Preferences for Stream Health Improvements in Macon County, NC

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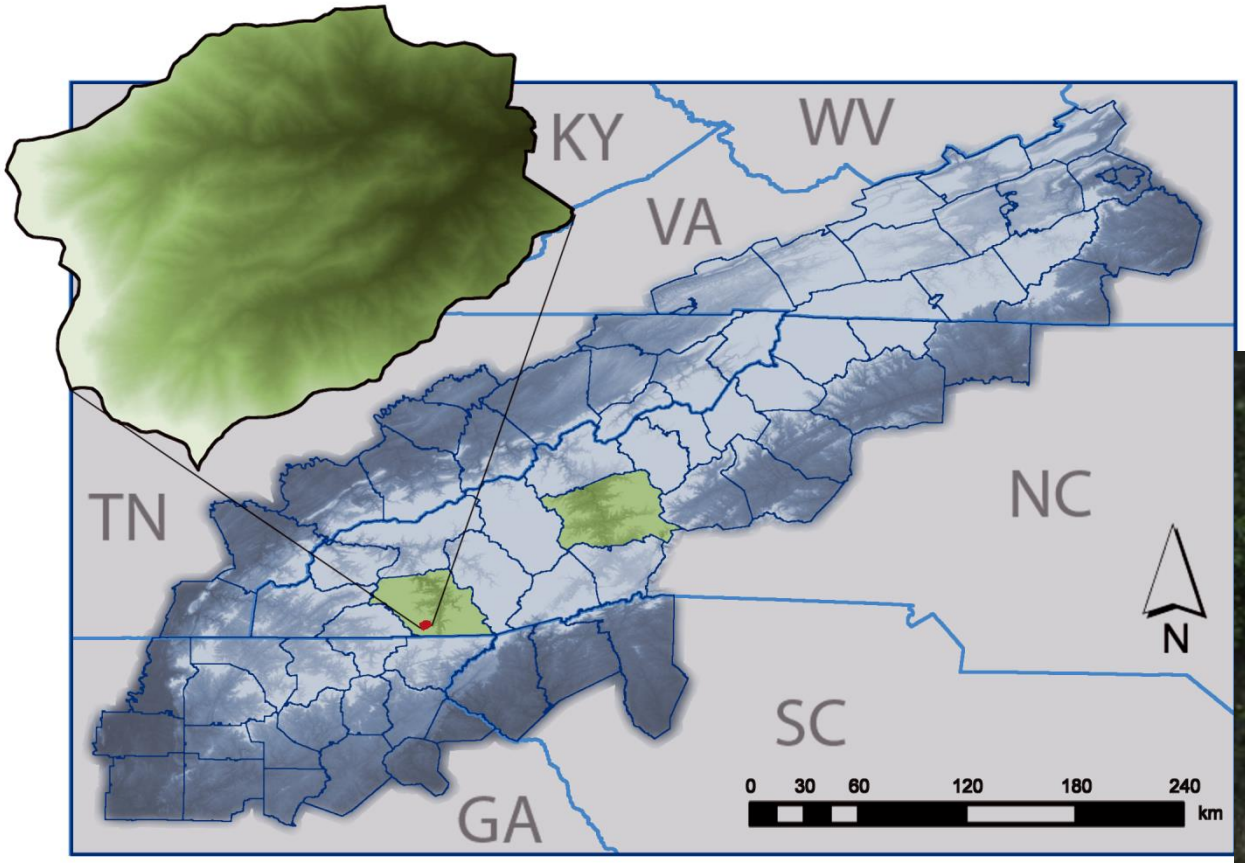
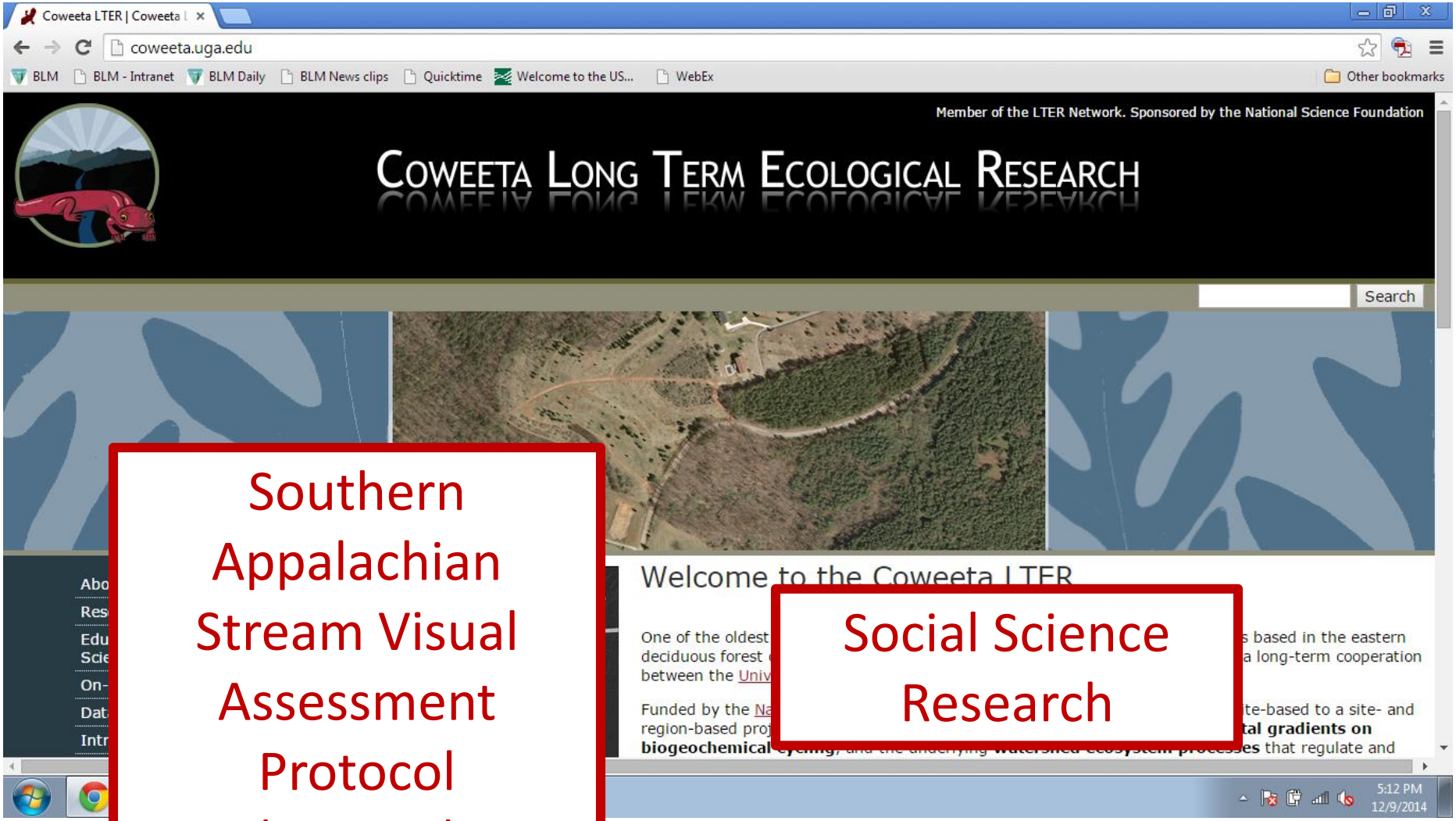
Macon County, NC



The Southern Appalachian Mountain Study Area, including Macon County and Buncombe County, NC and the Coweeta Hydrologic Laboratory.

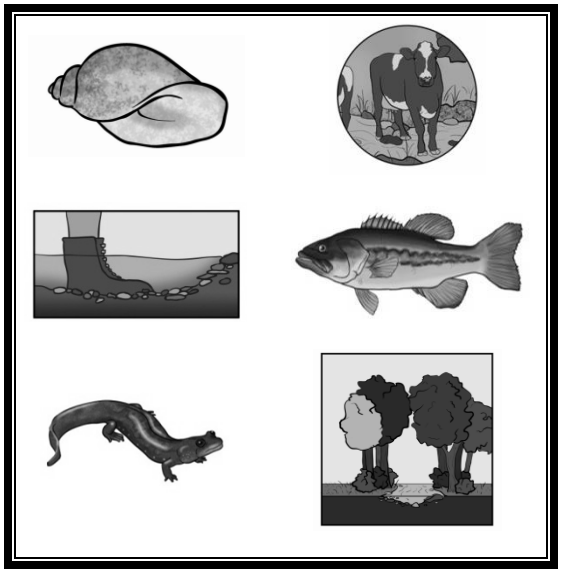
Coweeta LTER



Values for Stream-based Ecosystem Services

What a perfect opportunity for a choice experiment!

Public preferences for healthy streams: A survey of Macon County, NC residents



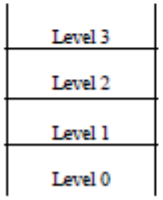
Attributes of Stream Health

Characteristics of Streams

Please use this insert to answer questions B1 – B5. These are descriptions of the possible characteristics of streams that run through private properties in your area.

Water quality: The ability to safely use water for various activities depends upon the level of contamination. This aspect of stream health is sometimes described as a ladder, where the bottom rung represents water that is not safe for any uses. Higher rungs represent lower contaminant levels. At level 1 the water is deemed safe for agricultural uses and for fishing; at level 2 it is also considered safe for swimming; at level 3 it can be used for drinking in addition to other uses.

Currently, NC regulations mandate that all streams meet, at minimum, the Level 1 standard. According to the NC division of water quality, in the Little Tennessee watershed (which includes all of the streams in Macon County) 76% of streams are at Level 1, 3% are at Level 2, and 21% are at Level 3.



Muddiness: This is the amount of mud on the stream bottom and suspended in the water. Muddiness varies considerably in streams, but is caused by road and housing development, clear-cutting of forests, and erosion.

No Mud: Bottom of stream is exposed; there is not a mud layer on top. Water color is clear.	**Some Mud**: There is a thin layer of mud on the bottom of the stream (less than 1 inch deep). Water color is light brown.	**Muddy**: There is a noticeable layer of mud on the bottom of the stream (1-3 inches). Water color is brown.	**Thick Mud**: There are over 3 inches of mud on stream bottom. Stream may be shifting due to sedimentation. Water color is dark brown.

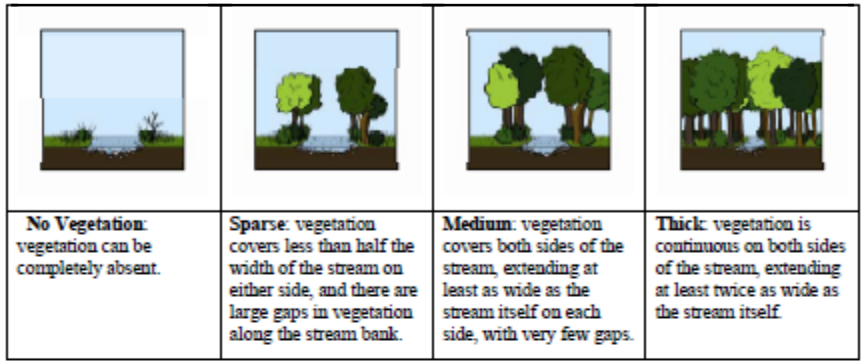
Livestock access: Livestock with direct access to the stream can damage the stream bank, affect water quality and clarity, and impact aquatic animals. Currently, livestock are allowed to enter streams on private property, though some property owners have fenced the livestock out of the stream, providing water through diversion.

Livestock may enter streams

Livestock are not allowed in streams

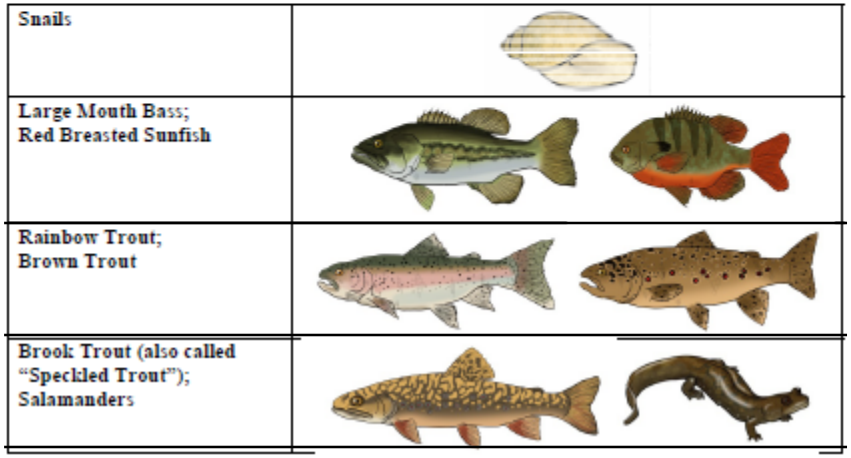
Continued on reverse

Vegetation around streams: Vegetation around streams regulates water temperature, stabilizes stream banks, filters pollutants, and provides habitat for animals. There is not a current minimum amount of vegetation required around most streams that are on private property.



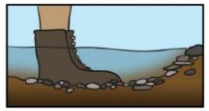
No Vegetation: vegetation can be completely absent.	**Sparse**: vegetation covers less than half the width of the stream on either side, and there are large gaps in vegetation along the stream bank.	**Medium**: vegetation covers both sides of the stream, extending at least as wide as the stream itself on each side, with very few gaps.	**Thick**: vegetation is continuous on both sides of the stream, extending at least twice as wide as the stream itself.

Aquatic animals: The animals living in streams depend partly upon water quality and other stream characteristics. Aquatic diversity varies widely in current streams. The four groups of animals shown here tend to be found in different stream conditions.



Snails	
Large Mouth Bass; Red Breasted Sunfish	
Rainbow Trout; Brown Trout	
Brook Trout (also called "Speckled Trout"); Salamanders	

Example Choice Question

	Alternative A	Alternative B	
Water quality	Agriculture and fishing	Agriculture, fishing, and swimming	
Muddiness	 Some Mud	 Muddy	
Livestock Access			
Vegetation around Streams	 No Vegetation	 Thick Vegetation	
Aquatic Animals	 Brook trout and Salamanders	 Snails	
Cost to your household	$20/year	$80/year	$0/year
Check ONE box. →	**I vote for Alternative A** ☐	**I vote for Alternative B** ☐	**I would not vote for either alternative.** ☐

Voluntary mechanism:
If you were voting in a referendum that would create a program to have 75% of streams in Macon County reach one of the following sets of standards through **voluntary incentives payments to landowners**, how would you vote?

Mandatory mechanism:
If you were voting in a referendum that would create a program to have 75% of streams in Macon County reach one of the following sets of standards through **mandatory regulation of land use decisions**, how would you vote

Latent Class Estimation: Predictors of Class Membership

Table 2: Variables describing latent class membership probability.

Variable Name	Survey Question	Proxy For
Voluntary efforts	Stream Improvements should be voluntary	Position on government mandates for environmental care
Slope	An ordinance should monitor slope developments	Position on zoning laws
Tax	Taxes should be increased on homes purchased on slopes	Position on taxes
First Generation	Are you the first generation of your family to live in Macon County?	Tenure
Primary Residence	Use of property	Time spent in region and investment in community
Income > 60K	Annual income less than 60,000 USD per household	Income

Predictors of Class Membership

	Mandatory Program Implementation		*Voluntary Program Implementation*	
	Long Term Residents	New Arrivals	Land Rights Advocates	Zoning Supporters
Class Membership Probability	.474	.526	.472	.524
	Class Characteristics			
Intercept	.000 (.190)	----	-.323 (.215)	----
Voluntary efforts	-.005 (.007)	----	.471 (.188)**	----
Slope	-.006 (.012)	----	-.659 (.298)**	----
Tax	-.484 (.139)***	----	.188 (.243)	----
First Generation	-.488 (.139)***	----	.006 (.013)	----
Primary Residence	.489 (.139)***	----	-.064 (.221)	----
Income > 60K	-.001 (.000)**	----	-.001 (.000)***	----

Preferences for Stream Health Attributes

	Mandatory Program Implementation	
	Long Term Residents	New Arrivals
Water Quality	.238 (.076)***	.301 (.044)***
Muddiness	-.304 (.091)***	-.408 (.049)***
Livestock access	.108 (.191)	-.247 (.105)**
Vegetation	.010 (.076)	.045 (.041)
Aquatic Animals	.186 (.092)**	.121 (.044)***
Cost	-.010 (.002)***	-.004 (.001)***
Opt out	1.910 (.321)***	-.556 (.197)***

WTP for Stream Health Attributes

	Mandatory		*Voluntary*	
	Long Term	New Arrivals	Land Rights Advocates	Zoning Supporters
Water Quality	$25	$81	$46	$99
Muddiness	-$32	-$109	-$110	-$107
Livestock Access	n.s.	-$66	n.s.	n.s.
Vegetation	n.s.	n.s.	n.s.	n.s.
Aquatic Animals	$19	$32	n.s.	$31

WTP for a Stream Health Improvement

Program targeting improvements of one “level”:

- Water quality = suitable for agr., fishing, and swimming
- Muddiness = “muddy”
- Aquatic animals = large mouth bass, red breasted sunfish

Mandatory mechanism	
• Long Term Residents	$76
• New Arrivals	$222
Voluntary mechanism	
• Land Rights Advocates	$156
• Zoning Supporters	$237

Choice Experiment Conclusions

- Mechanism matters, sometimes in unexpected ways
- Attribute rank was generally consistent
  - muddiness
  - water quality and aquatic animals
  - riparian buffer and livestock access
- But clear heterogeneity in WTP

Broader Implications

- Valuation is critical for understanding ecosystem services
- There is a role for stated choice methods even when specific policy or program proposals are not yet developed

Questions?