Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned

STAC WORKSHOP: THE STATE OF THE SCIENCE AND PRACTICE OF STREAM RESTORATION IN THE CHESAPEAKE

3/22/2023

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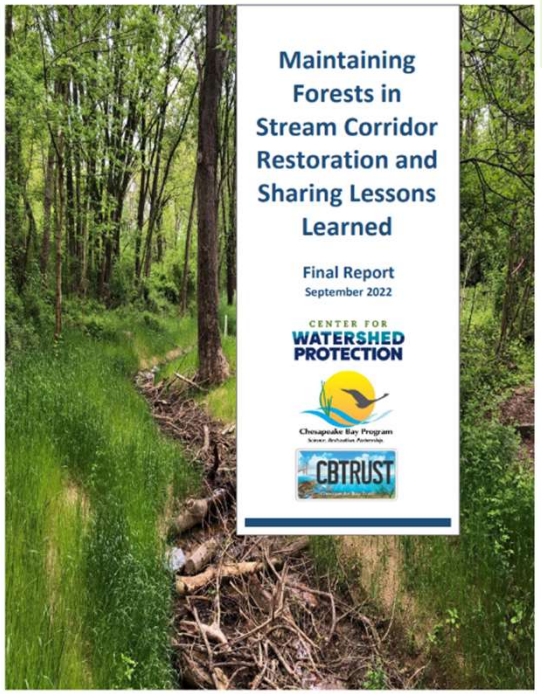
Project Overview

- **FUNDING & GOALS**
  - Project funded by the Chesapeake Bay Trust to evaluate processes and protocols in the Chesapeake Bay watershed that minimize potential unintended adverse outcomes of stream restoration projects on the adjacent riparian area, including forest buffers and identify opportunities to minimize these adverse outcomes and improve riparian and stream habitat quality.
  - Includes a comprehensive assessment of how forests are accounted for at multiple stages of stream restoration, including planning, permitting, implementation, and post restoration.
- **PARTNERS**
  - Collaboration between the Center for Watershed Protection, Chesapeake Bay Program, and stakeholders.
- **GEOGRAPHY**
  - Both urban and rural areas of PA, MD, and VA.
- **RESULTS**
  - Results will help CBP partnership to improve the selection, permitting, and funding processes for stream restoration projects and provide guidance to local governments for best practices.

Project Overview

- Policy and Document Review
- Interviews
- Case Study Analysis
- State Webcasts



Final Report

https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

Best Practices Guide

https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-a-best-practices-guide-for-projects-in-pennsylvania-maryland-and-virginia/

Potential Riparian Impacts

- Loss of existing trees from direct removal during construction, compaction and root disturbance, and increased groundwater elevations/extended floodplain inundation.
- Years of ecosystem maturation may be needed before a project fully meets its long-term restoration objectives and realizes its full environmental benefits (Kaushal et al., 2021; Wood et al., 2021).
- Projects that involve extensive channel reconfiguration or remove existing riparian cover are likely to see less functional uplift, including nutrient removal, at least until the replanted areas achieve maturity (Orzetti et al., 2010).
- Stream temperature impacts - STAC Temperature Workshop: https://www.chesapeake.org/stac/events/session-2-rising-watershed-and-bay-water-temperatures-e2-80-94ecological-implications-and-management-responses/
- The CBP Stream Restoration Protocols include qualifying conditions and best practices that offer some protection for riparian vegetation if implemented, but they have not been consistently applied.
- Public criticism

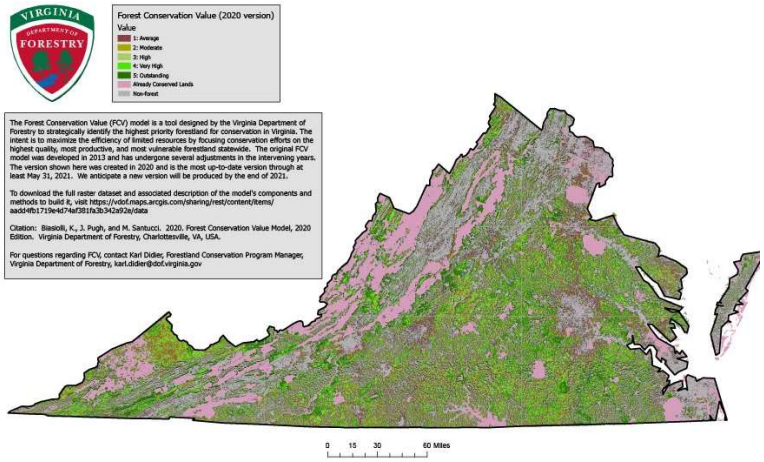
Site Selection

Proper site selection using a watershed-based approach is the most important best practice to target restoration to areas in need for restoration and prevent impacts to existing high-quality streams and riparian areas.

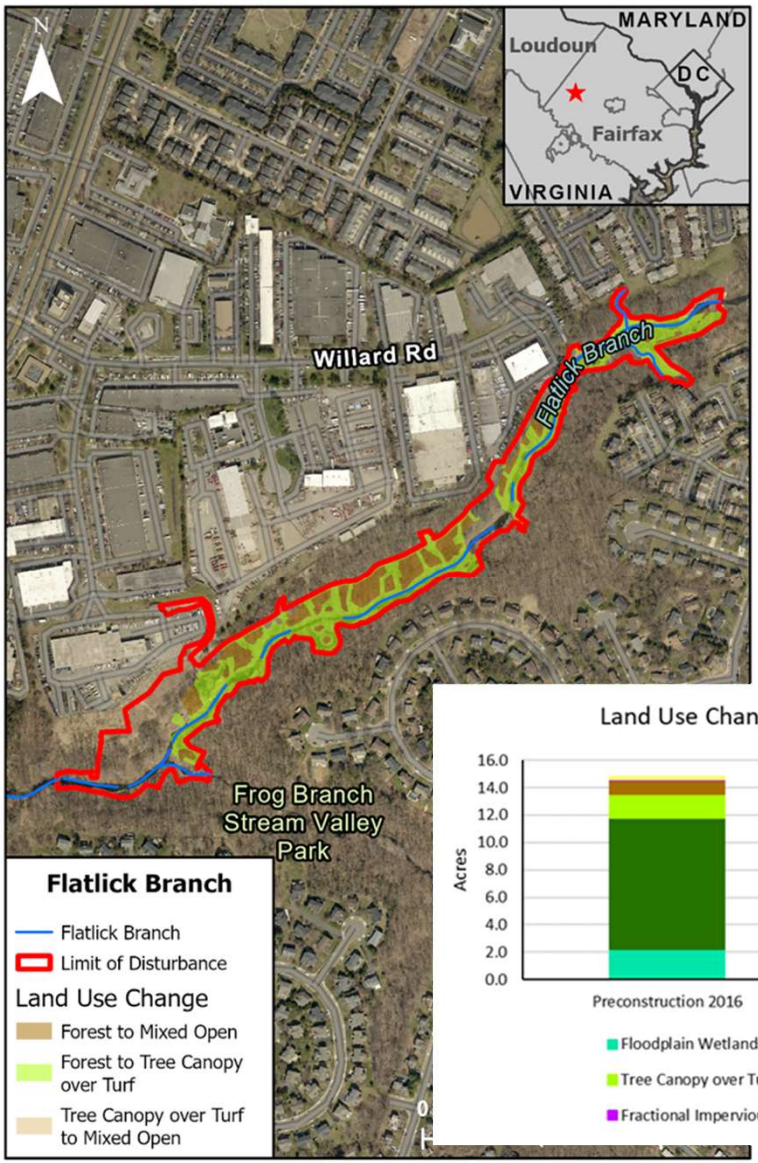
- Generally, sites are selected using one or a combination of:
  1. Opportunistic considerations
  2. Watershed assessments conducted as part of a watershed planning initiative
  3. Mitigation banking efforts

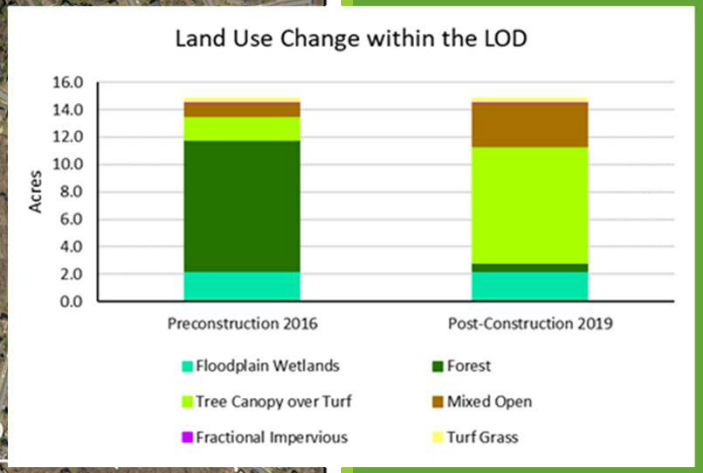
- Funding availability and landowner willingness drive site selection.

- Identified need for clear definitions of existing "high" and "low-quality" streams and riparian areas that need restoration and guidance from state regulatory agencies.



https://www.dcr.virginia.gov/natural-heritage/vaconvisforest





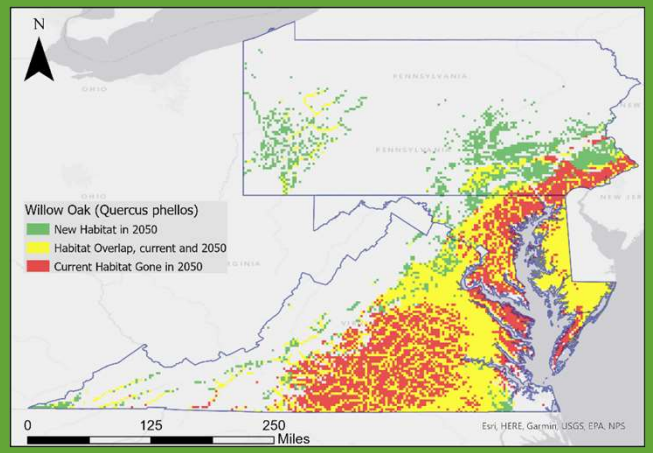
Establishing Goals and Objectives

- Stream restoration projects are commonly implemented with the goal of obtaining nutrient and sediment load reductions for TMDL credit only.
- The case study analysis found that the nutrient and sediment load reduction benefits of restoration significantly outweighed any increase in loads from riparian land use conversion within the context of the Chesapeake Bay Watershed Model land use and loading rate framework.
- Proposed stream restoration projects should be developed through a functional assessment process, such as the Stream Functions Pyramid.

Design and Permitting

Important best practices include pre-application meetings with federal and state permitting agencies and coordination with forest agencies.

Include assisted migration in planting plans to incorporate species adapted to changing climate conditions.



- The removal of entire buffers or mature trees is a value decision made by the municipality or other authorizing entities and was largely mentioned in association with legacy sediment removal, dam removal, and infrastructure protection projects.
- The types of forest agencies and their current level of involvement in the design and permitting process is highly variable among jurisdictions.
- In VA, the FEMA No-rise Certification has become a driver for stream restoration projects on larger streams to be designed following NCD Priority 2 that creates a new channel and lowers the floodplain in order to avoid requesting a CLOMR or variance to the requirements, resulting in a greater clearing footprint and hardened or armored restoration to provide stability.

https://forestthreats.org/research/tools/ForeCASTS

Monitoring and Maintenance

- Most restoration projects undergo monitoring for 2 – 5 years after construction, based on required state and federal permit conditions. CBP stream restoration verification is also required for visual inspections once every 5 years. Typically focused on stream stability and not riparian ecosystems.
- Invasive species management compounded by climate change.
- Funding was frequently mentioned as a limiting factor for extensive post-construction monitoring, particularly for grant-funded projects.
- Recommendations include a pooled monitoring approach and for local governments and funding agencies to allow for a percentage of funds to be allocated for post-construction monitoring and maintenance and extend the allowable project period so that monitoring can occur over the long-term.

Source: Ecotone, Inc.

Q&A / Discussion

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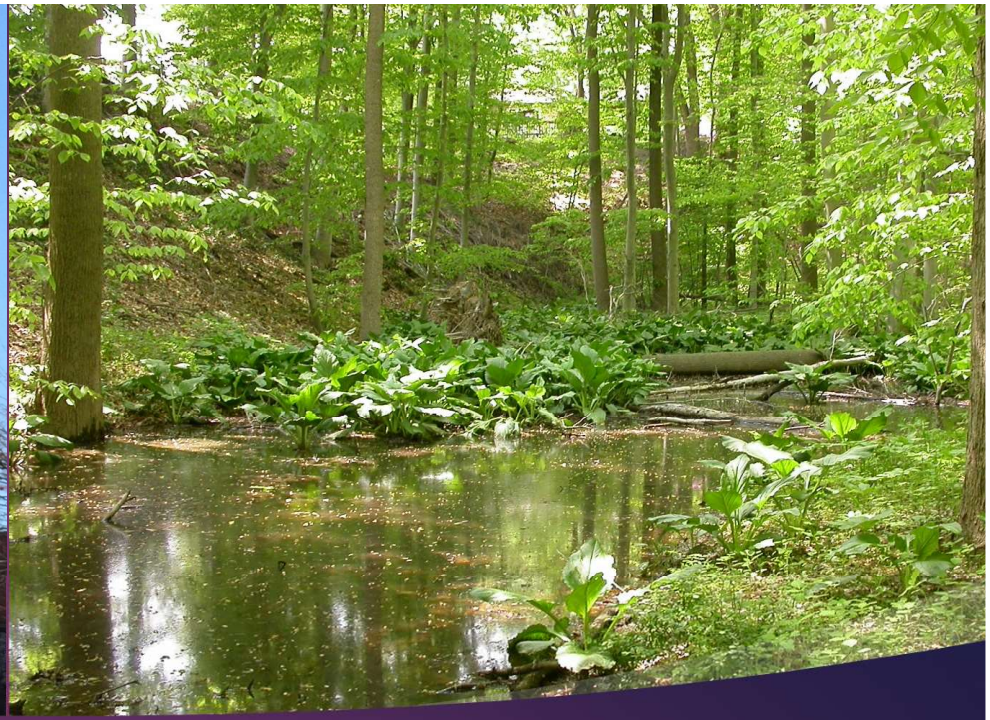

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Riparian Quality

WHY TREES MATTER IN ACHIEVING DESIRED RESTORATION OUTCOMES

Establishing and Maintaining Riparian Quality in a TMDL World (and avoiding unintended consequences)

Site Selection

Design

Monitoring & Maintenance

See one to know one

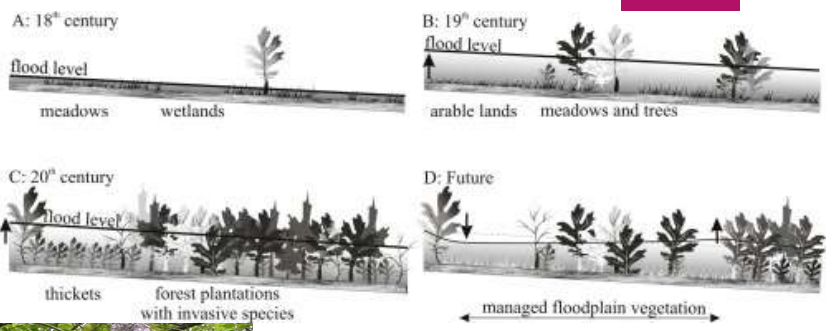
- Rapid Assessment Techniques do not incorporate RQ

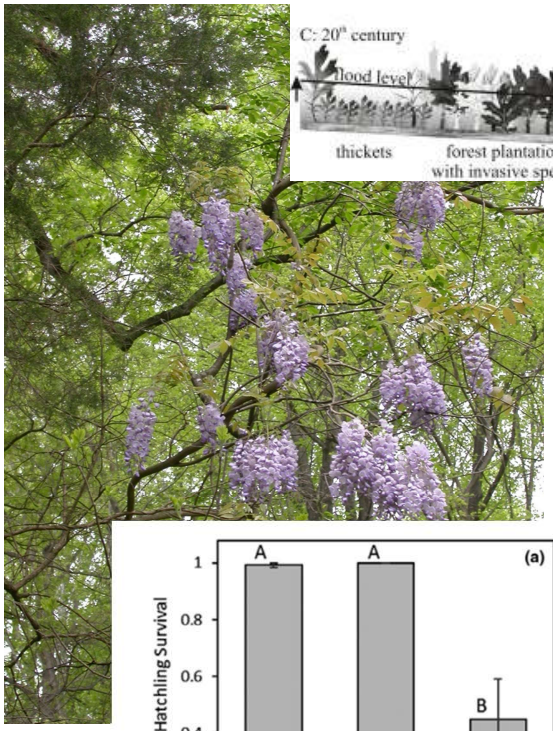
  Stream condition <> RQ
- Let's talk invasives
- Best available

Wetland Index with invasives is higher (more upland) than Wetland Index with just natives, p=0.001.

Invasive species are undesirable in nuanced ways

- Stress/kill trees
- Too many stems is bad for flood flow
- Biogeochemical effects on the soil and the water





Science of The Total Environment
Volume 686, 10 October 2019, Pages 931-945

(Mis) management of floodplain vegetation: The effect of invasive species on vegetation roughness and flood levels

Tímea Kiss [a], Judit Nagy [a], István Fehérváry [b], Csaba Vaszkó [a]

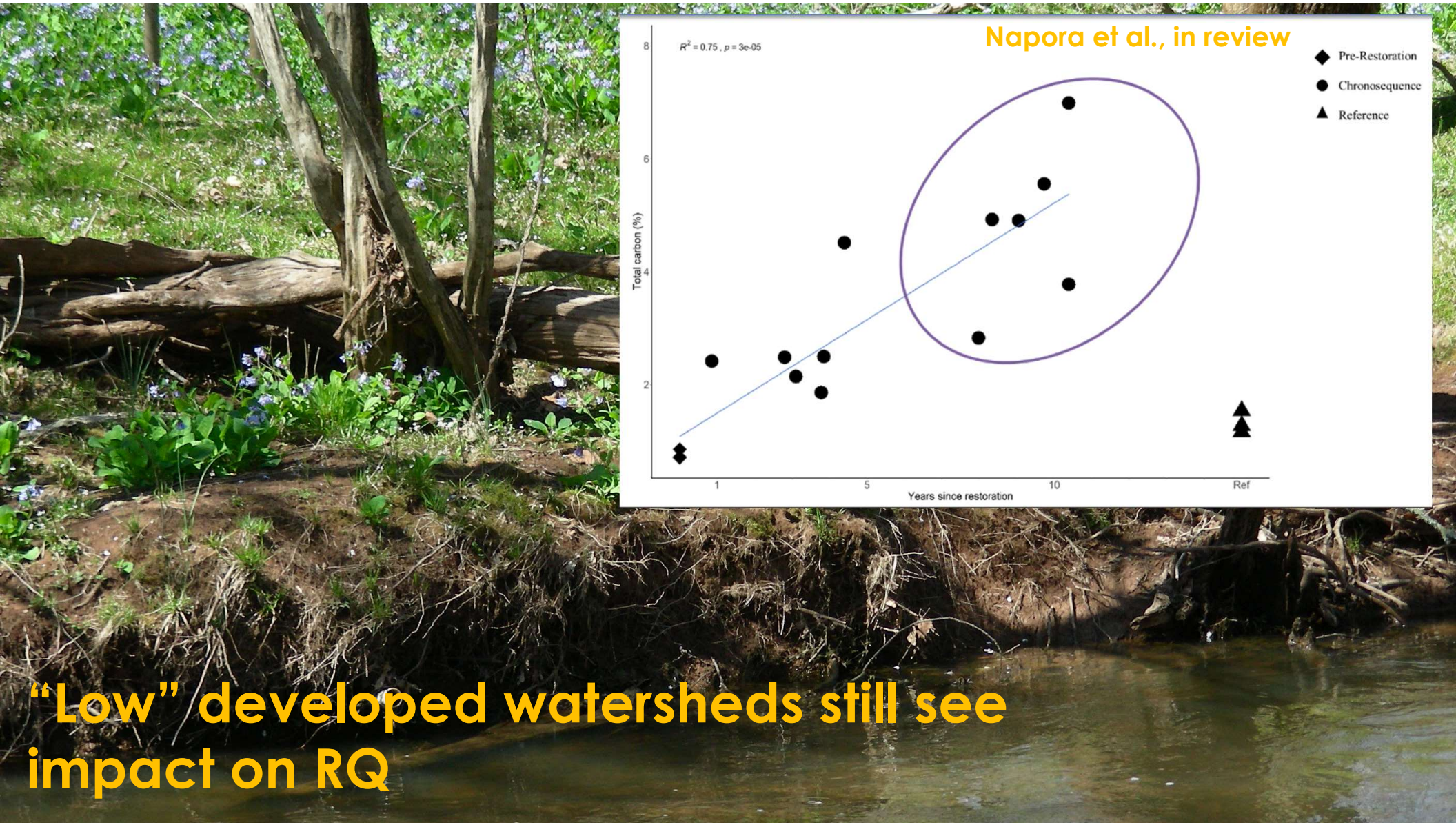
Freshwater Biology

ORIGINAL ARTICLE

Impacts of invasive Amur honeysuckle, *Lonicera maackii*, leaf litter on multiple trophic levels of detritus-based experimental wetlands

Alexis L. Robison, Josey L. Berta, Cy L. Mott, Kurt J. Regester

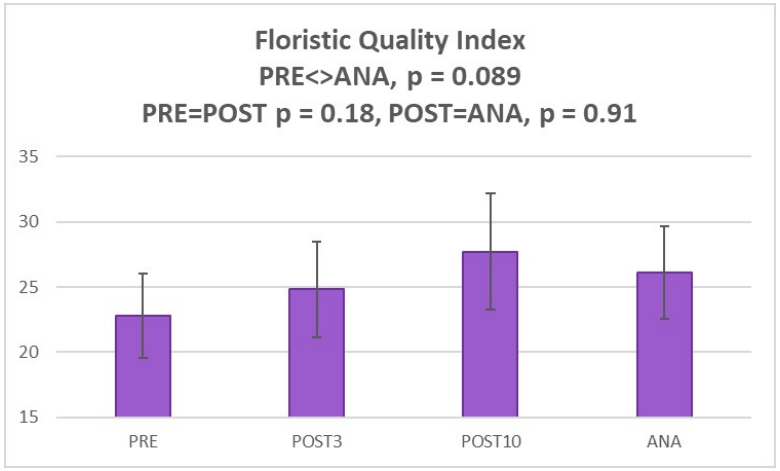
First published: 24 May 2021 | https://doi.org/10.1111/fwb.13731



"Low" developed watersheds still see impact on RQ

Site-specific design

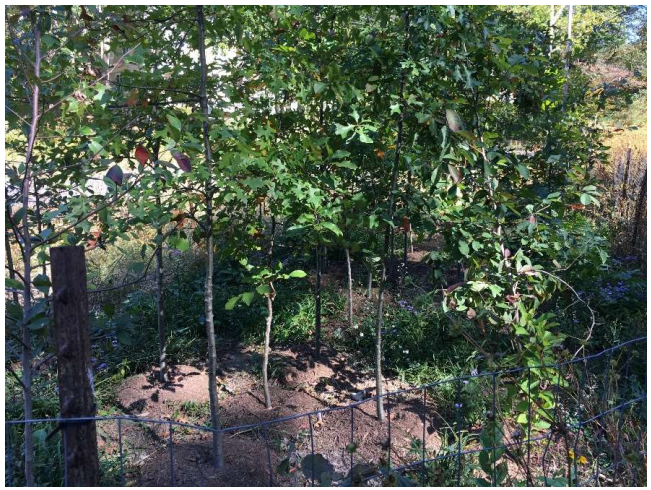
- Even when the goals are TMDL driven, there is room for ancillary benefits
- Choosing the best techniques for the benefits



Case Study: Applied Nucleation in Dead Run 2/3

April

June

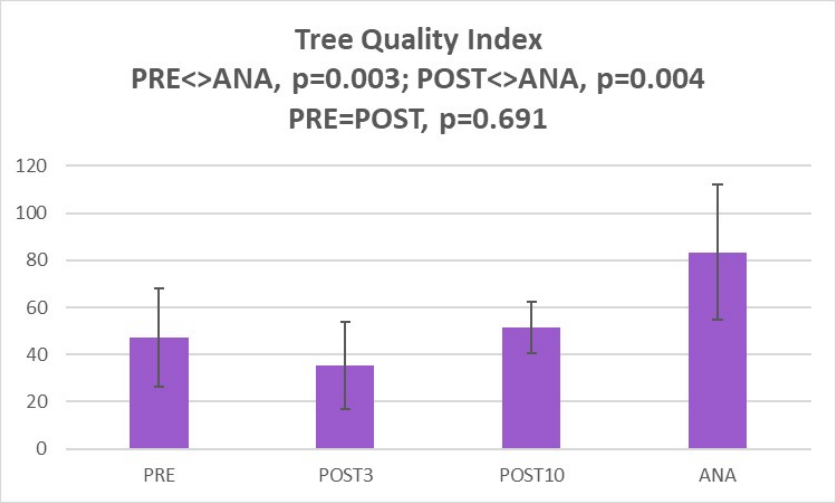


October

- At 1.5 years of growth, 90-100% cover in dense plantings
- Open plants are shorter, but greater dbh
- Closed canopy plants are taller (some >2 x high as initial planting height; 15+ feet)
- At 4 years - observed changes in soil and herbaceous community

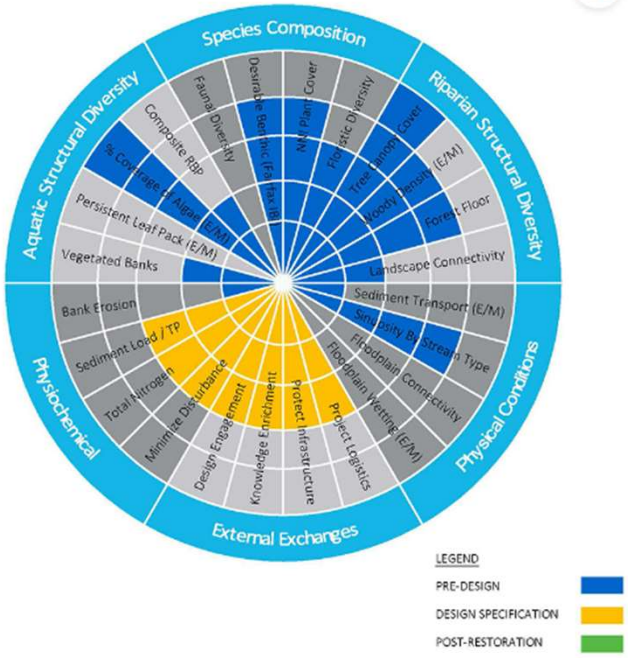
Monitoring - What is the question?

- Do we have a functioning/stable stream?
- Do we have Riparian Quality?

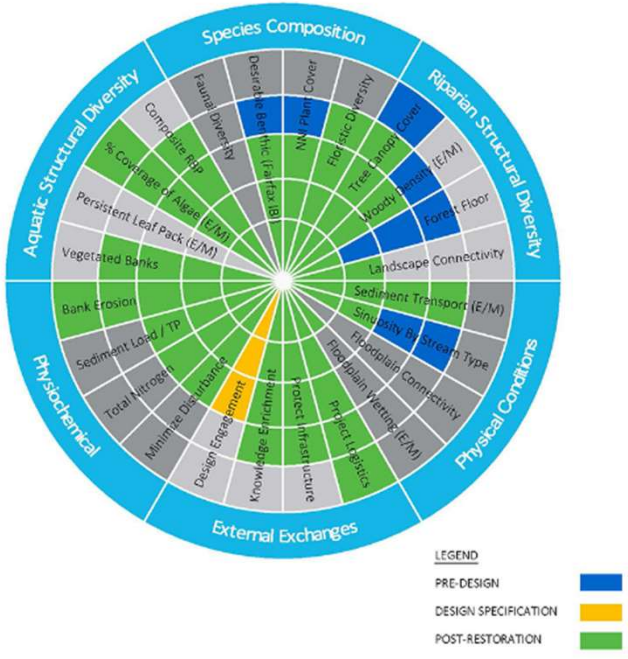


Riparian Quality and Holistic Lift

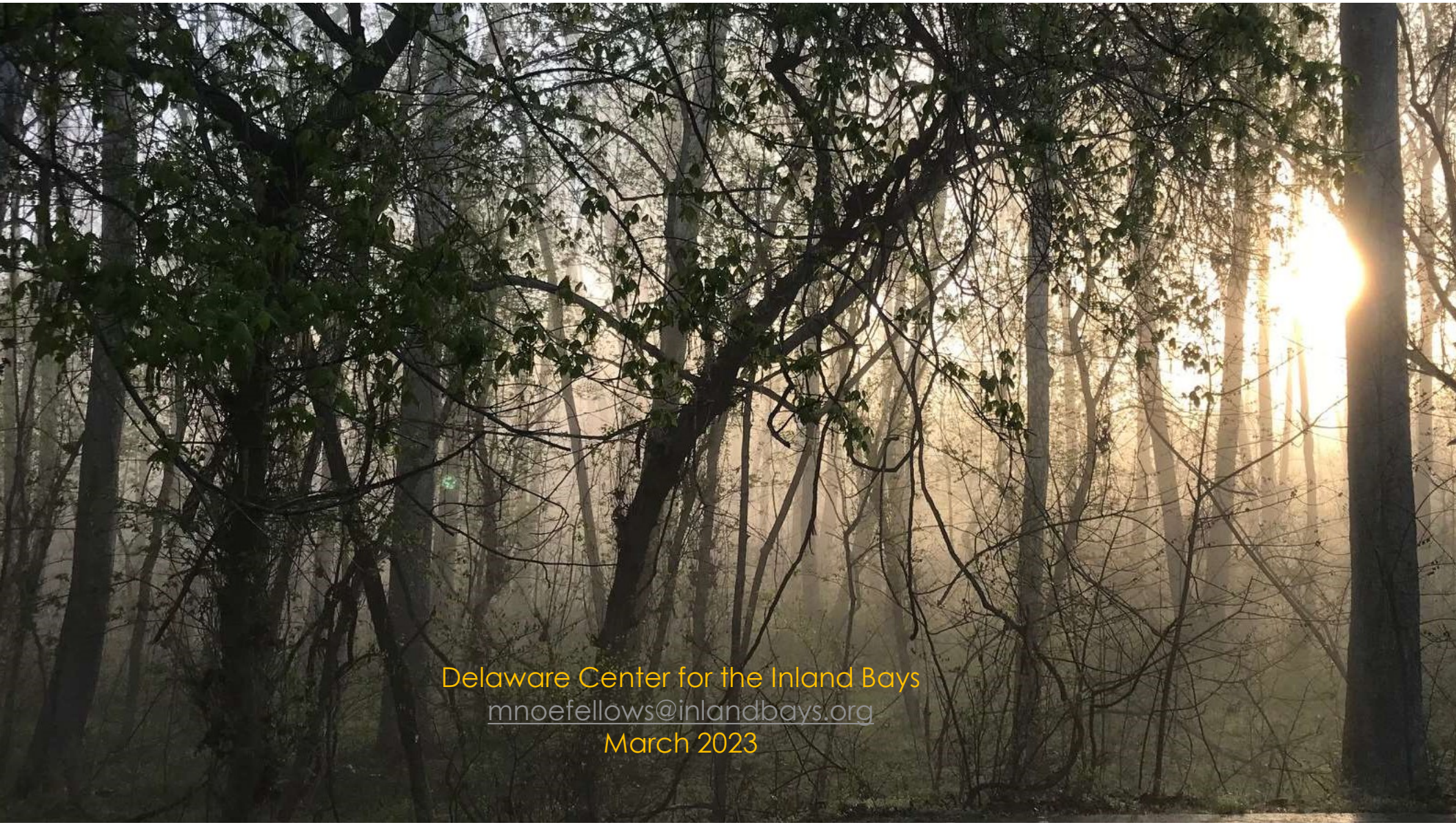
FLATLICK 2 (PRE)



FLATLICK 2 (POST-3 YEARS)



Manage the Riparian Corridor for the desired Riparian Quality Outcome



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