# Division of Water Quality Watershed Assessment Team January 16, 2009

## Memorandum

To: Steve Kroeger

From: Larry Eaton

Subject: Upper Neuse, Neuse River Basin HUC 03020201, Durham County, Fall 2008

Macroinvertebrate Results

## Background

During September and October 2008, attempts were made to sample benthic macroinvertebrates at previously unassessed major tributaries in the Neuse 01 subbasin located in the Triassic Basin ecoregion. This was done to provide a qualitative assessment of water quality conditions to help support the NC Ecosystem Enhancement Programs (EEP) endeavors during a Phase IV local watershed planning effort. Only qualitative conditions were determined, since the DWQ Biological Assessment Unit (BAU) does not assign bioclassifications on Triassic Basin streams. Streams in the Triassic Basin tend to have no flow or no water for portions of the year, since the high clay content of these soils yield little water to sustain base flow, especially during the summer. Currently there is little knowledge of conditions and sites within the Triassic Basin that could serve as reference sites, therefore bioclassifications are not assigned to any benthic macroinvertebrate samples taken from this ecoregion.

Nine streams between eastern Durham and the Creedmoor/Butner area were investigated to locate stream segments with flow where benthic macroinvertebrate samples could be collected. Only two sites were found to have currently acceptable conditions for sampling. These were Panther Creek and Rocky Branch, both on the western side of Falls Lake. All other sites had conditions that prevented sampling. These conditions include: the absence of flow, the presence of impoundments, or were not wadeable. Both Panther Creek and Rocky Branch were found to have small areas of flow and were sampled for macroinvertebrates. Field meter parameters measured at these sites were: water temperature, pH, dissolved oxygen (DO), and specific conductance. Sample sites are listed in Table 1 and shown in Figure 1, a map of the area.

All samples were collected in the Triassic Basin level IV ecoregion (Griffith *et al* 2002). Streams within these areas are generally highly erodible and flashy, with a tendency to stop flowing or dry up entirely because of a poor connection to groundwater.

Table 1. Location of sample sites. (Latitude and Longitude are in decimal degrees)

Subwatershed Map Code – Site Location	Lat.	Long.	Comments
Site 1Panther Cr off SR 1637	36.0372	-78.0866	Below Durham monitoring site. City of Durham Stormwater Services rated stream Impaired <sup>1</sup>
Site 2 Rocky Br at SR 1802	36.0394	-78.7786	Low Flow. Dried previous summer in drought.

<sup>&</sup>lt;sup>1</sup>City of Durham bioclassifications are not used by DWQ for use support determinations.

### Methods

BAU's Qual 4 sampling protocol was used because watershed areas were less than 3.0 mi.<sup>2</sup> and because there was insufficient habitat at either site to collect a more extensive sample. All samples were taken in accordance with the BAU standard operating procedure (NC DENR 2006).

The Qual 4 method collects four samples (kick, sweep, leafpack, visuals), rather than the 10 samples of the standard Full Scale protocol. While only limited amounts of information can be gleaned from collecting only a subset of the aquatic community, enough information can be obtained quickly to determine whether water quality problems are present. The purpose of these collections is to inventory the aquatic fauna and produce a measure of the relative abundance for each taxon. Organisms are classified as Rare (1-2 specimens, denoted by "R" on taxa tables), Common (3-9 specimens, "C"), or Abundant (>10 specimens, "A").

Several data-analysis summaries (metrics) can be produced from the results of benthos samples to assess water quality. These metrics are based on the idea that unstressed streams and rivers have many invertebrate taxa and are dominated by species intolerant to pollution. Conversely, polluted streams have fewer numbers of invertebrate taxa and are dominated by tolerant species. The diversity of the invertebrate fauna is evaluated using taxa richness counts. The tolerance of the stream community is evaluated using a biotic index, an average tolerance value of the species collected in a stream weighted by the qualitative abundance of each species. These metrics are commonly used to determine bioclassifications for streams not in the Triassic Basin. These metrics can be used to compare samples taken within the Triassic Basin to samples not from the Triassic Basin.

An assessment of the stream habitat and of the land use within the catchment was also conducted at each site sampled using DWQ's Habitat Assessment Field Data Sheet – Mountain/Piedmont Streams (NC DENR 2006, 3/06 Revision 6). These habitat evaluations assess the quality and quantity of the instream habitat and the riparian zone of a stream, and also evaluate detrimental impacts on stream habitat such as bank erosion and substrate embeddedness. Habitat evaluations result in a score between 1 and 100.

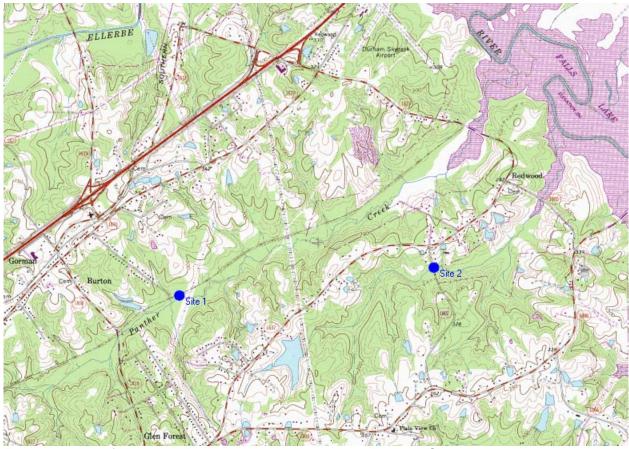


Figure 1. Map of Neuse 01 Macroinvertebrate samples, Durham Co.

### Site Descriptions and Results

A summary of the number of intolerant taxa, the habitat score and water chemistry information collected at each site is provided in Table 2. Appendix 1 provides the relative abundances of each taxon. Panther Creek had a watershed of 2.8 square miles, while the watershed of Rocky Branch was only 0.9 square miles. Conductivity varied little between sites, from 89  $\mu$ s/cm at Panther Creek to 108  $\mu$ s/cm in Rocky Branch. Streams were slightly acidic (pH values from 6.0 to 6.1). While dissolved oxygen did not appear to be a problem in Panther Creek (7.6 mg/L), it could be considered low enough (5.1 mg/L) to be of concern in Rocky Branch during the summer when water temperatures are greater.

The substrate at both sites was very sandy (90% sand and silt), with both sites having slightly more than 10% gravel, rubble and boulder combined. This was reflected in low habitat scores (46 and 58) where riffles and instream habitat were usually limited. Panther Creek had generally stable banks with a moderate sized buffer providing good stream shading, while Rocky Branch had a good mix of pool sizes.

Table 2. Benthic Macroinvertebrate Results and Site Description -- Panther Creek and Rocky Branch, Neuse Basin, Durham Co.

Tantifici Ofeck and Rocky Dialicit, N	·	
	Panther Cr	Rocky Br at SR
Parameter	off SR 1637	1802 (Creech Rd.)
Ephemeroptera	1	1
Plecoptera	0	1
Trichoptera	2	0
EPT Taxa Richness	3	2
Total Taxa Richness	30	21
Biotic Index	7.09	7.40
Watershed Size (sq mi)	2.8	0.9
Stream Width (m)	5	2
Canopy %	85	50
Substrate (%)		
Boulder	Trace	0
Rubble	Trace	Trace
Gravel	10	10
Sand	90	80
Silt	Trace	10
Habitat Score (out of 100)	58	46
Water temperature (°C)	19.7	16.0
Dissolved oxygen (mg/L)	7.6	5.1
Specific conductance (µs/cm)	89	108
pH	6.1	6.0

#### Sites

### Panther Cr off SR 1637

The City of Durham Stormwater Services has a monitoring site on Panther Creek (Burton Rd.) at the bridge upstream of SR 1637 where the City stated that water quality is "not good" having found problems with fecal coliforms and turbidity<sup>1</sup>. Even though large streams in the Triassic Basin can go dry, this site contained enough perennial indicators (mature mayflies and Elmid beetles, a dragonfly, and a dobsonfly) to indicate that this stream contained water, but not flow, last summer. The presence of very small filter feeding caddisflies (*Cheumatospyche*) suggests that flow has only returned to the system within the past couple of months. The presence of several species tolerant of low dissolved oxygen (the midges *Chironomus stigmaterus, Natarsia* and *Dicrotendipes*, the mayfly *Caenis*, and the worm *Limnodrilus hoffmeisteri*), most of them Common or Abundant, suggests that this stream has suffered from low oxygen in the past. It was not possible to tell from this sample whether this low oxygen is due solely to lack of flow, or runoff of organic material from northeast Durham.

\_

<sup>&</sup>lt;sup>1</sup> http://www.durhamnc.gov/departments/works/pdf/state\_of\_our\_streams2006.pdf

## Rocky Br at SR 1802 Creech Rd

A local resident related that this stream had gone dry over the past summer. The clearly intermittent invertebrate community at this site (high abundance of crustaceans and beetles coupled with a nearly equal number of chironomids and other dipterans) coupled with several young perennial taxa (*Baetis* – Mayfly, *Isoperla* – Stonefly and *Enallagma* – Damselfly) confirm this statement. The presence of several young stoneflies at this site suggests that lack of water, rather than poor quality of water, is the largest issue here.

#### **Conclusions**

Of the nine streams investigated, only two had flowing water at the time of sampling. and both of those appear to have lacked either flow or water over the summer, making any attempt to apply a water quality rating inappropriate. Both streams supported communities indicative of intermittent streams. Panther Creek probably stopped flowing, with a corresponding drop in dissolved oxygen, but didn't dry up. Rocky Branch appears to be recovering from a drying event one to three months before. The presence of young stoneflies in Rocky Branch suggests that drying is a bigger problem for this stream than water quality.

#### References

Griffith, G.E., Omernik, J.M., Comstock, J.A., Schafale, M.P., McNab, W.H., Lenat, D.R., MacPherson, T.F., Glover, J.B., and Shelburne, V.B., 2002, Ecoregions of North Carolina and South Carolina, Reston, Virginia, U.S. Geological Survey. August, 2002. (<a href="ftp://ftp.epa.gov/wed/ecoregions/nc\_sc/ncsc\_front.pdf">ftp://ftp.epa.gov/wed/ecoregions/nc\_sc/ncsc\_front.pdf</a>)

(NC DENR) North Carolina Department of Environment and Natural Resources, Division of Water Quality, Environmental Sciences Section. 2006. Standard Operating Procedure for Benthic Macroinvertebrates. (http://h2o.enr.state.nc.us/esb/BAUwww/benthossop.pdf)

All websites were accessed on January 12, 2009

cc: Michelle Drostin, EEP
Stratford Kay, DWQ
Trish MacPherson, DWQ

Appendix 1. Taxa collected at Panther Cr and Rocky Br

Appendix 1. Taxa collected at Pantner Cr and Rocky Br					
Taxa	Panther Cr off SR 1637	Rocky Br at SR 1802 Creech Rd			
Ephemeroptera					
Baetis (very small)		R			
Caenis	С				
Tricorythodes					
Plecoptera					
Isoperla (very small)	·	R			
Trichoptera					
Cheumatopsyche (most small)	Α				
Molanna (very small)	R				
Odonata					
Enallagma (very small)		С			
Somatochlora	R				
Diptera (misc)					
Simulium		С			
Simulium venustum	•	С			
Antocha	R	•			
Limnophora	R	•			
Nippotipula	•	R			
Palpomyia		R			
Diptera (Chironomidae)					
Conchapelopia	•	С			
Natarsia	Α	•			
Diplocladius cultirger	•	R			
Parametriocnemus lundbecki	R	R			
Chironomus stigmaterus	R	•			
Dicrotendipes modestus	R	•			
Dicrotendipes neomodestus	С				
Phaenopsectra punctipes gp	R	R			
Polypedilum fallax	R				
Polypedilum illinoense	A	С			
Polypedilum scalaenum	R	D			
Polypedilum tritum	•	R R			
Rheotanytarsus	•	K			

Taxa	Panther Cr off SR 1637	Rocky Br at SR 1802 Creech Rd
Tanytarsus sp 2	R	Oleech Nu
Tanytarsus sp 3	R	•
Tanytarsus sp 6	R	· ·
Coleoptera		
Helichus	С	Α
Neoporus	R	A
Neoporus mellitus	C	<i>,</i>
Peltodytes	R	•
Stenelmis	C	
Megaloptera		
Nigronia serricornis	R	
Oligochaeta		
Limnodrilus hoffmeisteri	С	R
Stylaria lacustris	R	
Crustacea		
Asellus	С	С
Astacidae		Α
Cambarus sp	Α	•
Crangonyx	R	А
Mollusca		
Pisidium	R	
Other		
Mesovelia		R