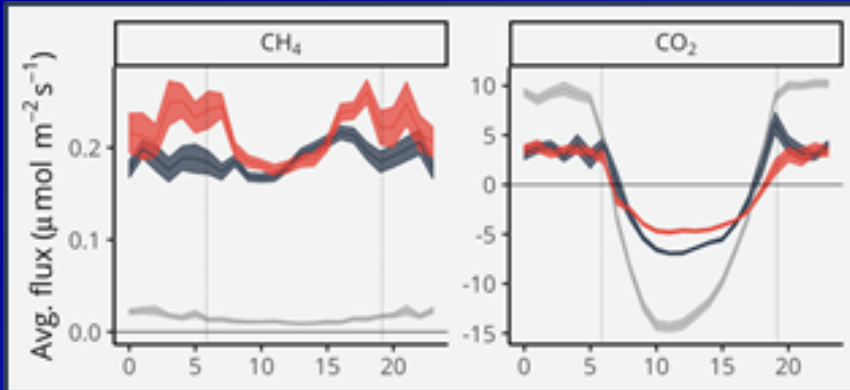
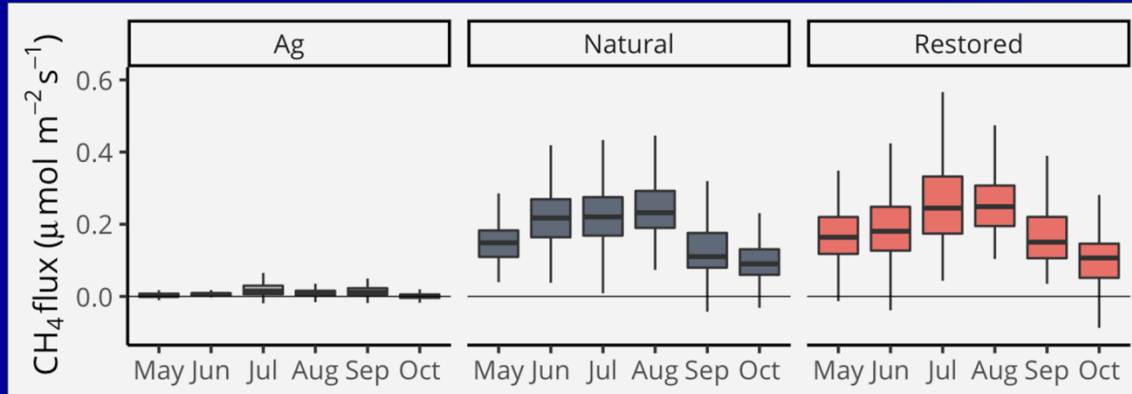


# Post-Construction Disturbances

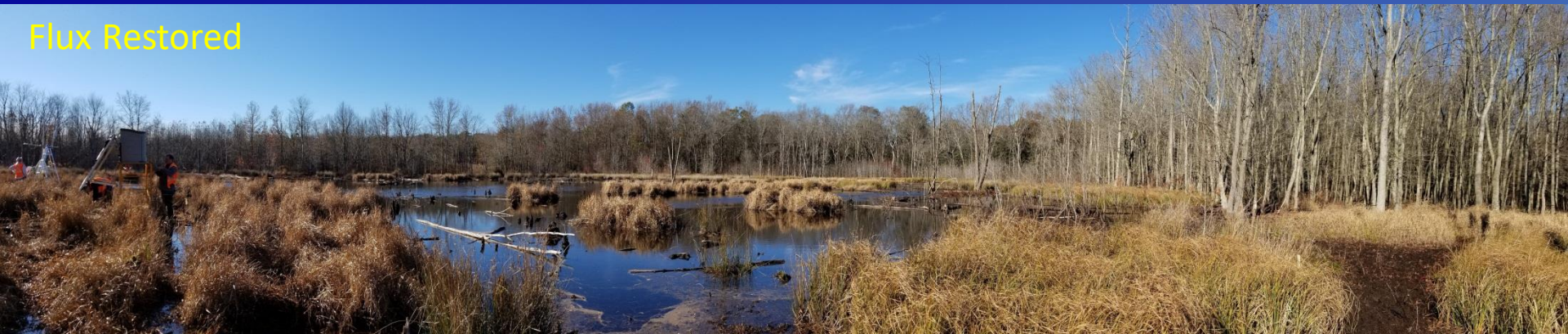
- Intense high-volume storm events and construction activities (e.g., headwater restorations)
- Elevate sediment loads thereby compromising wetland habitat and water retention capacity



# Delmarva Wetland



Flux Restored



# Concluding Remarks

- Unintended Consequences
  - Tree and riparian zone losses
  - Post-construction disturbances increase sediment loads and sedimentation in wetlands
  - Excessive flocculate from Fe-oxidizing bacteria
  - Dissolved oxygen concentrations often below criteria threshold during low-flow, warmer conditions
  - Increased streamwater temperatures
  - Increased light availability increases gross primary production (GPP)
  - Increased methane production



