

A topographic map of the Fishing Creek watershed is shown on the left side of the slide. The map features contour lines, a yellow line representing the creek, and a white line representing a road. A white circle with a dot inside is located on the map, with a white arrow pointing to the right towards the text. Another white arrow points downwards from the circle towards the text.

# Fishing Creek Local Watershed Plan Water Quality Study

Presented by NC Division of Water Quality  
Watershed Assessment Team  
Fishing Creek Stakeholders' Meeting  
July 31, 2007

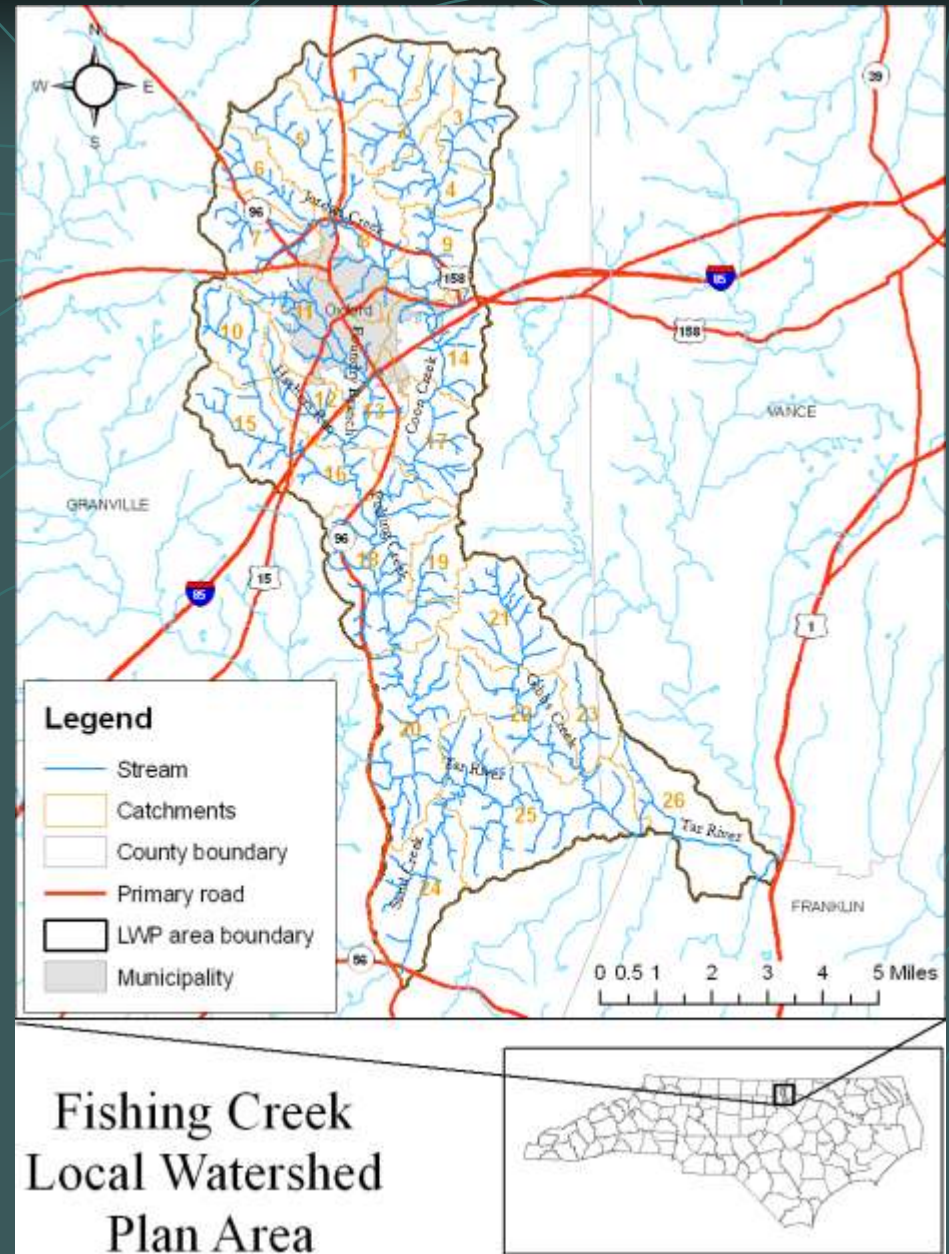
A vertical strip on the left side of the slide shows a topographic map of the Fishing Creek area. It features contour lines, a yellow line representing the creek, and various symbols indicating land use or infrastructure. The map is partially obscured by the dark background of the slide.

# Fishing Creek WQ study overview

- Support EEP/WK Dickson with identification of areas that may benefit from restoration, BMPs, or other enhancement projects
- Identify water quality issues/concerns (point source and non-point source) in Fishing Creek LWP area
- Monitor chemical, bacteriological, biological, and habitat water quality indicators
- Data collected from Sept. 2005- Nov. 2006

# LWP area Overview

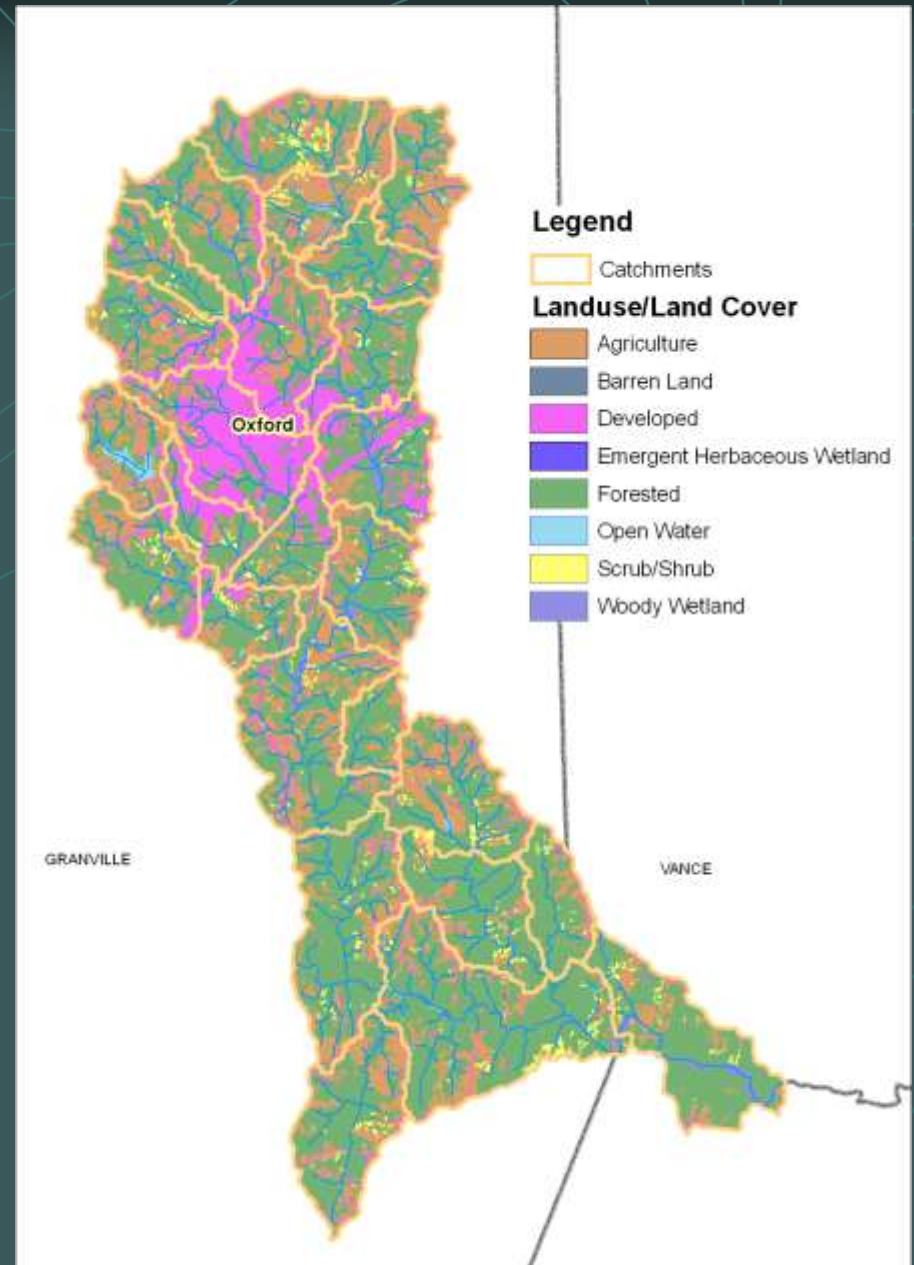
- Area defined by EEP
- Divided into 26 catchments
- Total area ~70 sq. mi.
- Major subwatersheds include Fishing Cr, Foundry Br, Hachers Run, Coon Cr, Jordan Cr, Sand Cr, Gibbs Cr, Tar R



Fishing Creek  
Local Watershed  
Plan Area

# LWP area Land use

- Simplified version of data provided by WK Dickson
- Forested and agriculture by far most common throughout LWP area
- Developed shows largest variability (1.5-66%)







# Analytical chemistry

# Analytical sampling and results

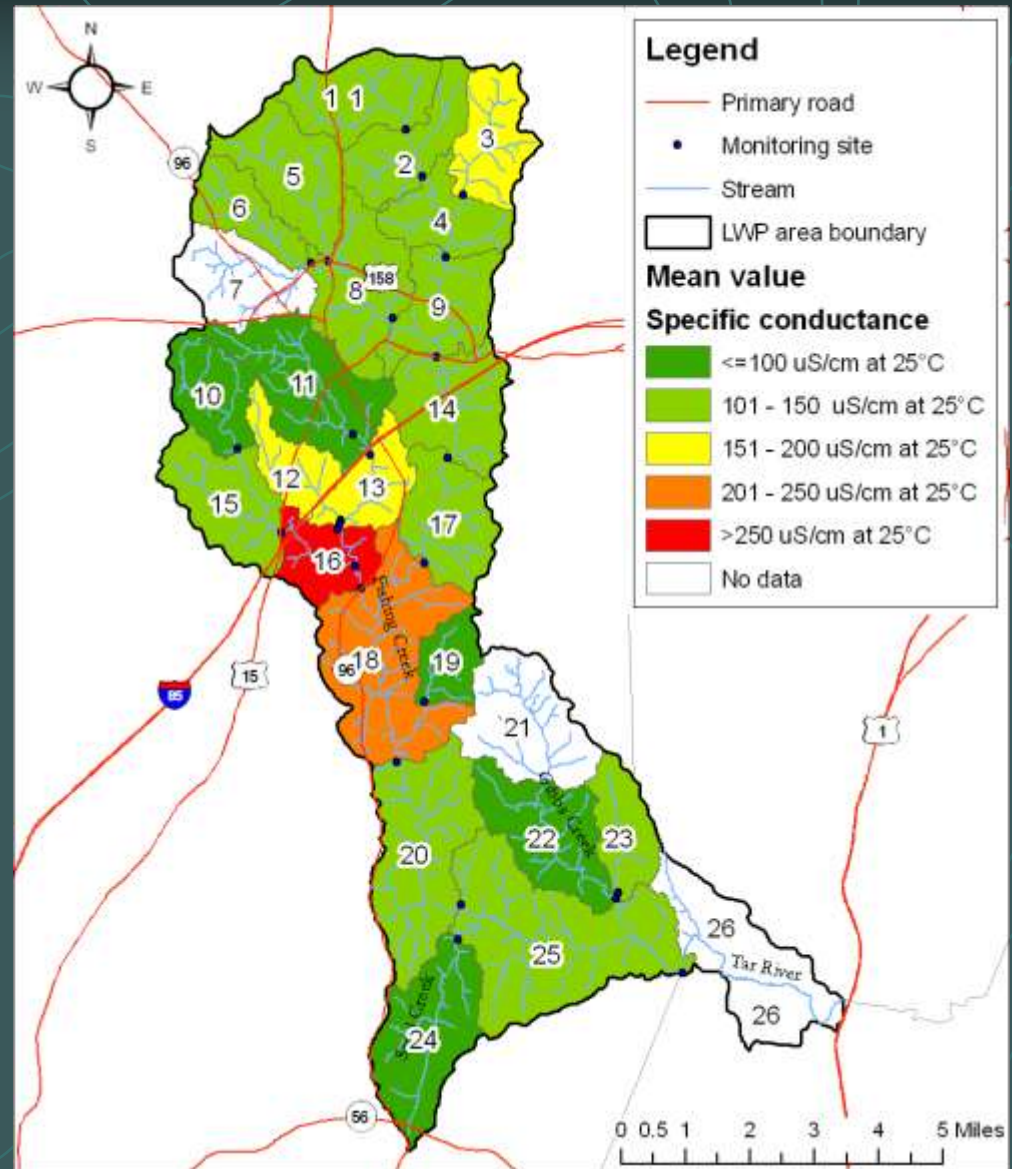
- Analytical samples:
  - Bacteria: Fecal coliform
  - Physical: Turbidity, suspended residues
  - Nutrients: Ammonia ( $\text{NH}_3$ ), total Kjeldahl nitrogen (TKN), nitrite+nitrate ( $\text{NO}_2+\text{NO}_3$  or  $\text{NO}_x$ ), total phosphorus (TP)
  - Metals: Aluminum, copper, iron, lead, zinc, etc.
- Field measurements: dissolved oxygen (DO), temperature, specific conductance, pH, turbidity
- Sample under different flow regimes: base (majority), storm, “other”

# Analytical sampling and results

- In some cases NC has a water quality standard or action level
- Most do not; historic DWQ Ambient Monitoring System (AMS) source for “typical” results
- WAT results presented here as mean (or geomean) for monitored catchments
- Focus is to facilitate ranking of sites/catchments, not necessarily labelling as “good” or “bad”

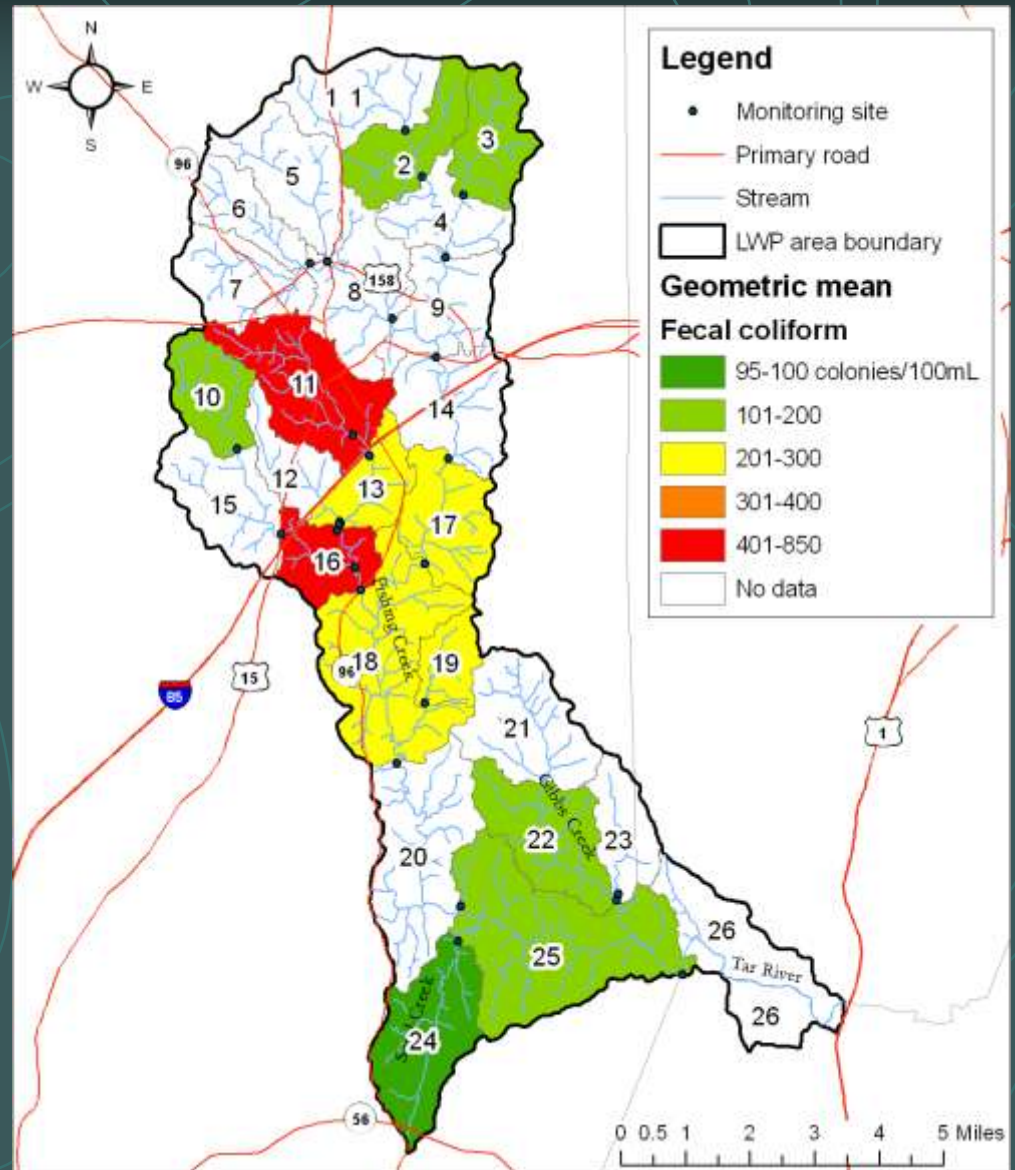
# Specific conductance

- AMS mean = 112  $\mu\text{S}/\text{cm}$  at 25 C
- Elevated in Foundry Br., upper Fishing Cr., below WWTP outfall, and headwaters of Coon Cr.



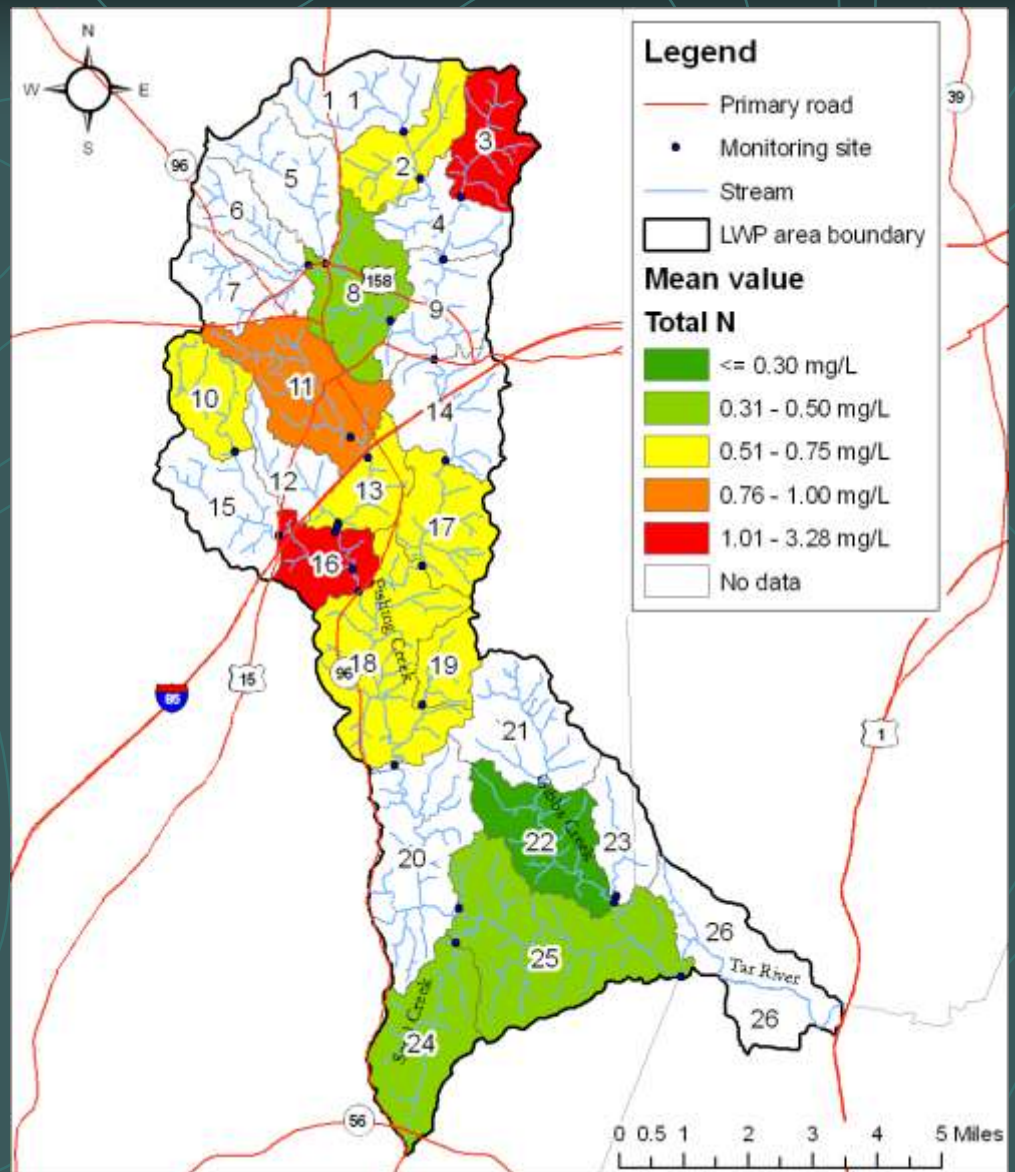
# Fecal coliform

- AMS geometric mean: 95 col./100mL
- NC WQ standard (caveats!):
  - Geometric mean: 200 colonies/100mL
  - Single sample max: 400 colonies/100mL
- Slightly elevated throughout much of the LWP area
- Very elevated in upper Foundry Br., Fishing Cr. below WWTP



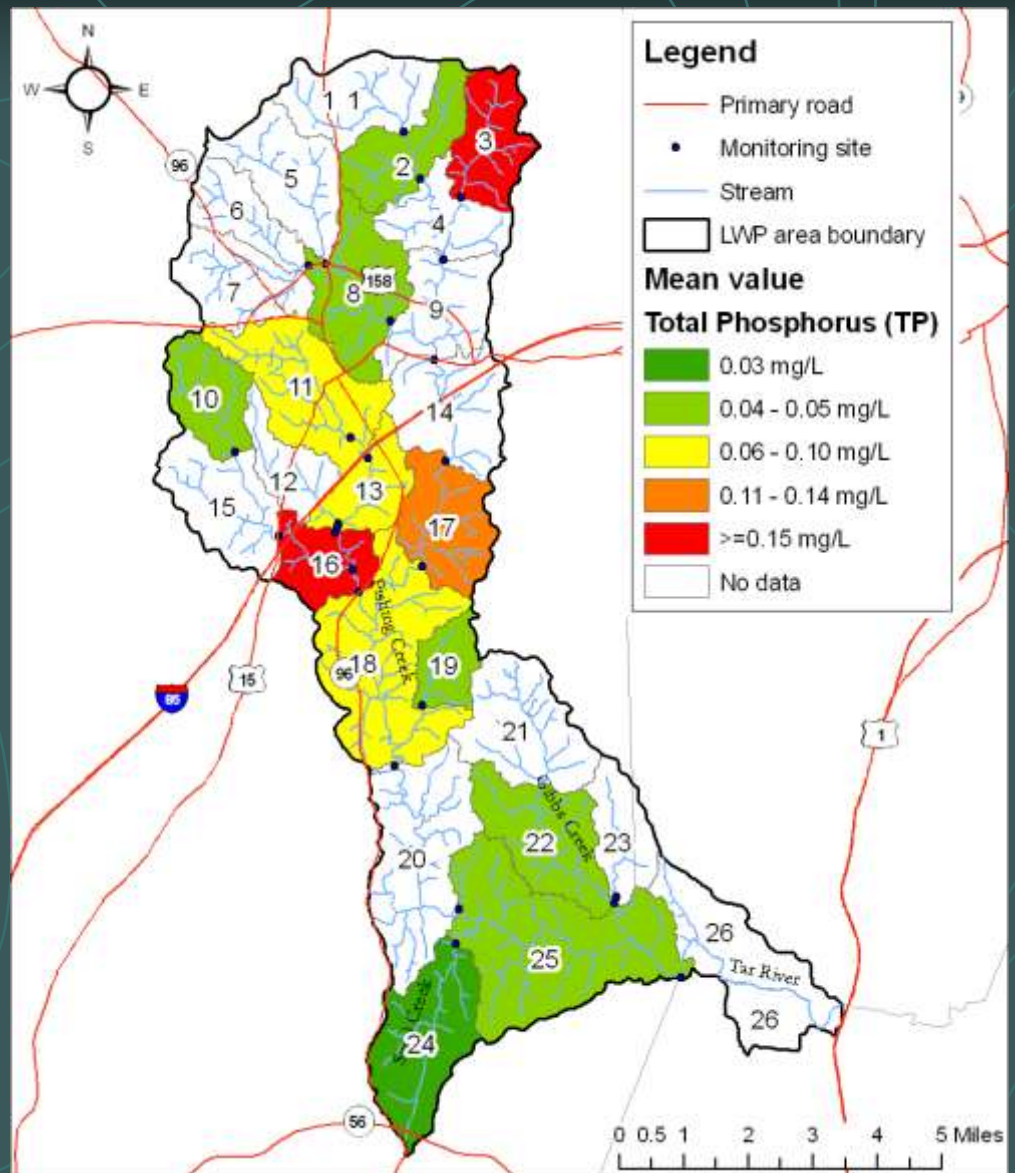
# Total nitrogen

- AMS mean: 0.6 mg/L
- Elevated in Foundry Br.
- Very elevated in Fishing Cr. below WWTP, headwaters of Coon Cr.



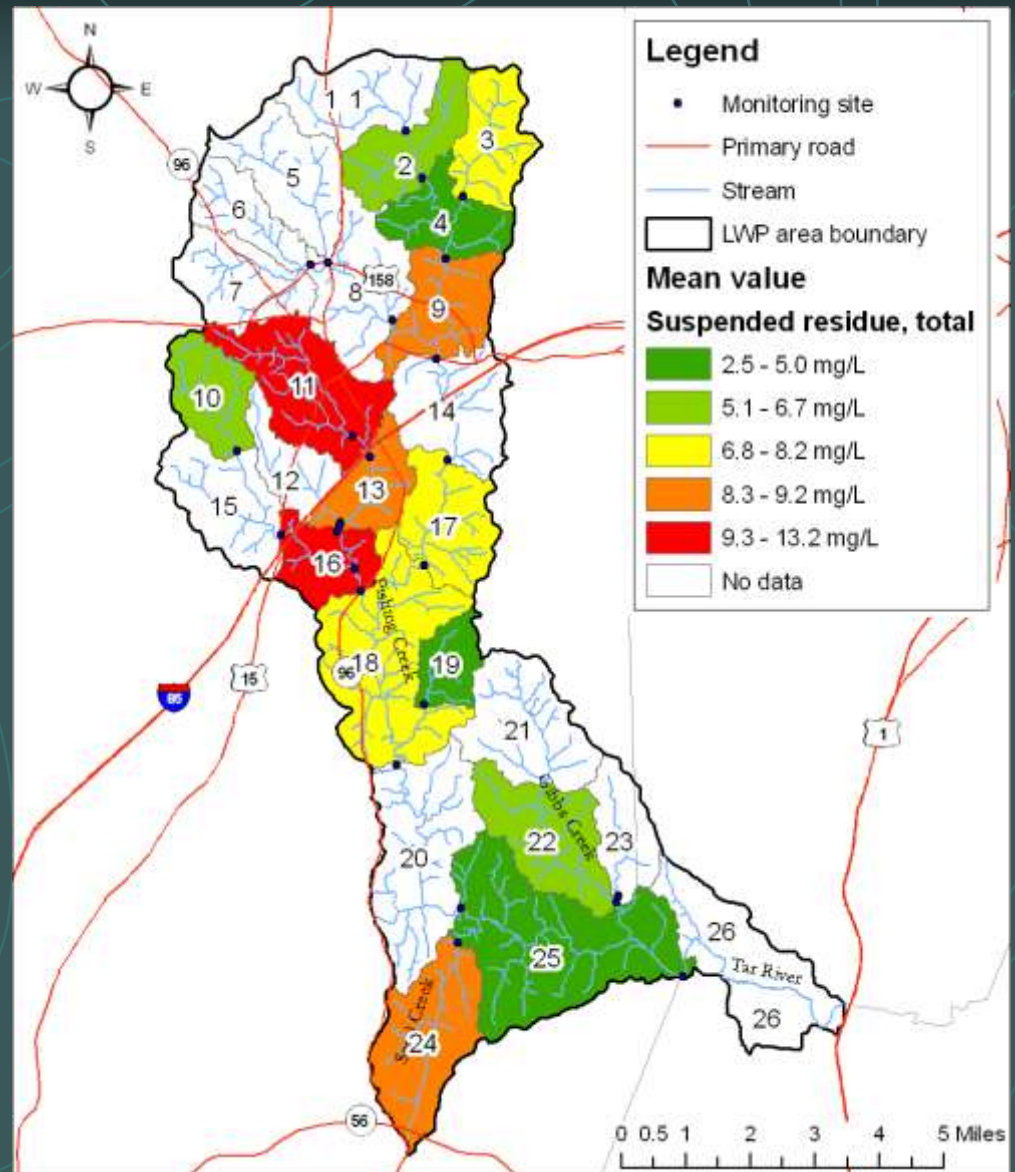
# Total phosphorus

- AMS mean: 0.06 mg/L
- Elevated in Coon Cr. and Fishing Cr. below WWTP



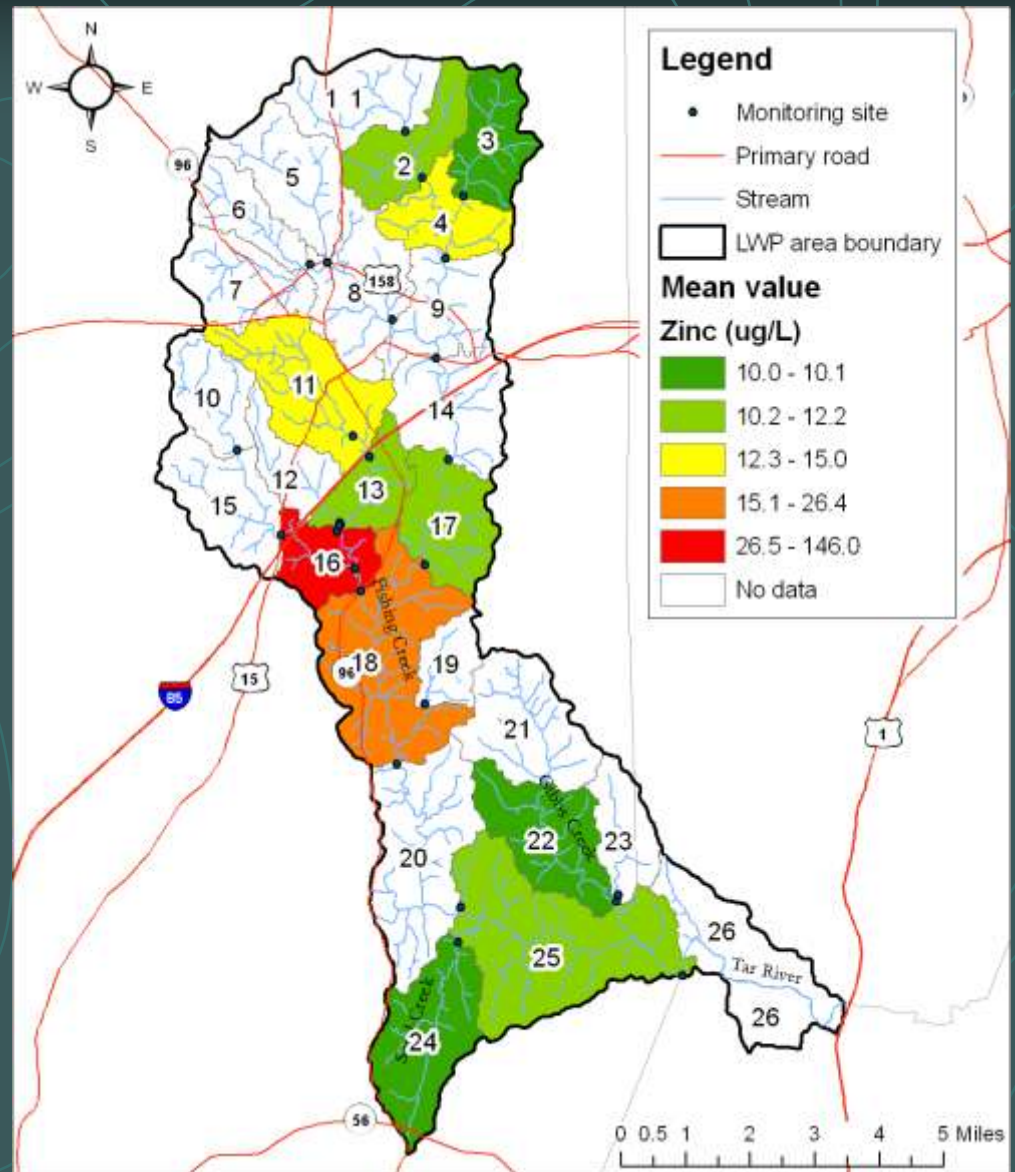
# Total susp. solids (TSS)

- AMS mean: 8 mg/L
- Generally low throughout
- Higher than expected in Sand Cr. and Coon Cr. headwaters



# Zinc

- AMS mean: 11 ug/L
- NC action level: 50 ug/L
- Very elevated in Fishing Cr. below WWTP, and elevated levels continue down to Eaton Rd.





# Results- Biology



# Benthic macroinvertebrate sampling

- Biological community show responses to a wide array of stressors, including changes in chemistry, hydrology, and habitat, and synergistic effects from all factors
- Invertebrates (mainly insects) that live in/near stream bottoms
- Sampled at 7 locations in LWP area

# Benthic macroinvertebrates- examples



# Benthic macroinvertebrate Sampling methods

- DWQ Biological Assessment Unit (BAU) SOPs  
[h2o.enr.state.nc.us/esb/BAU.html](http://h2o.enr.state.nc.us/esb/BAU.html)



# Benthic macroinvertebrate Analysis

- Bugs ID'ed to lowest possible taxonomic level
- Abundance and sensitivity of individual taxa used to calculate Biotic Index (BI), scale of 0-10
- The lower the BI, the healthier the bug community
- BI can be used to assign a “bioclassification” to waterbody (e.g., Excellent, Good, Good-Fair, Fair, Poor)
- Community composition can also provide evidence for nutrient enrichment, toxicity, flow issues, etc.



# Fish community sampling

- Assesses streams' biological integrity, based on species richness/composition, indicator species, trophic function, abundance and condition, reproductive function
- Electrofishing using backpack shockers
- In this study species list may be useful to mussel folks for determining presence of host species
- Sampled at 5 locations in LWP area

# Fish community Sampling methods

- DWQ Biological Assessment Unit (BAU) SOPs  
[h2o.enr.state.nc.us/esb/BAU.html](http://h2o.enr.state.nc.us/esb/BAU.html)

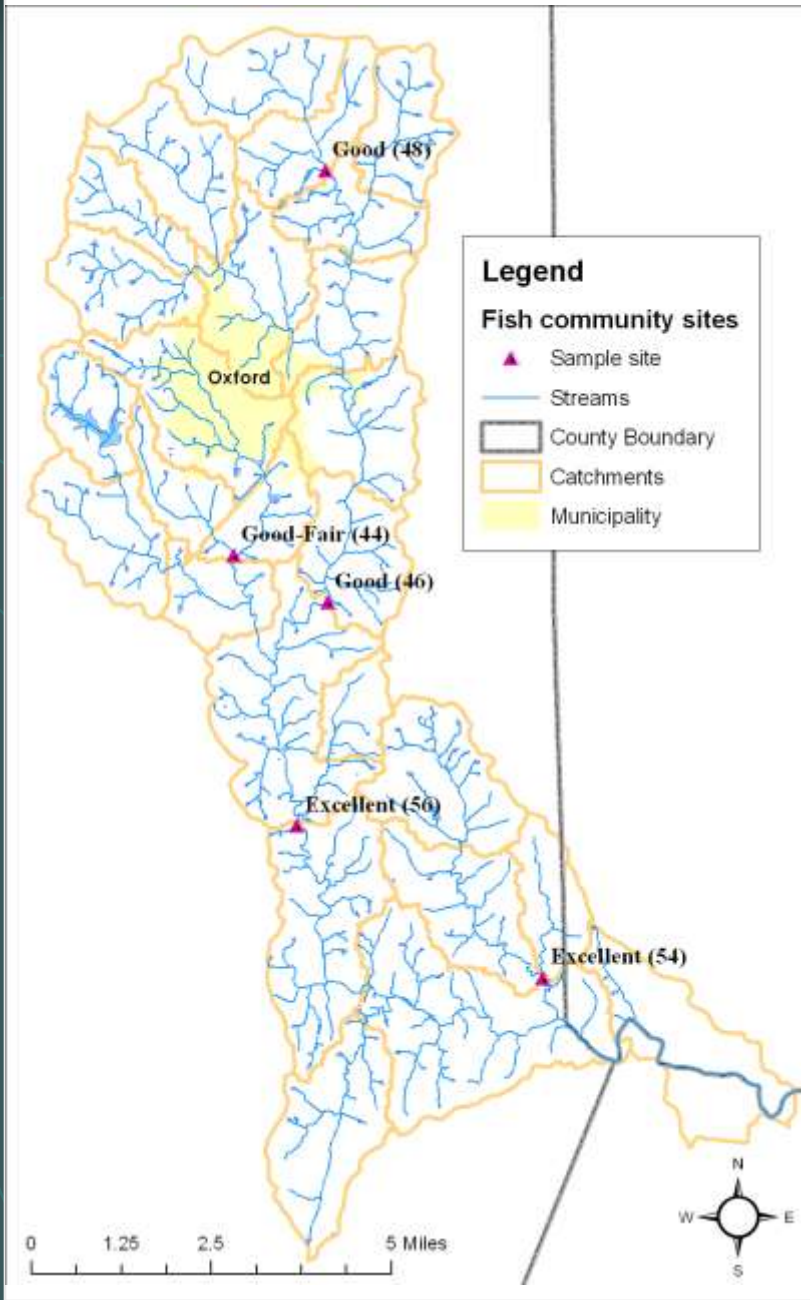




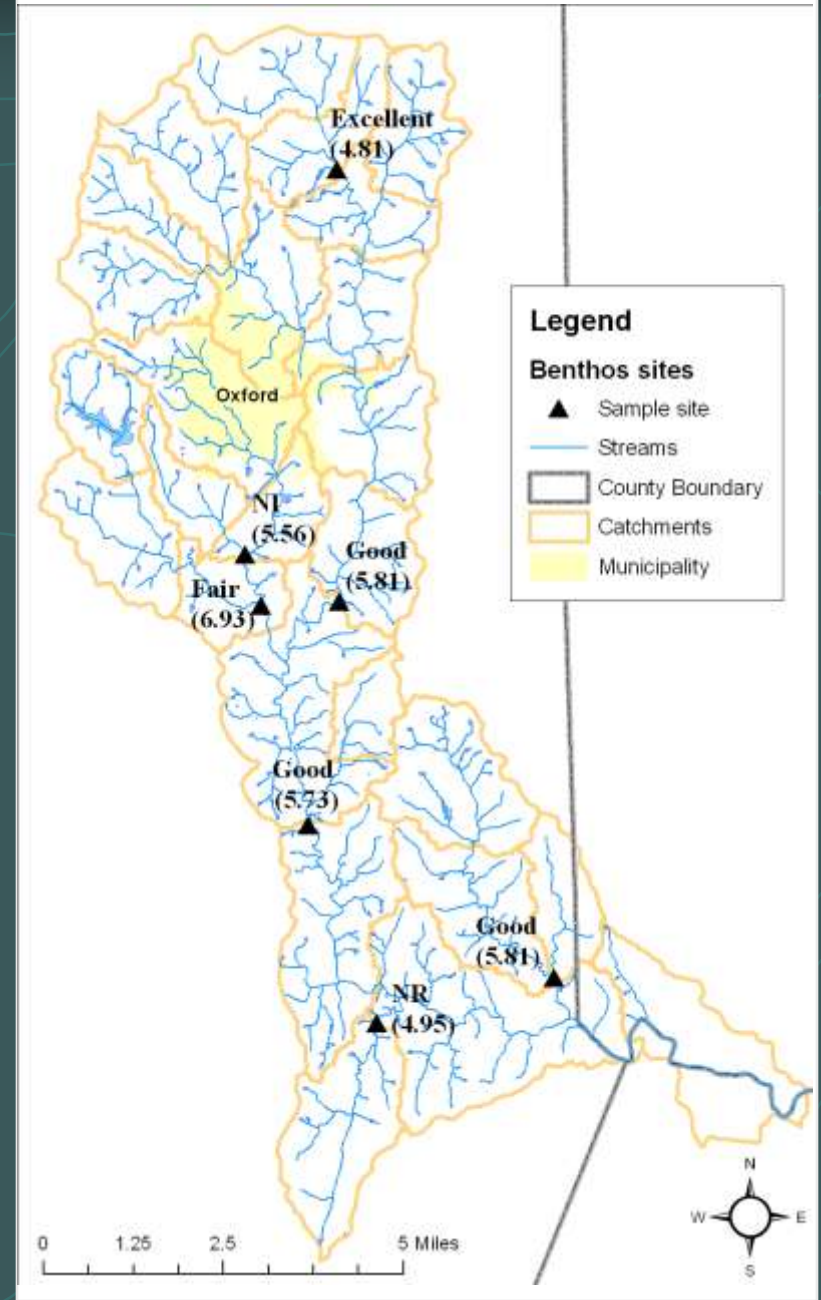
# Fish Community Analysis

- Calculate NC Index of Biological Integrity (NCIBI)
- Scale of 0-60
- The higher the NCIBI, the healthier the community
- NCIBI can be used to assign a “bioclassification” to waterbody (e.g., Excellent, Good, Good-Fair, Fair, Poor)

## Fish community results



## Benthos results





# Habitat assessments

- Standardized form developed by BAU
- Assess physical traits of stream
- Semi-quantitative, score range 1-100
- The higher the score, the better the habitat for bugs and fish

A vertical strip on the left side of the slide shows a topographic map of a stream reach. The map features contour lines, a yellow line representing the stream channel, and several yellow cross-section markers along the stream's length.

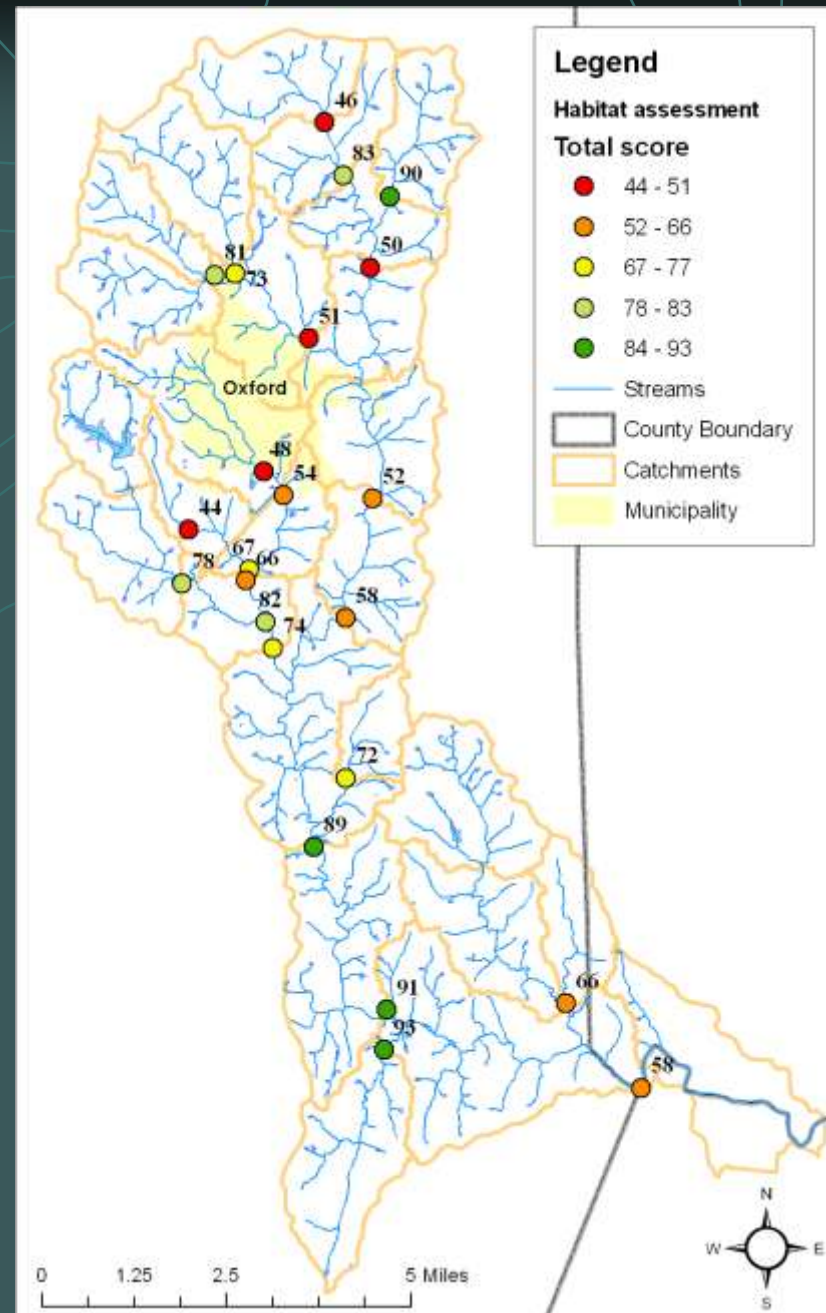
# Habitat metrics assessed

- Channel modification
- Instream habitat
- Bottom substrate
- Pool variety

- Riffle habitats
- Bank stability
- Light penetration/canopy
- Riparian zone

# Habitat assessment results

Very wide range of total scores (44-93)



A vertical strip on the left side of the slide shows a topographic map of a stream network. The map features contour lines and a network of stream channels, with a prominent yellow line indicating a specific stream or reach.

# Habitat assessment- overall “trends”

## Common issues:

- Poor flow (Slate Belt or Triassic Basin geology?)
- Homogenous substrate dominated by sand and/or gravel
- Poor quality riffles
- Incised streams

## Good things:

- Riparian buffer width generally good (varying quality)
- Canopy good
- Instream habitat generally diverse



# Site-specific discussions

# Jordan Cr. at Salem Rd. (SR 1522)

- Very high metals (Pb, Cu, Zn, Fe, Al, Mn), nutrients (NH<sub>3</sub>, TKN), residue, and turbidity results from storm sample
- Will continue limited follow-up sampling



# UT to Jordan Cr. at US 158 bypass

- Flow often low (like most sites in study), moderate habitat score
- Located next to Webb HS, may be a good place for a demonstration enhancement project?



# Coon Cr. at Perry Rd.

- Intended as a “reference” site
- Very high nutrients
- Sporadic elevated conductivity (max=319)
- Odd surface foam (positive for detergents) & discolored water
- Grey water? Agriculture?
- May be good catchment for agriculture BMPs?



# Sand Cr.

- Unusual “looking” stream for piedmont and for LWP area
- Some siltation/ sedimentation
- Benthos community excellent overall, though fewer than expected EPT taxa
- Bug data suggest poor flow during part of year, but site had most consistent flow in study
- Slate Belt or Triassic Basin?



# Gibbs Cr. and UT to Gibbs Cr.

- Undeveloped area
- Good benthos,  
Excellent fish, few  
chemistry problems
- Moderately low habitat  
scores
- Poor flow
- Very sandy substrate,  
filling in, incised banks
- Poor quality understory



# Foundry Br.

- Two sites, practically identical results
- Typical urban issues- bacteria, conductance, TSS, turbidity, nutrients, Cu, Zn
- Poor habitat
- Flashy
- Subwatershed may benefit from stormwater BMPs?



# Fishing Creek at US 15

- Very poor habitat
- Very poor flow
- Exotics in riparian zone
- Beaver activity
- May benefit from restoration or enhancement?



# Fishing Creek near outfall

- Improvements as compared to US 15
- Impacts from upstream land use fewer than expected, though still issues
- More significant impacts due to inputs from Foundry Br. and point source
- Extreme elevation of many parameters



January 2006



October 2006



Non-vegetated easement allows sediment inputs from easement and adjoining ag field

# Fishing Cr. at Fielding-Knotts Rd. (SR 1608)

- Habitat improved as compared to upstream
- Benthos community stressed, lowest BI in study
- Community shows indicators of toxicity and nutrient enrichment
- Conductivity too high for fish sampling

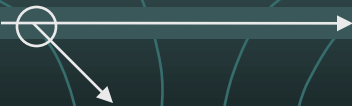


# Fishing Cr. at NC 96

- Severe overgrowths of algae in early spring; pH WQ standard exceedence (9.1 su)
- Coliform consistently high
- Additional nutrient and coliform inputs just upstream- source?



# Questions and comments



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