

# Motivations, goals, and potential outcomes of a habitat restoration project on the South Fork of the New River

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# The Restoration Debate

- Lack or underuse of ecological indicators
- Lack of communication between researchers and practitioners
- Underwhelming results
- Rosgen / Natural Channel Design
  - Preferred method for agencies
  - Criticized for oversimplifying fluvial systems

# Research Questions

1. What are the goals for restoration?
2. Does available data suggest the need for restoration?
3. How likely are management goals to be met based on available data?

# The South Fork New River Restoration

- Section 206 of the Water Resource Development Act for projects
  - to improve environment
  - in the public interest
  - cost-effective
- 1998 Town of Boone, NC requested project
- 2013 actual implementation; Fall 2014 construction
- Partners: New River Conservancy, ASU
- Total budget = \$2.6 million

# The South Fork New River

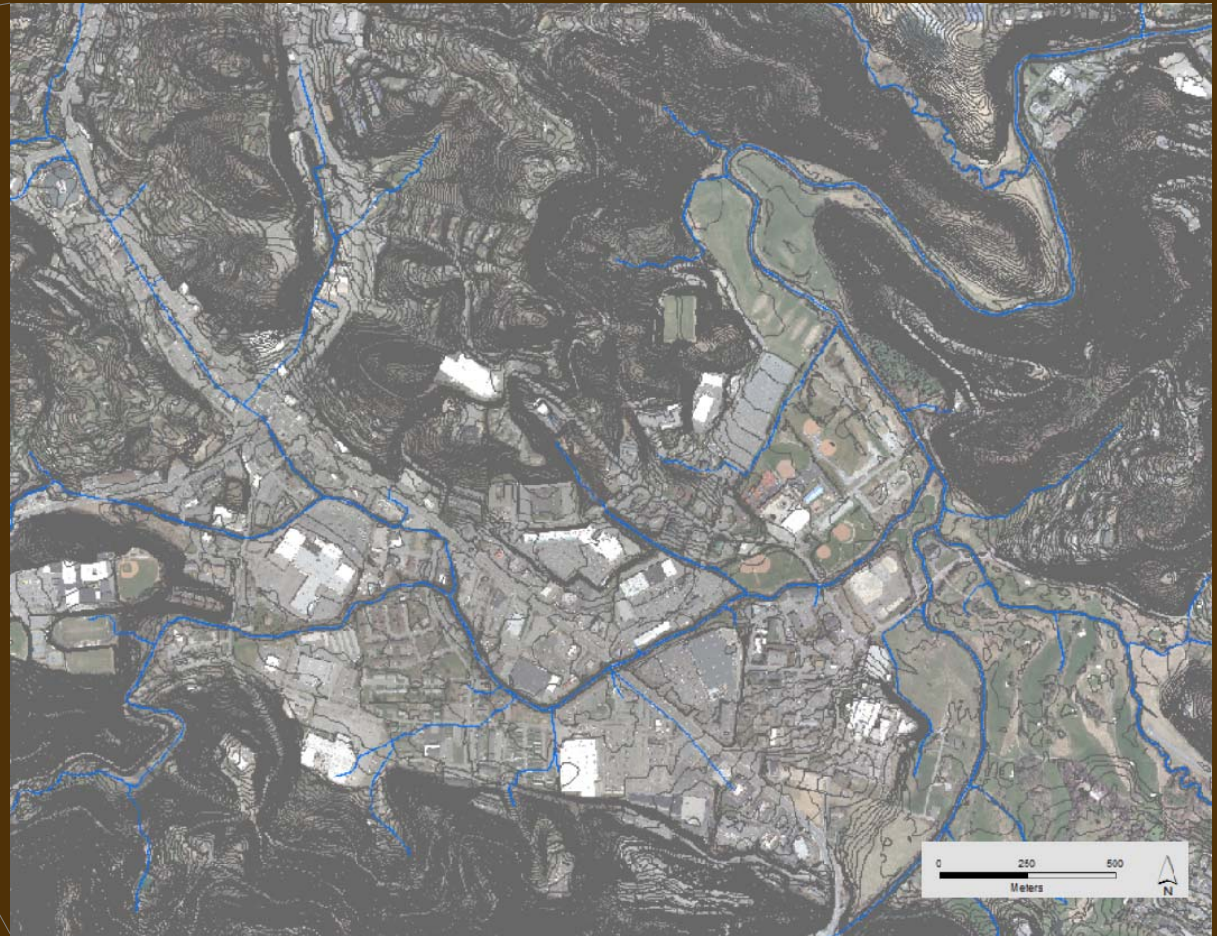


## The New River

- One of the oldest rivers in the world
- American Heritage River

## Boone, NC

- ~17,000 full time residents + ~17,000 students
- 20% growth rate 2000-2010 = development /impervious surfaces



# Methods

- In-depth interviews with project sponsors
  - US Army Corps of Engineers
  - Town of Boone project manager
  - New River Conservancy
  - Appalachian State University physical plant
- Reviewed project plan and construction documents
- Reviewed available pre-restoration data

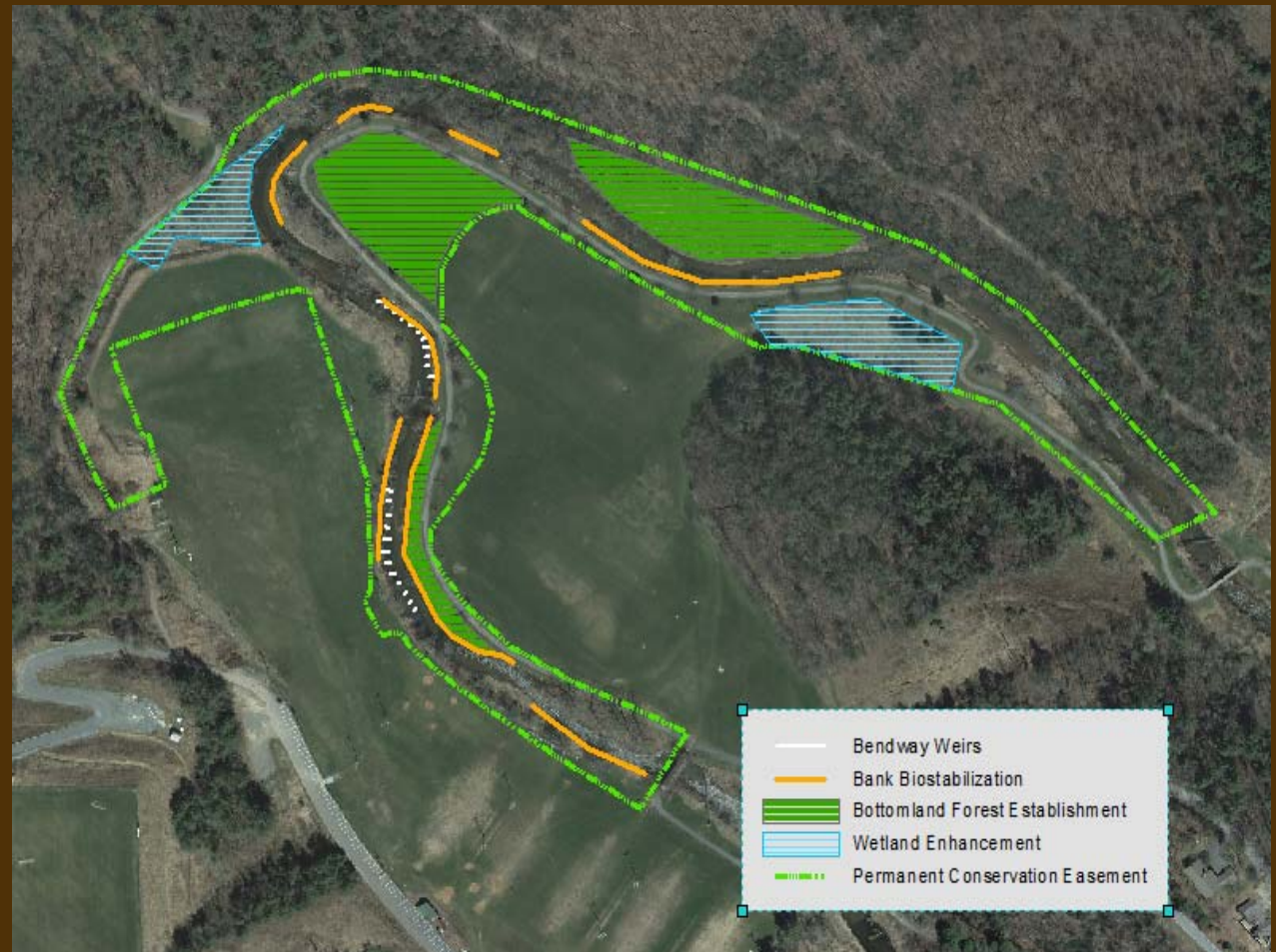


# Restoration Goals

Sponsor	Objectives	Expected Outcomes
<b>USACE</b>	<b>Improve aquatic habitat</b> <b>Prevent loss of greenway</b> Reduce sedimentation Create access for recreation Buffer stormwater impact	<b>Improved habitat</b> <b>Protected greenway</b> Reduced bank loss Reduced meander Provide recreation
<b>Boone</b>	<b>Improve aquatic habitat</b> <b>Prevent loss of greenway</b> Stabilize streambank	<b>Improved habitat</b> <b>Protected greenway</b> Reduced turbidity
<b>New River Conservancy</b>	<b>Improve aquatic habitat</b> <b>Prevent loss of greenway</b> Stabilize streambank Create access for recreation Reconnect floodplain	<b>Improved habitat</b> <b>Reduced erosion/sediment</b> Economic potential Public education
<b>ASU</b>	Improve athletic fields	Raise fields 6 inches, reduce standing water, level fields

# Restoration Plan

- Bendway weirs and boulders to control flow direction
- Rehabilitate wetland areas
- Bank sloping and vegetation
- Riparian buffer extension
- Invasive species control and re-vegetation
- Bottomland hardwood forest re-vegetation







## Fish Community

USACE (2004) and AppAqua (2014) surveys throughout restoration area

~ At least 27 different species inhabit restoration area

~ Large number of herbivores (i.e. stonerollers, *Campostoma anomalum*)  
indicative of excessive solar input

**NC Index of Biotic Integrity rating = Good**

# Benthic Macroinvertebrate BI Ratings

## North Carolina Biological Index Ratings for Macro Invertebrate Communities in the Upper South Fork Watershed

Data Analyzed by the Biological Assessment Branch at NCDENR (1993-2008)

Stream	Site ID	Sample Type	July-1993	Aug-1998	Aug-2003	Nov-2003	Aug-2008
South Fork New River	KB16	SQM	Fair	Good-Fair	Good-Fair	Fair	Fair
Middle Fork South Fork New River	KB1	EPT	Excellent	Good	Good-Fair	Good	Good-Fair
East Fork South Fork New River	KB12	EPT	Excellent	Good	Good	Fair	Good

NCDENR benthic data =  
declining BI ratings

*Sampling sites not in  
restoration reach*

2013 AppAqua data at  
restoration site =  
**Excellent BI rating**

# Water Quality from EA & NCDENR

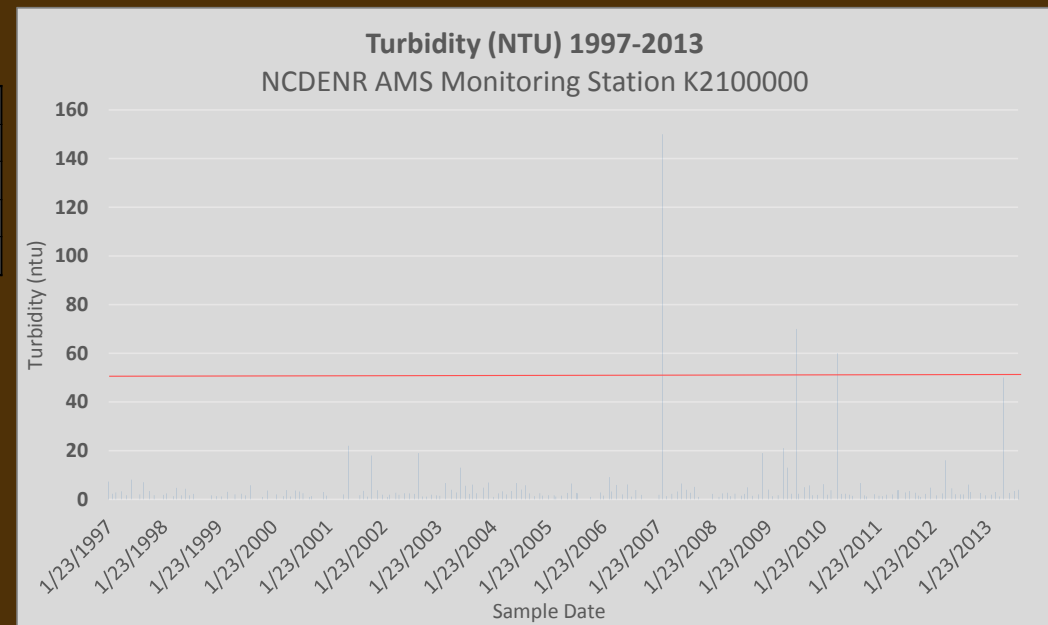
Water Quality Data from NCDENR Monitoring Station KB16 (1998-2003)					
Parameter	N	Evaluation Level	Minimum	Median	Maximum
Specific Conductance (µS/cm)	44	n/a	20	134	266
pH	45	<6, >9	5.9	7	7.6
Turbidity (ntu)	53	>50 (Trout Designated)	1	2	22

EA drafted in 2009; data through 2003

EA did not include temperature

AppAqua temp data within reach averages 7° C

**Water quality = very good**  
**low turbidity except runoff events**  
**low temp**



> 50 ntu evaluation level for trout designated water

# Restoration needed?

- EA & ASU fish survey = **Good** biologic integrity
  - herbivores = excessive solar input
- EA benthic data = declining ratings; sampling sites outside project area
- AppAqua benthic data = **Excellent** biologic integrity at project area
- NCDENR turbidity data = low, within NC standard for trout waters

**Data = good water quality; room for improvement in fish diversity**

# How likely are management goals to be met?

## Improve Habitat

- Habitat in good shape
- Disrupts good habitat
- Added vegetation = canopy cover and habitat

## Protect Greenway

- Stabilized banks reduces land loss
- Upstream conditions = overwhelms restoration area
- River systems migrate naturally

## Stabilize banks

- In stream structures may fail/require maintenance
- Upstream conditions = overwhelms restoration area

## Reduce Turbidity

- No turbidity data at restoration site
- Turbidity = very low
- Turbidity = function of entire watershed

# Conclusions

- Data used in decision = poor (geographically and temporally)
- Upstream watershed conditions may overwhelm in-stream structures
- Upstream watershed conditions may continue bank degradation
- Restoration may lower quality in short term
- Restoration justification = improved aquatic habitat
- Primary issue = land loss via erosion
  - Grading banks + re-vegetation = cheaper approach; same outcome