

URBAN STREAM RESTORATION IN THE GEORGIA PIEDMONT: POLICY, PRACTICE, AND NOVEL ECOSYSTEMS

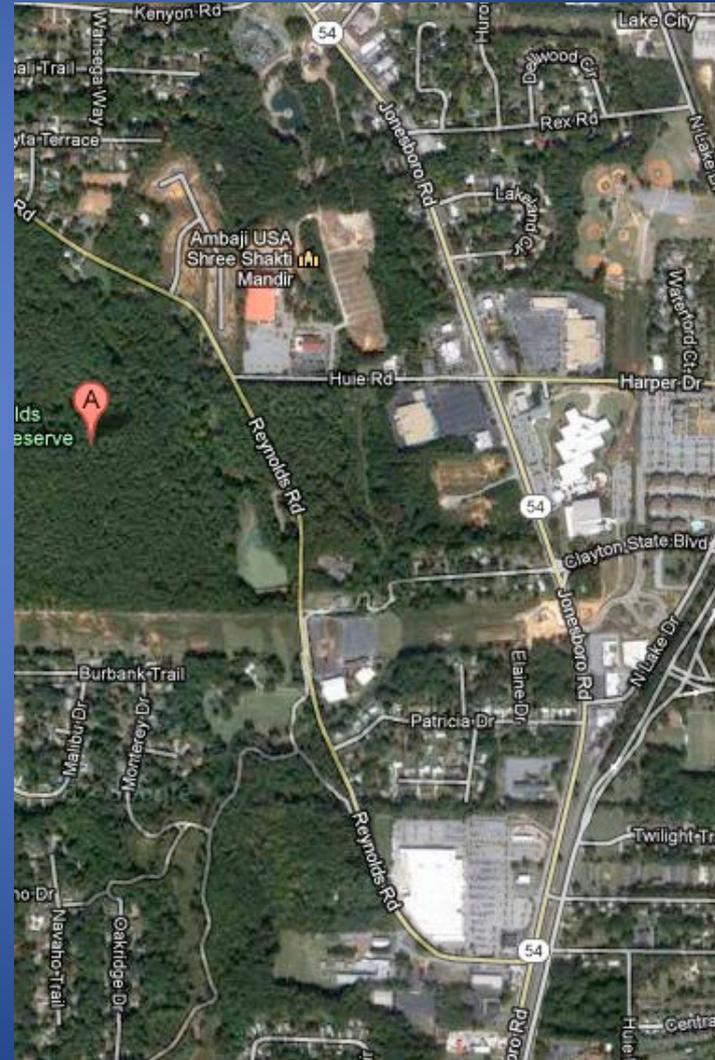


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Urban Streams

Vulnerable to impacts due to proximity to, and frequency of, anthropogenic influence



Urban Stream Syndrome

- Increased impermeability
- Modified hydrograph
- Channel degradation
- Riparian soil and plant communities altered



What can we do to improve degraded urban streams?



- The majority of river restoration dollars are used in urban areas
- In part due to mitigation banking which provides a higher return on investment

Mitigation Banking

- Mitigation banking is a system of credits and debits
 - Restored site = credit
 - Impacted site = debit
- The credits are for sale, creating a lucrative business for investors
- Urban restored streams can be used as mitigation banks

Objectives

- Evaluate a series of riparian sites located along an urbanization and restoration gradient
- Determine the recovery trajectory of a “best practices” high impact urban stream restoration site used as a mitigation bank
 - Restored: similar to historical conditions
 - Reclaimed: improved

Site Locations



Urbanization/Restoration Gradient

Matured

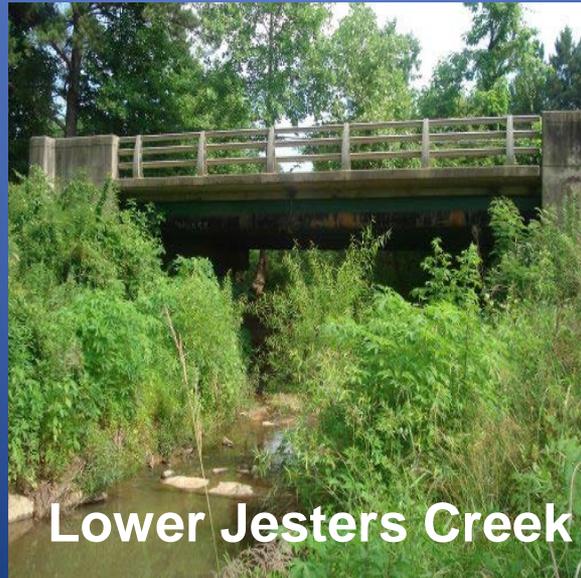
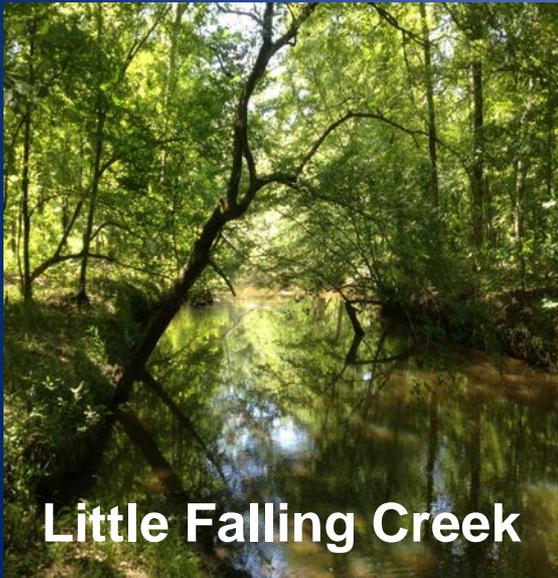
- Piedmont National Wildlife Refuge
- Agricultural Legacy
- 80 years post-restoration

Restored

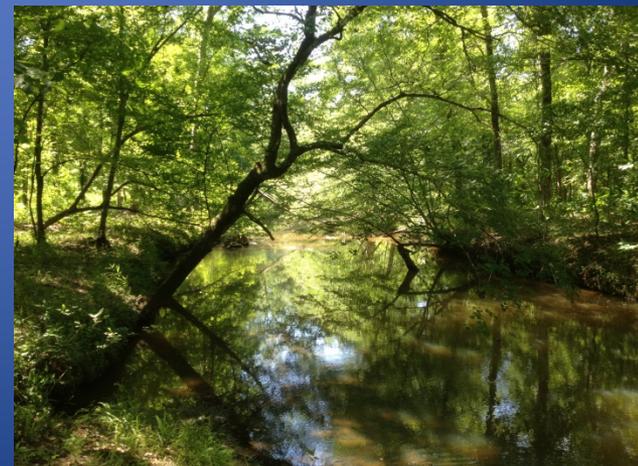
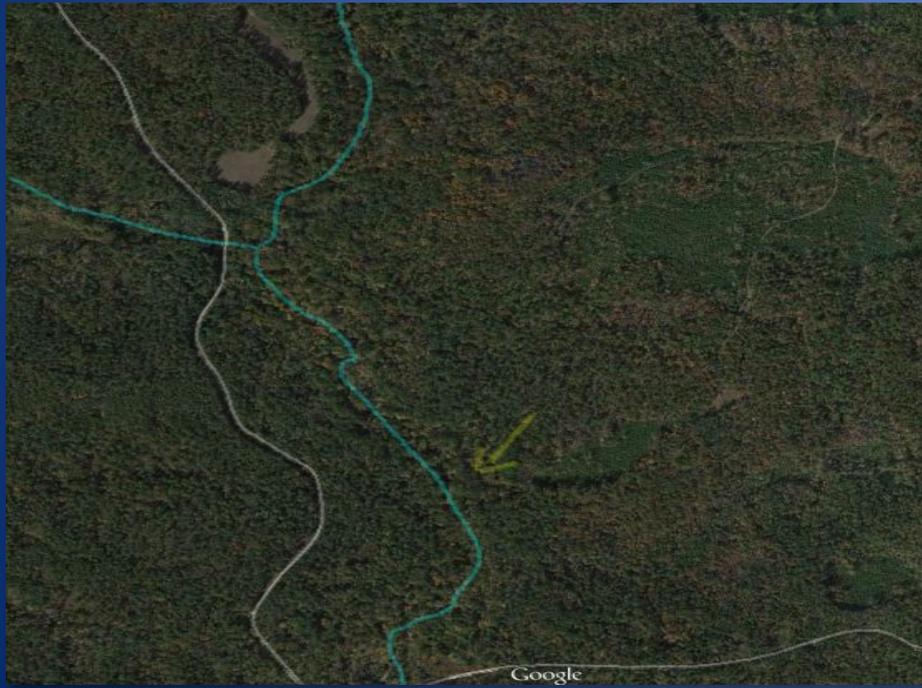
- Urban watershed
- 8 years post – restoration
- Mitigation Bank

Degraded

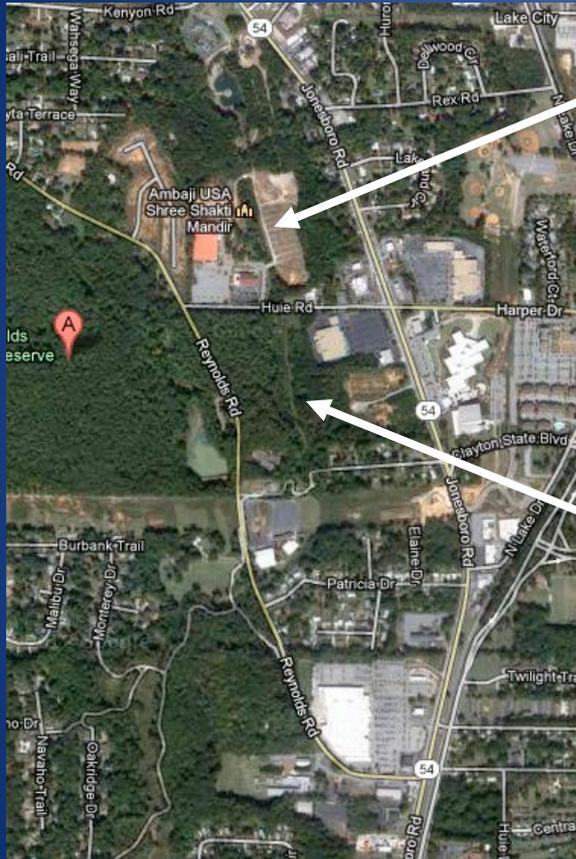
- Urban watershed
- Unrestored



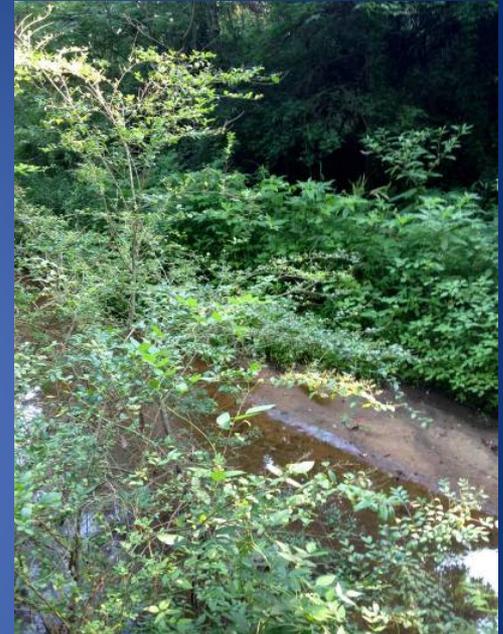
Matured Little Falling Creek



Jesters Creek



**Degraded
Upper Jesters Creek**



**Restored
Lower Jesters Creek**



Methods

- 2012 sampled active channel bar, bank, floodplain, & terrace communities
- Soils: compaction & nitrates
- Vegetation: herbaceous and woody species
- All data were modeled using generalized linear models

Recovery Trajectory

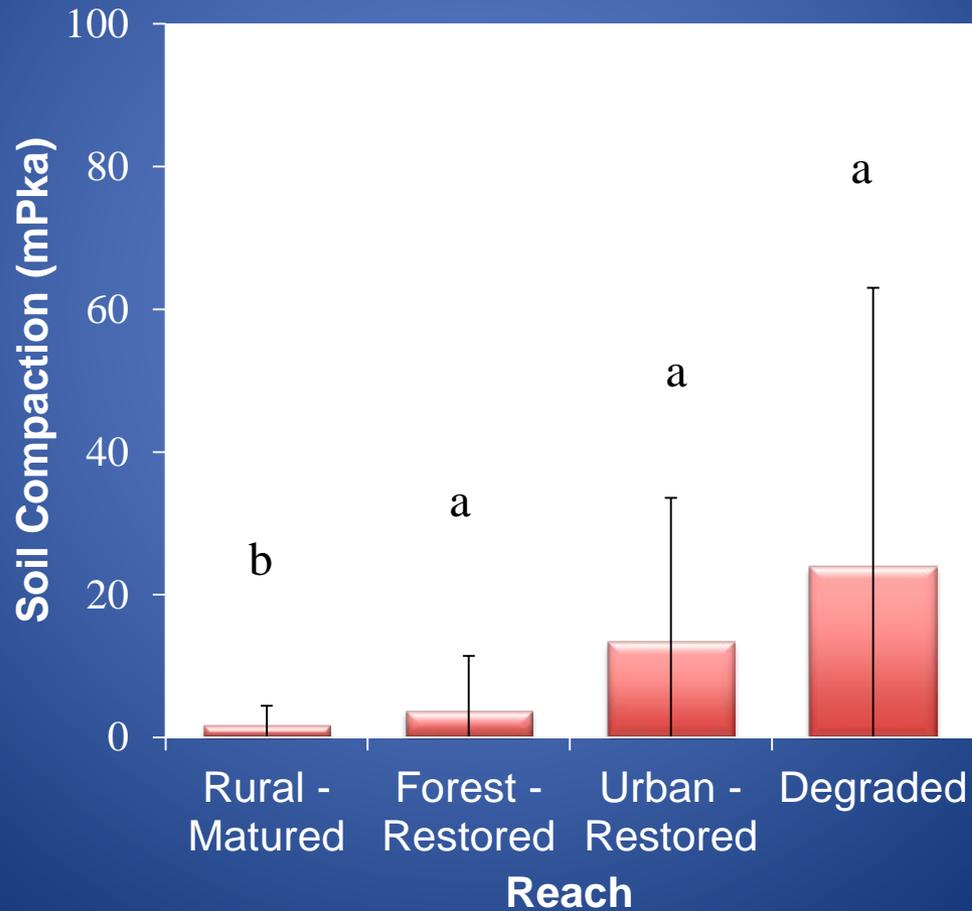
Restoration

Properties of the restored reach most similar to the *matured* reach

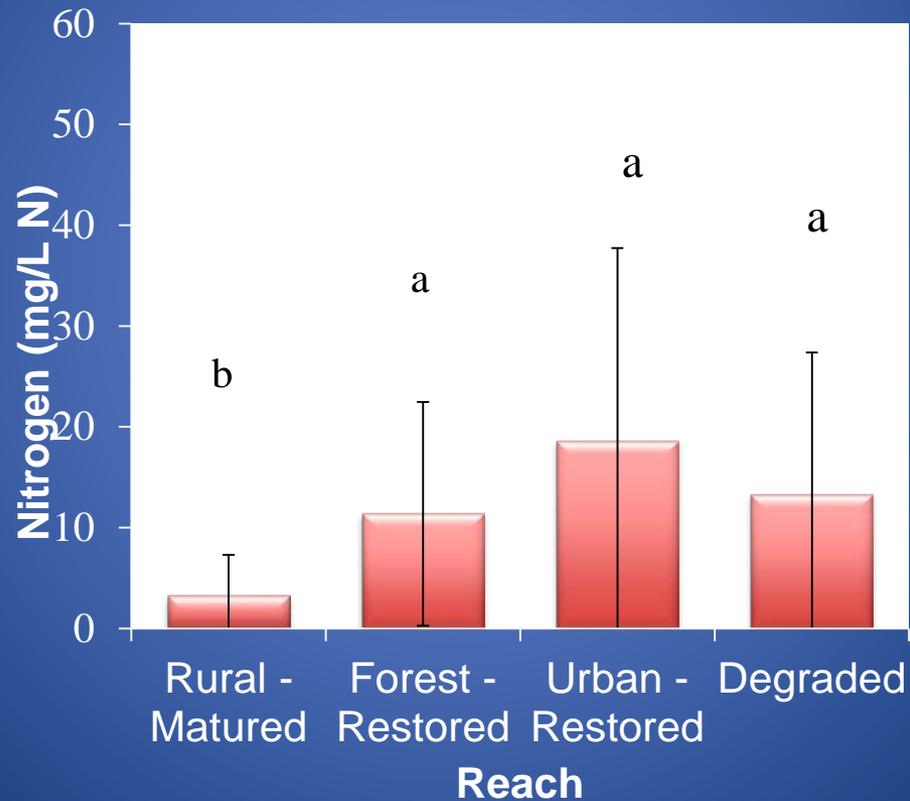
Reclamation

Properties of the restored reach most similar to the *degraded* reach

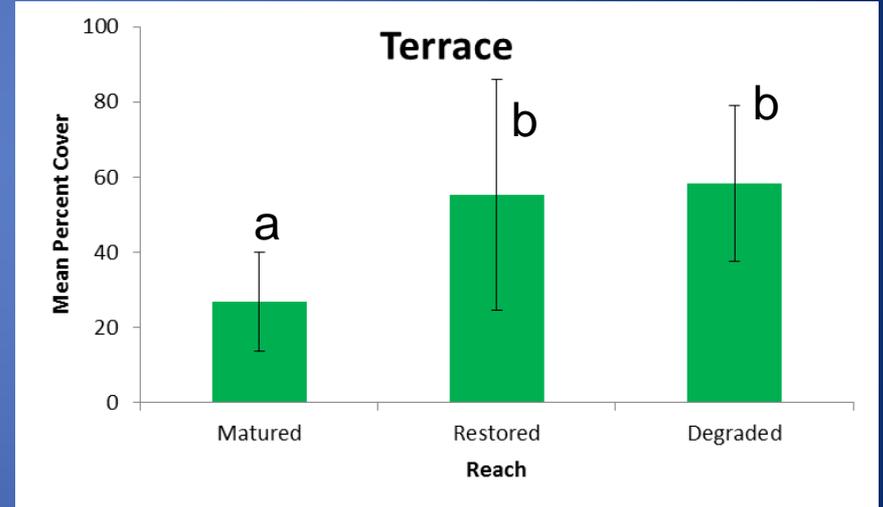
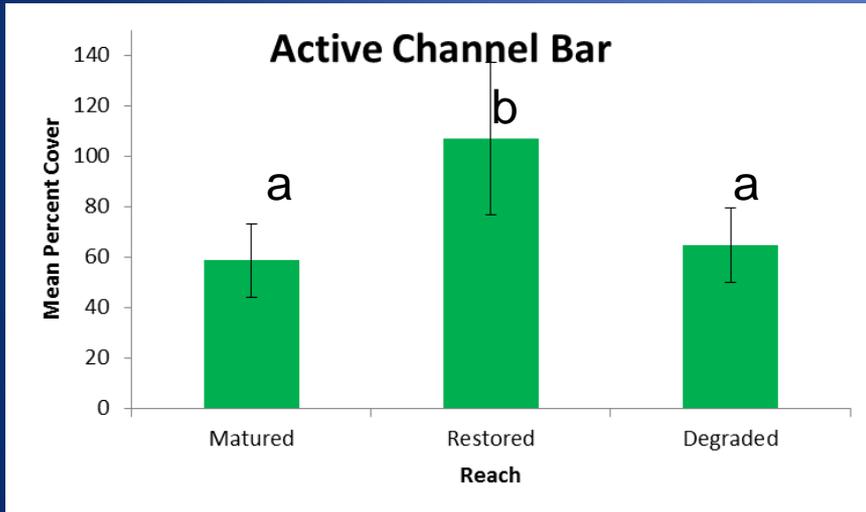
Soil compaction was similar between the urban, restored side of Jesters Creek and the degraded reach.



Soil inorganic nitrogen was similar between restored and degraded reaches.



Herbaceous cover was significantly higher in active channel bar and terrace communities at the restored Jesters Creek.



Species richness and the percent exotic and herbaceous species were higher at the restored reach than at the matured reach. Fewer tree species were present.

Species	Matured	Restored	Degraded
Richness	93	117	74
Exotic	5%	22%	28%
Herbaceous	43%	60%	51%
Tree	33%	17%	23%

Compositional similarity was low between all reaches.

Sørensen's Similarity Index		
	Matured	Degraded
Restored	0.15	0.23
Degraded	0.13	

Property	Restored

R = Restoration: Similar to **Matured** Reach

D = Reclamation: Similar to **Degraded** Reach

U = Unique

Severe sedimentation in cross vanes, bank erosion, and channel widening occurring at Jesters Creek restoration site.



Sewer line and repeated mowing of restored Jesters Creek to maintain access



Outcome

- Best practices restored site shared characteristics with the degraded and the matured restoration sites
- Urban streams subjected to continual urban stress
- Urban stream restoration creates a unique, novel riparian ecosystem

Questions

- With plethora of reports on failure of urban streams to be truly restored, should urban streams be used as mitigation banks?
- Should the bulk of stream restoration dollars be used to restore urban streams?
- Can we stop demanding that urban streams be comparable to protected riparian streams subjected to different stressors?

Changing Ecosystem Services

- Value urban riparian ecosystems for what they can provide
 - Riparian buffers
 - Dispersal corridors
 - Species refuge
 - Carbon sequestration*

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