

Seeding Benthic Macroinvertebrates by use of *Habitubes* as a Habitat Restoration Technique in Several Stream Sections in Greensboro, NC

EcoStream 2018 – NCSU's Stream Ecology & Restoration Conference
August 14, 2018



Presentation Overview

- **Background of Project**
- **Overview of Site selection**
- **Stream Restoration-"If you build it, they will Come!!!"**
- **Use of *Habitubes* for instream habitat restoration**
- **Macroinvertebrate data review**
- **Summary/conclusion**

**Stream restoration work
has historically focused on
channel structures and
bank stabilization.**



But what about the aquatic critters??



Will naturally repopulate but what if you helped that process along & seeded from higher rated streams.....could you get a bump in the bioclassification????

Thus a project is borne!!!

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Project Scope

- **Site selection (receiving & donor streams)**
- **Baseline benthos sample collection**
- **Placement of *HabiTubes***
- **Restocking with organic material (as needed)**
- **Relocation of *Habitubes*/Benthos (min of 3 times)**
- **Post benthos sample collection**
- **Data analysis and final summary report**

Greensboro restoration projects for the *Habitubes* System

- **Piedmont Creek, was a stream restoration project completed by NC Division of Mitigation Services (formerly EEP)-2003.**
- **Kersey Tributary, was a city stream enhancement project built in collaboration with the NC Clean Water Management Trust Fund-2013.**
- **Ardmore Park was city stream restoration project built in 2014 (city funds) & was added in phase 2.**



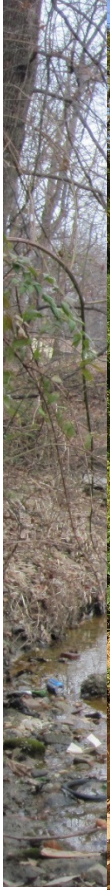


Piedmont Creek



Kersey Tributary





Cost of Restorations

Kersey Tributary (1300 ft.) = \$400,000

Piedmont Creek (1500 ft.) = \$300,000*

Ardmore Park (1800 ft.) = \$766,000

*** Piedmont Park restoration occurred in 2003**

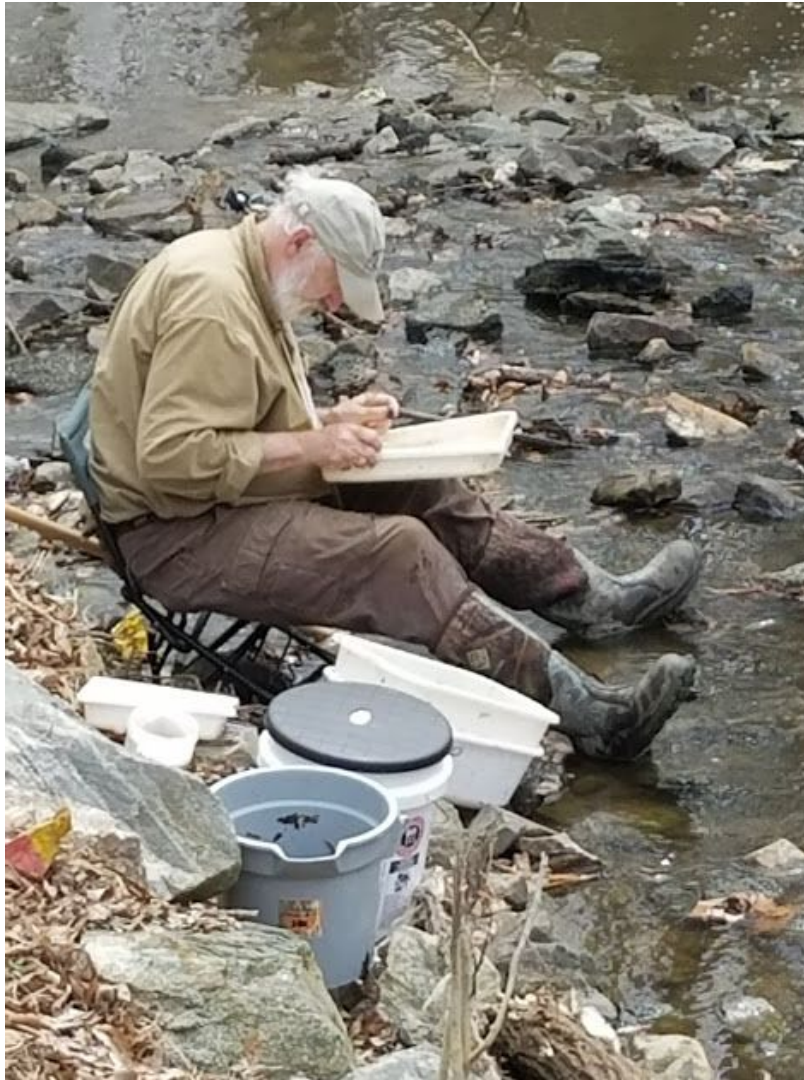
Stream Restoration Mantra:

**If You Build It,
They Will Come!**

Did the bugs come? Well, lets see!!!.... Baseline Macroinvertebrate Surveys

- **Samples collected using the standard qualitative method as outlined by the NC Department of Environmental Quality.**
- **2 Kick net samples, 3 sweep-net samples, 1 leaf-pack, 2 fine-mesh rock and/or log wash, sand sample, and visual collection.**
- **Baseline samples of receiving & donor streams, relocation sample (sub group), and three final surveys after last relocation effort.**

Samples collected and analyzed by Dave Penrose



Benthos Stream Assessment for Kersey Trib, Piedmont Creek, & Ardmore Park

Kersey, Piedmont, & Ardmore Creeks

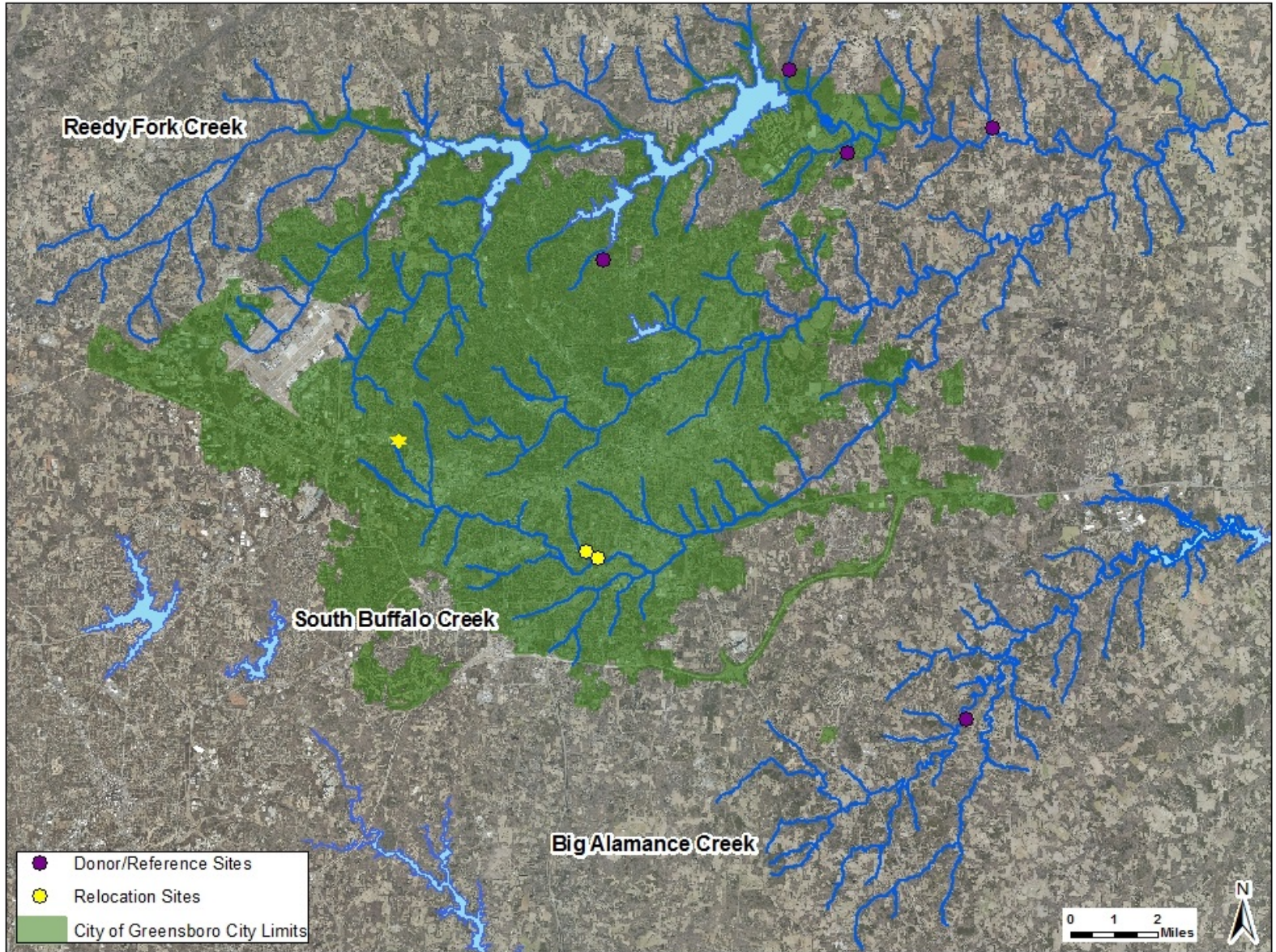
	Kersey Trib.	Piedmont Ck.	Ardmore Pk.
Total Taxa Richness	31	22	15
EPT Taxa Richness	6	4	2
EPT Abundance	19	40	20
Biotic Index	7.28	6.66	7.87
Seasonal Correction	na	na	8.07
Number of taxa = 2.5 or less	1	0	0
Bioclassification*	Fair	Poor	Poor

*used full scale criteria despite the fact that these are very small streams.

Donor Streams to the Rescue!!!...

- **Big Alamance Creek, King Edwards Tributary, Reedy Fork Creek, Pawpaw Creek, and Tom's Creek.**
- **Donor streams are mainly located in the less developed northern part of City/Guilford County with the exception of Big Alamance Creek.**
- **Where more pollution intolerant benthos reside....**





Benthos Stream Assessment for “Donor” Creeks

	<u>Alamance Ck.</u>	<u>Paw Paw Ck.</u>	<u>Reedy Fork Ck.</u>	<u>King Edwards Ct.</u>
Total Taxa Richness	58	37	44	39
EPT Taxa Richness	16	10	13	11
EPT Abundance	87	52	71	51
Biotic Index	5.88	5.54	5.88	5.6
Number of taxa = 2.5 or less	4	6	1	4
Bioclassification*	Good/Fair	Good/Fair	Good/Fair	Good/Fair

Why Use *HabiTubes*??

- Artificial and natural way to keep leaf packs and woody debris in place for extended time.
- A relatively easy way to move organisms from one stream to another.
- Can help speed up the recovery of macroinvertebrates after a stream restoration project and provide an ecological lift.
- Provides a place for organisms to hang on during high or flashy flows.
- Are very durable and can last 3 to 5 years.

Relocation of *HabiTubes* from donor streams into Kersey Trib, Piedmont Creek, & Ardmores Park



Seeding of donor *HabiTubes* in Piedmont Creek



What's in the Habitubes from donor streams?



Benthos in Habitubes

	Alamance Creek	Paw Paw	Tom's Creek
Total Taxa Richness	12	10	6
EPT Taxa Richness	6	24	36
EPT Abundance	195	18	17

Seeding of Kersey, Piedmont, & Ardmore Creeks

- **11 total relocations for Piedmont Creek, 1st in Oct 2015 & last being in February 2017**
- **10 total relocations for Kersey Trib, 1st in Oct 2015 with last being in February 2017.**
- **5 total relocations for Ardmore Park, 1st in May 2017 with last being in January 2018.**

Final Benthos Stream Assessment for Kersey Tributary

	Final Score			
	Jul-16	May-17	Jul-17	Apr-18
Total Taxa Richness	26	29	30	27
EPT Taxa Richness	3	3	3	1
EPT Abundance	16	23	16	1
Biotic Index	7.03	7.1	7.2	7.4
Seasonal Correction	na	7.3	na	7.6
Number of taxa = 2.5 or less	0	0	0	0
Bioclassification*	Poor	Poor	Poor	Poor

Final Benthos Stream Assessment for Piedmont Creek

				Final Score
	Jul-16	May-17	Jul-17	Apr-18
Total Taxa Richness	26	25	32	21
EPT Taxa Richness	5	3	6	3
EPT Abundance	29	30	42	5
Biotic Index	7.09	6.65	6.57	7.15
Seasonal Correction	na	6.85	na	7.35
Number of taxa = 2.5 or less	0	0	0	0
Bioclassification*	Poor	Poor	Fair	Poor

Final Benthos Stream Assessment for Ardmore Park

		Final Score
		Apr-18
	May-17	
Total Taxa Richness	15	15
EPT Taxa Richness	2	3
EPT Abundance	20	16
Biotic Index	7.87	7.66
Seasonal Correction	8.07	7.86
Number of taxa = 2.5 or less	0	0
Bioclassification*	Poor	Poor

Project Findings

Piedmont Creek

- **Bio classification moved from Poor to Fair and Biotic Index improved in Piedmont Creek in 2017.**
- **From 2015 to 2017 sixteen new species were introduced into Peoples Creek.**
- **July 2017 investigation a Heptageniidae (*Maccaffertium modestum*) was also collected and common at this site**
- **Organisms in 2018 were mostly tolerant species and very small individuals.**

Project Findings

Kersey Trib

- **The Biotic Index improved in Kersey in the first year of sampling after the baseline sampling.**
- **The 2nd & 3rd years after baseline sampling, the Biotic Index declined due to debris and ponding situations in the stream.**
- **Taxa were dominated by very tolerant taxa; baetid mayfly, filter-feeding caddisfly (primarily *Cheumatopsyche* spp.), a Philopotamidae caddisfly (*Chimarra* spp.), and several Chironomids.**

Project Findings

Ardmore Park

- **Relatively no change in species composition from 2017 to 2018.**
- **Very Poor EPT taxa richness values and Poor bioclassifications.**
- **Taxa dominated by tolerant Baetid mayflies and filter feeding caddisflies (primarily *Cheumatopsyche* spp.).**
- **Chironomid taxa became very abundant from baseline to post relocation...perhaps responding to water quality perturbations in the watershed.**

Lessons learned and adapting to Environmental Challenges...

- **Need to factor in the unpredictable nature of environmental problems.**
 - Drought
 - Flooding & Flashy Flows
 - Hydrologic Changes
 - Catastrophic Water Quality Problems

- **We ran into problems with donor streams. Having multiple donor streams will increase the opportunity for success.**

Drought on Paw Paw Creek



Debris Jam on Kersey



Final takeaways!!!

- **Unique project in terms of trying to relocate benthic macroinvertebrates!!!**
- **In the end...no sustained upward shifts in bioclassification of the three streams**
- **Incremental (+) results...Piedmont Creek “Poor” to “Fair” in 2017 & 16 new species**
- ***Habitubes* provide a good format for in stream habitat...the bugs are really attracted to them**
- **Provided an a easy way to relocate benthic macroinvertebrates from one stream to another**
- **Project provided invaluable information on the challenges of removing urban stream sections from 303(d) list for biological integrity**
- **Keep the big picture in mind in dealing with habitat & water quality improvement projects; “Perfection versus Progress”**

Questions???



J. Patrick Barber
pbarber@acervn.net
(404) 520-9422



Peter W. Schneider
peter.schneider@greensboro-nc.gov
(336) 373-2737