The Ripple Effects of Collaborative Stream Restoration

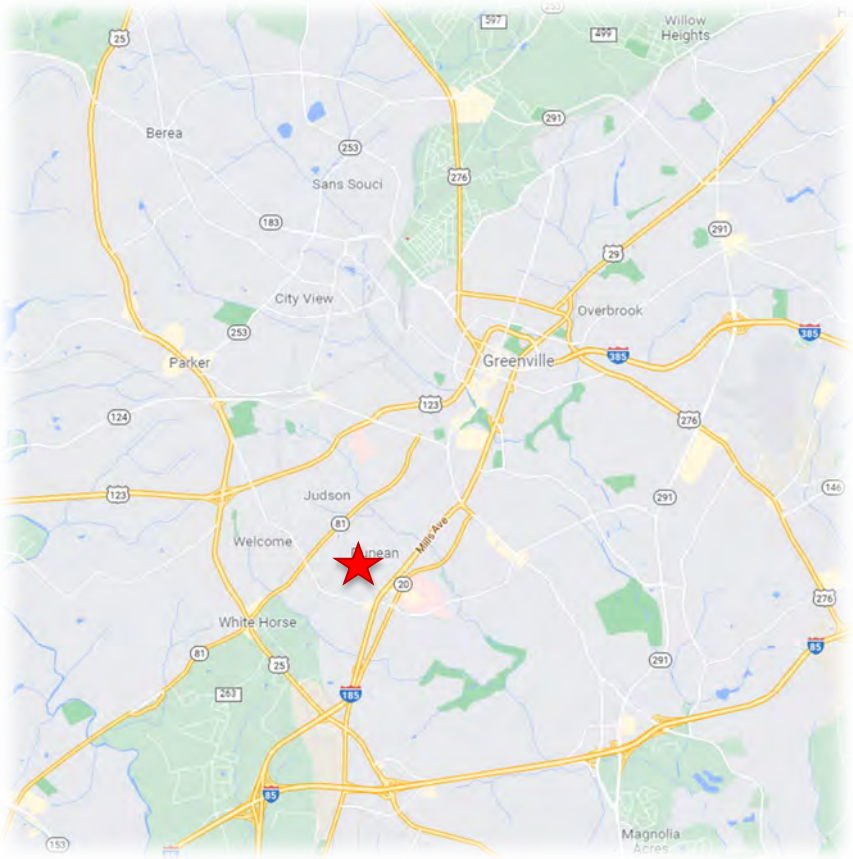
Brushy Creek

Greenville County

WOOLPERT

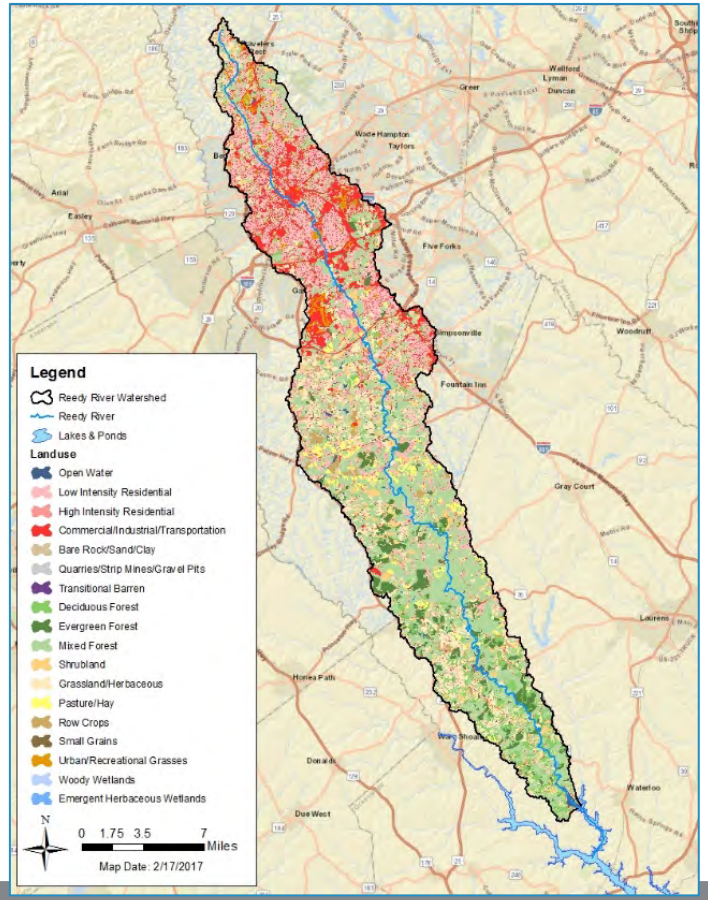
ARCHITECTURE | ENGINEERING | GEOSPATIAL

Project Location



- Between Mills Avenue and Seth Street
- Tributary to the Reedy River
- Two primary landowners

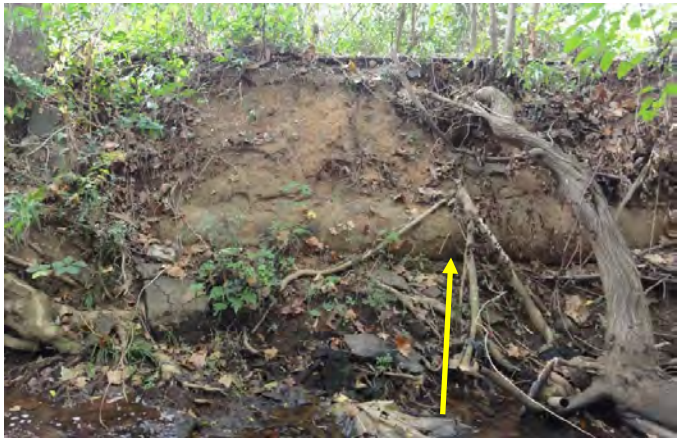
Why Brushy Creek? The Reedy River Plan



- SCDHEC proposed a Reedy River TMDL for Total Phosphorus (TP) in the early 2000s
- Reedy River was then delisted for TP, but Total Nitrogen (TN) was a new pollutant of concern
- EPA proposed a 5R approach, with three major stakeholders: Greenville County, the City of Greenville, and ReWa
- Within the 5R group, the BMP committee was tasked with finding solutions to reduce TN and TP in the Reedy

Why Brushy Creek? The Issues

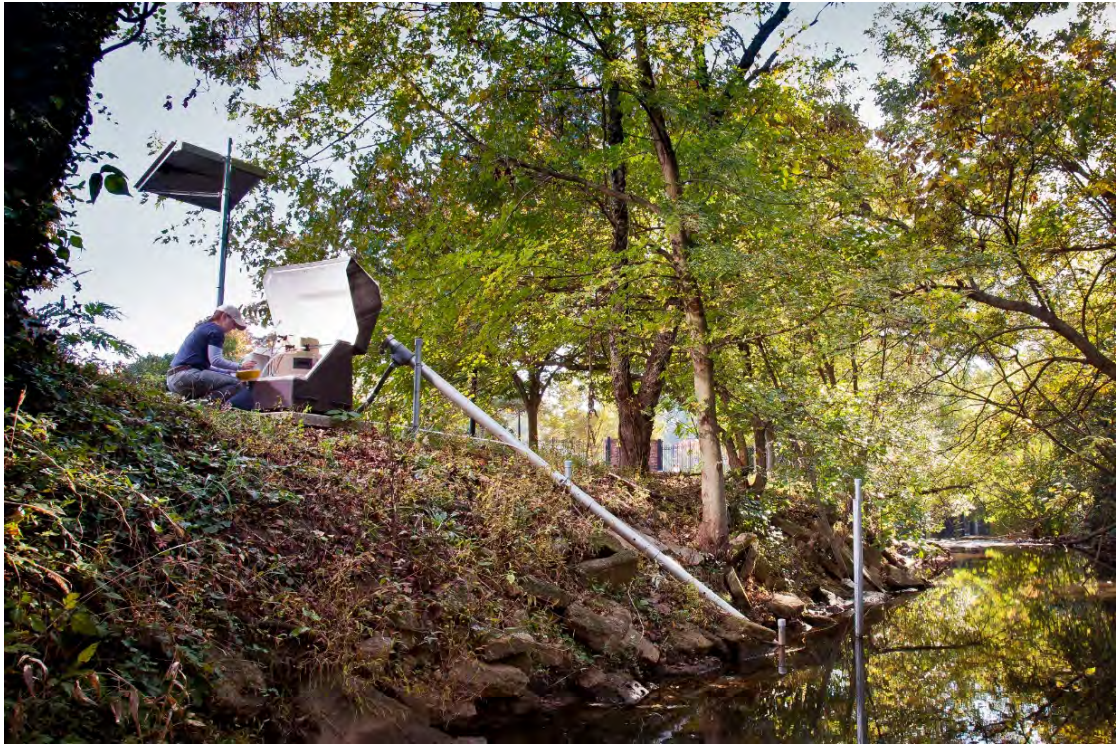
- Degrading stream banks
- Exposed sewer lines
- Older development in watershed
- Confined stream corridor
- In-stream debris and trash
- Multiple stakeholders – 5R Participants



Water Quality Monitoring Station

Greenville County Monitoring Station

- Real-time water quality and gaging station installed in 2012
- Nearly 2 million individual data points collected
- More than 300 samples collected
- Enable County to evaluate the direct water quality benefits within the stream reach as a result of implementing this project



The Solution:

A partnership between multiple stakeholders

ReWa
renewable water resources

Funding, Planning,
Design input

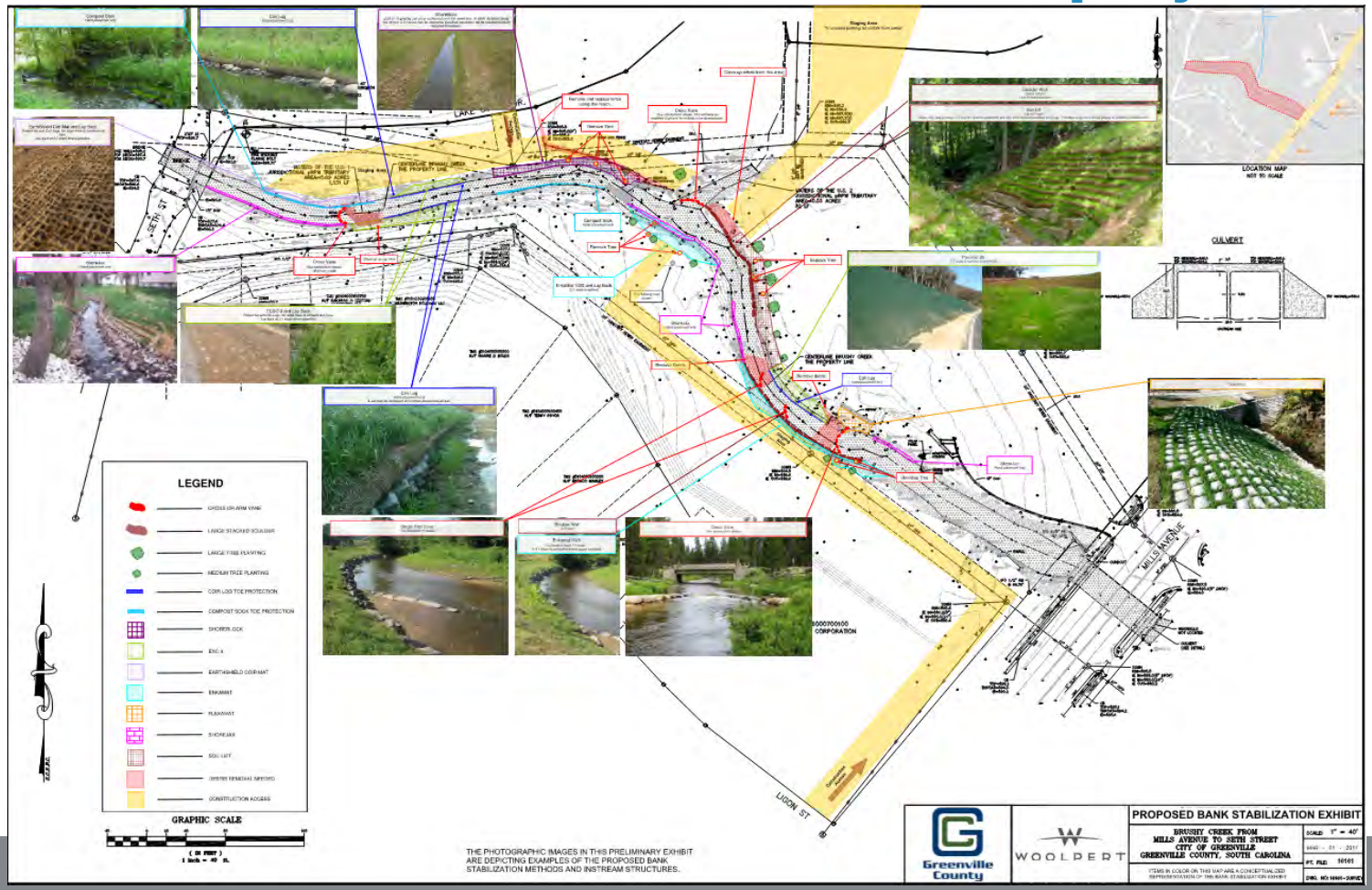
Access, Maintenance,
Landscaping Input

city of greenville

SPINX
Making Life Easier

the Lofts
At MILLS MILL

The Solution: A *demonstration* project



The Solution: A *demonstration* project

- Primary goal: stabilize the stream, protect the sewer lines, and improve water quality
- Secondary goal: evaluate the ease of installation, effectiveness, and longevity of a variety of stream stabilization techniques
- 19 different techniques were used
  - Grade/Velocity Control
  - Toe Protection
  - Bank Stabilization
  - Hard Armoring
  - Vegetation

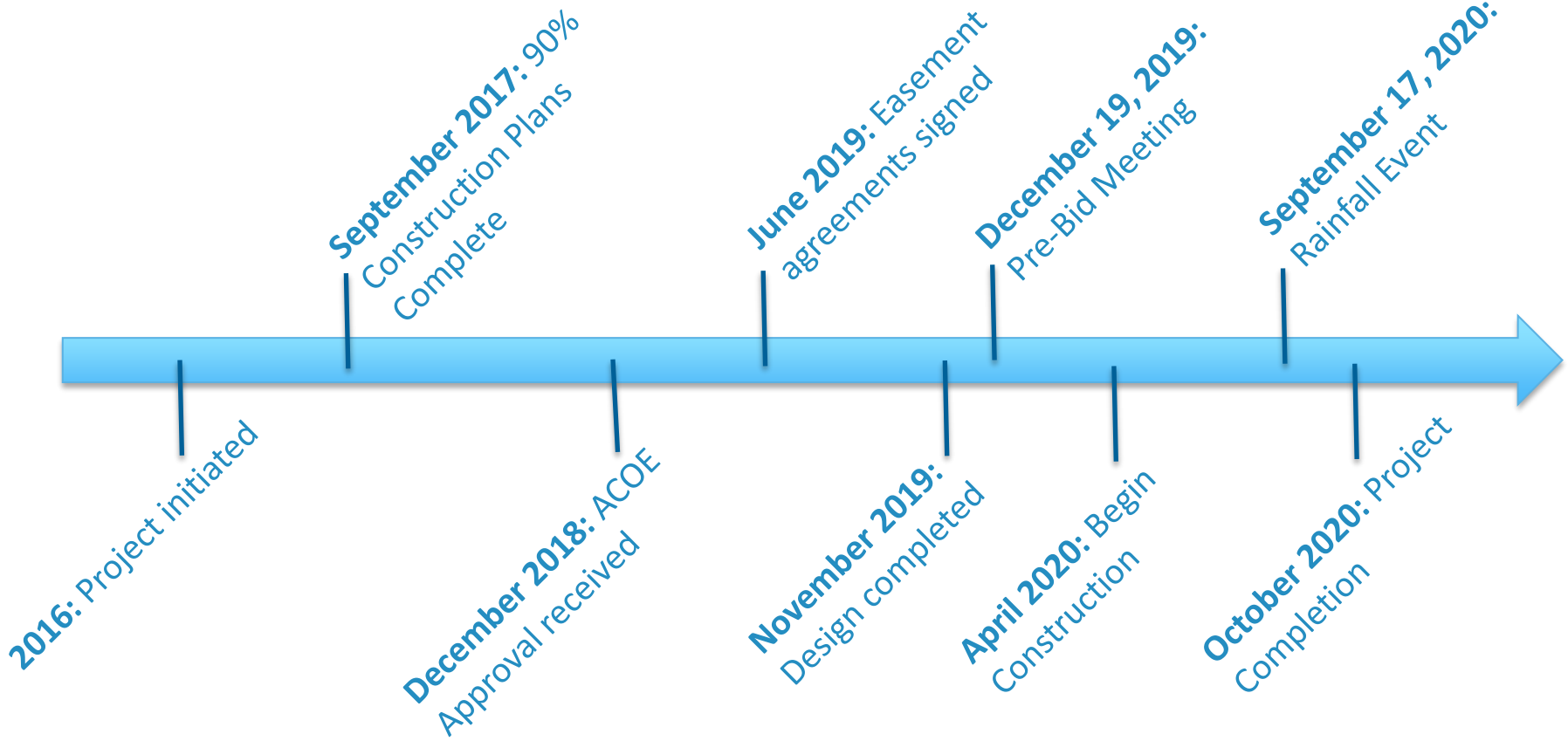
The Price Tag:

Construction Cost: **$630,000**

Project Length: 900LF

$700/LF

The Solution: Timeline



Grade/Velocity Control: *Cross Vane*

Downstream

Upstream

Grade/Velocity Control: *Cross Vane*

Before

After

Grade/Velocity Control: *Single Arm Vane*

Before

After

Toe Protection: *Boulder Toe and Concrete Jacks*

Boulder Toe

Jacks

Toe Protection: *Boulder Toe*

Before

After

Toe Protection: *Concrete Jacks*

Before

During

After

Toe Protection: *Coir Logs*

Before

After

Toe Protection: *Compost Sock*

Before

After

Bank Stabilization: *3-D TRM*

Before

After

Bank Stabilization: *3-D TRM*

Before

After

Bank Stabilization: *Coconut/Straw TRM*

Before

After

Bank Stabilization: *Coconut / Coir /Jute Matting*

Before

After

Bank Stabilization: *Boulder Wall and Soil Lifts*

Bank Stabilization: *Soil Lifts*

Before

After

Hard Armoring: *Boulder Wall*

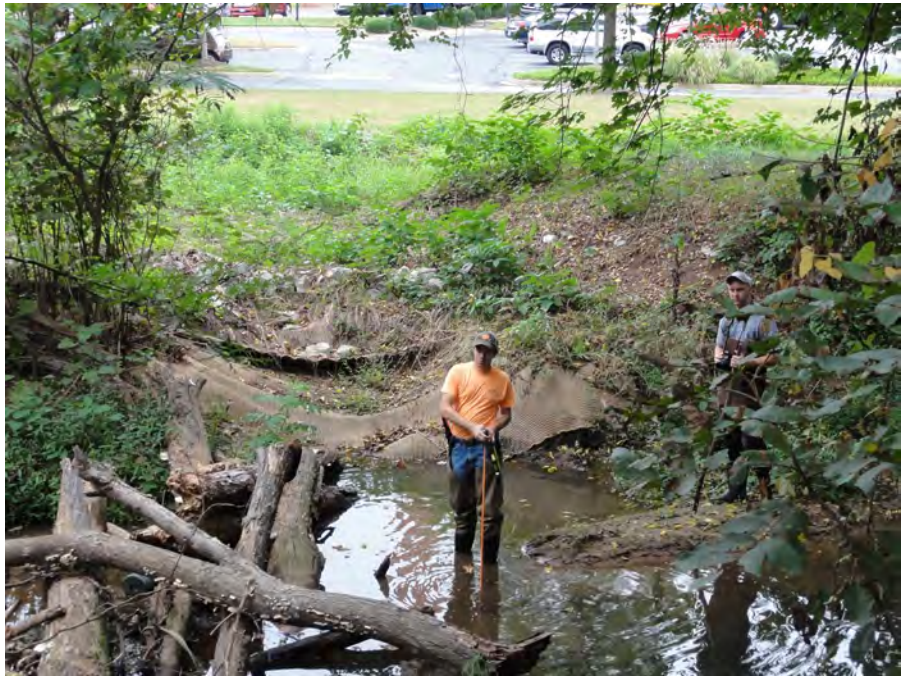
Before

After

Hard Armoring: *Flexamat and Shoreblock*

Hard Armoring: *Vegetated Concrete Block Mat (Flexamat)*

Before



After

Hard Armoring: *Tied Concrete Block Mattress (Shoreblock)*

Before

After

Vegetation: *Live Stakes and Plantings*

Storm Event – How Did it Hold Up?

Storm Event – How Did it Hold Up?

Then & Now

Nov ‘20

May ‘21

Then & Now

Nov ‘20

May ‘21

Then & Now

Nov ‘20

May ‘21

Then & Now

Nov ‘20

May ‘21

Then & Now

Nov ‘20

May ‘21

Then & Now

Nov ‘20

May ‘21

Then & Now

Nov ‘20

May ‘21

Contractor Survey and Lessons Learned

1. Grade/Velocity Control
   - Expect significant oversight for these critical applications.
2. Toe Protection
   - In open areas, contractor preferred boulder toe, but recognized the benefit of concrete jacks in tight spaces.
3. Bank Stabilization
   - Blankets and TRMs were by in large preferred
   - The 3-D nonwoven TRM resulted in the most immediate aesthetic appeal.
   - Contractor did not mind soil lift installation, but it was time consuming and costly.
4. Hard Armoring
   - Concrete mattresses are difficult to install along curves.
   - Vegetated block mats are a great compromise for installation, strength, and aesthetics.

Contractor Survey and Product Evaluation

Product	Cost	Ease of Install	Aesthetics	Durability
Cross Vane/Arm Vane	$ $ $	#	★ ★	✚ ✚ ✚ ✚
Concrete Jacks	$ $	#	★ ★	✚ ✚ ✚
Coir Logs	$	# #	★ ★	✚
Compost Socks	$	# # #	★ ★	✚ ✚
Boulder Wall	$ $ $	# #	★ ★	✚ ✚ ✚ ✚
Soil Lift	$ $ $ $	# #	★ ★ ★	✚ ✚
3-D TRM	$ $	# # #	★ ★ ★	✚ ✚ ✚
Coconut/Straw TRM	$	# # # #	★ ★ ★	✚ ✚
Vegetated Concrete Block Mat	$ $	# #	★ ★ ★	✚ ✚ ✚
Tied Concrete Block Mattress	$ $ $	#	★ ★	✚ ✚ ✚ ✚

Another Lesson: Invasive Species

Japanese Knot weed

Aug ‘20

Oct ‘20

Moving Forward

1. Continue invasive treatment at regular intervals
2. Evaluate water quality effects with continued Stream Monitoring
3. Follow up field inspections and repairs as needed


Brushy Creek Stream Restoration
BMP Demonstration Project
Reedy River
Water Quality Group

Questions?

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