

## Division of Water Quality Biological Assessment Unit

October 9, 2008

### MEMORANDUM

To: Jimmie Overton

Through: Trish F. MacPherson

From: Jeff DeBerardinis and Bryn H. Tracy

Subject: Fish community assessments of Catheys and Hollands Creeks (Rutherford County, Broad River Basin, Subbasin 02, Index Nos. 9-41-13-(0.5), 9-41-13-(6), and 9-41-13-7-(3)).

### INTRODUCTION

At the request of the Watershed Restoration Program, now known as the Ecosystems Enhancement Program, four sites on Catheys and Hollands Creeks were sampled on March 23, 2004 for the purpose of evaluating their fish communities. This memorandum summarizes the results from this monitoring.

### WATERSHED DESCRIPTION

This study was conducted in the Catheys Creek watershed, a tributary to the Second Broad River in central Rutherford County (Figure 1). Catheys Creek originates in a forested area north of the Town of Rutherfordton near the McDowell County line and flows southeast until it reaches the Second Broad River, just north of Forest City. Hollands Creek originates northwest of Rutherfordton and drains the northern part of the Town of Spindale as it flows east towards Catheys Creek. The upstream Catheys Creek site is located in the Southern Inner Piedmont Level IV ecoregion (Griffith *et al.* 2002) and is classified as WS-V. The other three sites on Catheys and Hollands Creeks are in the Southern Outer Piedmont Level IV ecoregion and are class C waters.

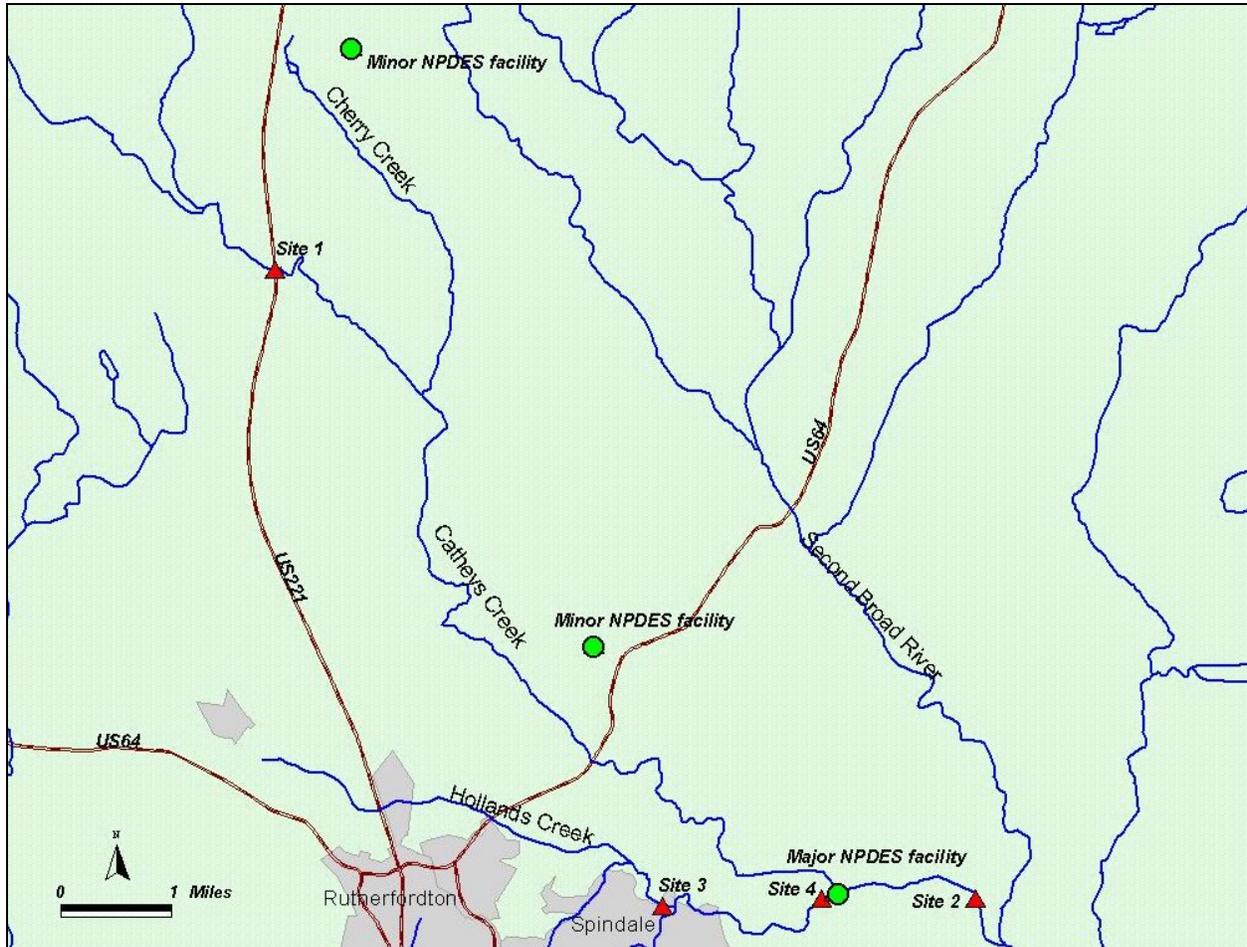
There is one major NPDES facility and two minor NPDES facilities that discharge into Catheys Creek or its tributaries. The Town of Spindale's WWTP (Permit No. NC0020664) discharges 6 MGD to Catheys Creek just below the mouth of Hollands Creek (~1.5 river miles above Site No. 2) (Basinwide Information Management System query on April 07, 2004). This facility has a history of numerous violations (52 since December, 1994) including exceedances of total suspended solids (TSS), biochemical oxygen demand (BOD), ammonia-nitrogen, and total nickel. The most recent violation was an exceedance of the TSS permit limit in January 2004.

The United World Mission Treatment Plant (Permit No. NC0032174) discharges 0.02 MGD into an unnamed tributary to Cherry Creek (~2 miles upstream of Catheys Creek) in the upper reaches of the watershed (Basinwide Information Management System query on April 13, 2004). This facility also has a history of violations (44 since December 1994), the most recent being a daily pH minimum violation in April 2002 and a daily fecal coliform violation in June 2002.

The White Oak Manor-Rutherfordton Treatment Plant (Permit No. NC0030139) discharges 0.015 MGD into an unnamed tributary that confluences with Catheys Creek about one mile above US 64 (Basinwide Information Management System query on April 13, 2004). This minor discharger has only two violations since 1995 for exceeding BOD and TSS levels.

Sedimentation from the urban areas of Rutherfordton and Spindale is a major habitat quality problem in the Catheys Creek watershed (NCDENR 2001). Many of the streams have a shifting sand bottom with embedded riffles and few pools. These sedimentation issues are severe enough that the segment of Catheys Creek from the dam at the old Duke Power Company Raw Water Supply Reservoir (unknown

location) to the Second Broad River has been placed on the 303(d) list of impaired waters (NCDENR 2003). Hollands Creek from the Duke Power Company old Auxiliary Raw Water Supply Intake (unknown location) to Catheys Creek is also on the 303(d) list of impaired waters, but the cause of this impairment is unknown.



**Figure 1. Location of four fish community sites (red triangles) sampled on March 23, 2004 and the three NPDES dischargers (green dots) in the Catheys Creek watershed.**

#### **HISTORICAL DATA**

Monitoring of the fish communities in the Catheys Creek watershed has been limited to two surveys of Catheys Creek at SR 1549 (Site No. 2, Figure 1) in 1994 and 2000 by the Biological Assessment Unit (NCDENR 1995, NCDEHNR 1997, NCDENR 2001). Sixteen species were collected during the June 1994 special study and the fish community was rated Good-Fair (NCIBI score = 46). In May 2000, this stream was sampled again as part of the Broad River basinwide monitoring program and was rated Poor (NCIBI score = 32). The decrease in ratings between 1994 and 2000 resulted from a change in the trophic metrics, a decrease in the species reproductive success (8 of 13 species were represented by only one or two individuals per species in 2000), and a decrease in the number of fish collected. In fact, this site had the fewest fish ( $n = 65$ ) of any basinwide monitoring site in 2000. The water, although clear, was plum colored and the conductivity was elevated at 240  $\mu\text{mhos/cm}$ .

In 1999, the Town of Spindale's WWTP discharge was relocated about 1.2 river miles downstream from Hollands to Catheys Creek. Although no fish community monitoring data existed for Hollands Creek prior to this relocation, benthos studies documented a water quality improvement from Poor in 1988 to Fair (almost Good-Fair) in 2000 due to receiving only non point sources of pollution (NCDENR 2001b). The

fish community monitoring site on Catheys Creek has always been downstream of the WWTP discharge, so its water quality issues have remained relatively constant despite relocation of the discharge.

## **METHODS**

Fish samples were collected on March 23, 2004 from Catheys Creek at US 221 (Site No.1), Catheys Creek at SR 1549 (Site No. 2), Hollands Creek at SR 1547 (Site No. 3), and Hollands Creek at SR 1548 (Site No. 4) (Figure 1). Samples were collected following all methods, including physical-chemical and habitat assessments, in the existing North Carolina Index of Biotic Integrity (NCIBI) protocols (NCDENR 2001c, NCDENR 2001d, <http://www.esb.enr.state.nc.us/BAU.html>). At each site, a 600 ft. section of stream was delineated and measured. The fish were then sampled with two backpack units with each unit accompanied by two persons dip netting. After collection, all identifiable fish were examined for sores, lesions, fin damage, and skeletal anomalies, measured (total length to the nearest 1 mm), and then released. Once the first 50 specimens of each species were measured, the remaining fish of each particular species were just counted and released. Those fish that were not readily identifiable in the field were preserved in 10 percent formalin and returned to the laboratory for identification, examination, and total length measurement. Those fish were then deposited as voucher specimens with the North Carolina State Museum of Natural Science. The resulting data were then analyzed with the existing NCIBI.

The NCIBI method was developed for assessing a stream's biological integrity by examining the structure and health of its fish community. The scores derived from this Index are a measure of the ecological health of a water-body and may not directly correlate to water quality. For example, a stream with excellent water quality, but with poor or fair fish habitat, would not be rated excellent with this index. However, in many instances, a stream that rated excellent on the NCIBI should be expected to have excellent water quality. The assessment of the biological integrity of a fish community using the NCIBI is provided by the cumulative assessment of 12 parameters or metrics. The values provided by the metrics are converted into scores on a 1, 3, or 5 scale. A score of 5 represents conditions which would be expected for least disturbed reference streams in the specific river basin or ecoregion, while a score of 1 indicates that the conditions deviate greatly from those expected in least disturbed streams of the region. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score. Finally, the score (an even number between 12 and 60) is then used to determine the ecological integrity class of the stream from which the sample was collected.

An assessment technique has been developed by the Biological Assessment Unit to better evaluate a stream's physical habitat (NCDENR 2001d). The habitat score, ranging between 1 and 100, is based on eight characteristics including channel modification, instream habitat, bottom substrate, pool variety, bank stability, light penetration, and riparian zone width. Higher numbers suggest better habitat quality, but criteria have not been developed to assign ratings.

At each site surface water temperature, dissolved oxygen, and conductivity (specific conductance) measurements were collected using a calibrated YSI 85 Oxygen, Conductivity, Salinity, and Temperature meter. Surface pH measurements were also made at each site with a calibrated Fisher Scientific Accumet Portable AP 61 pH meter.

## **SITE LOCATIONS, DESCRIPTIONS, and HABITAT ASSESSMENTS**

### **Site No. 1, Catheys Creek at US 221**

Site No. 1 is located in the upper part of the watershed at US 221, above the stream's confluence with Cherry Creek (Figure 1). Fish were sampled beginning about 50 ft downstream of the concrete culverts (Figure 2). Typically, the upstream section of a stream is sampled, but atypical habitats (i.e. impassible tree snags) prevented this. Visible land use was about 75 percent forest with some recent logging activity, and about 25 percent active pasture. The riparian zone was good and consisted primarily of a beech forest with dog hobble growing along the bank. Instream habitats consisted of runs, snags, and pools created by undercut roots and deadfalls. The major habitat degradations at this site were highly embedded, sandy substrates and a lack of cobble riffle habitats. The overall habitat score for this site was 64 (Table 1).



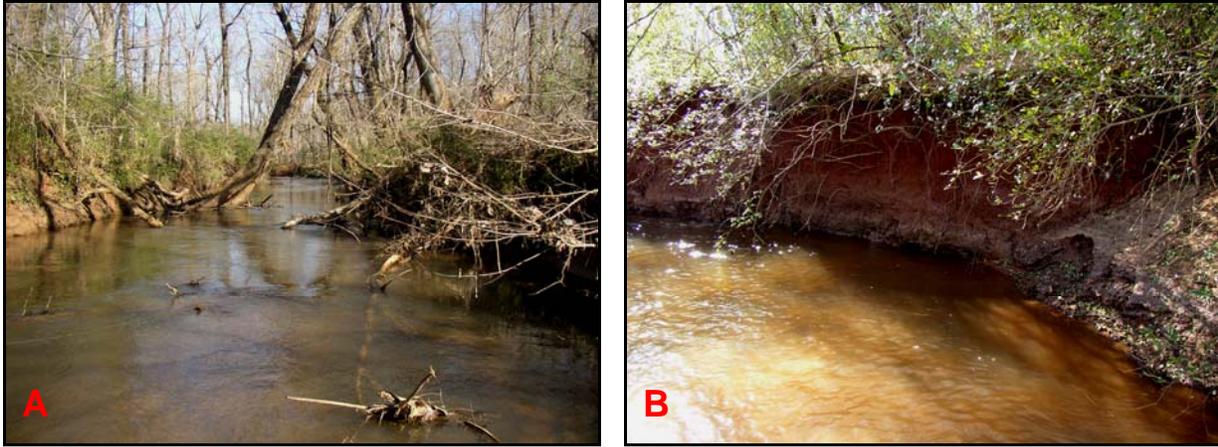
**Figure 2.** Catheys Creek downstream of US 221 showing the beginning of the sample reach (A) and sand bar formation, dog hobble, and a large beech tree snag near the end of sample reach (B).

**Table 1.** Habitat assessment scores at four sites in the Catheys Creek watershed, March 23, 2004.

Site No.	1	2	3	4	
Waterbody	Catheys Cr	Catheys Cr	Hollands Cr	Hollands Cr	
Location	US 221	SR 1549	SR 1547	SR 1548	
County	Rutherford	Rutherford	Rutherford	Rutherford	
Latitude	352732	352251	352243	352249	
Longitude	815844	815157	815454	815324	
Date	03/23/2004	03/23/2004	03/23/2004	03/23/2004	
<b>Habitat characteristics</b>					<b>Maximum Possible Score</b>
Channel modifications	5	4	5	4	5
Instream habitat	14	8	18	6	20
Bottom substrate	4	3	12	3	15
Pool variety	6	6	6	5	10
Riffle habitats	3	1	16	1	16
Bank stability and vegetation					
Left bank	6	3	7	2	7
Right bank	6	3	5	2	7
Light penetration	10	7	7	1	10
Riparian vegetative zone width					
Left bank	5	5	5	1	5
Right bank	5	1	1	1	5
Total habitat score	64	41	82	26	100

**Site No. 2, Catheys Creek at SR 1549**

Site No. 2 is located in the lower part of the watershed at SR 1549, about 1.5 miles upstream from its confluence with the Second Broad River (Figure 1). Fish were sampled upstream of the bridge. Visible land use was about 50 percent hayfield/inactive pasture, 30 percent forest, and 20 percent residential. The riparian zone was good along the left bank with no breaks, but poor along the right bank at the upper end of the site where cattle had access to the stream *via* a small tributary. Bank stability was poor along both stream banks and there was evidence of scouring along the left stream bank at a bend near the upper end of the sample reach (Figure 3B). Instream habitats were poor at this site and consisted primarily of runs with some riffles created by stick packs; snag pools; and some large woody debris (Figure 3A). This site had the same habitat problem as Site No. 1, with sand filling the stream channel, poor fish habitats, and almost no functional riffles. The overall habitat score for this site was 41 (Table 1).



**Figure 3. Catheys Creek above SR 1549 showing typical instream habitat types (A) and highly erodible stream bank (B).**

**Site No. 3, Hollands Creek at SR 1547**

Site No. 3 is located at SR 1547, about 3.5 miles above the stream’s confluence with Catheys Creek (Figure 1). Fish were sampled upstream of the SR 1547 bridge (Figure 4). Visible land use was primarily forest and the riparian zone was good. Although a section of lawn at the lower end of the sample reach provided soil stabilization, this was the major cause of the slight habitat degradation at this site (Figure 4A). Instream habitats were atypical for this portion of the Catheys Creek watershed (Andrea Leslie, pers. comm.) and consisted primarily of bedrock, boulders, and cobble with moderate gradient plunge pools, and rocky runs. The difference in substrate type in this segment of Hollands Creek appeared to reflect the local geology rather than land use changes (NCDENR 2003b). Nutrient inputs were also evident, as slick periphyton covered all instream substrates. The overall habitat score for this site was 82 (Table 1).

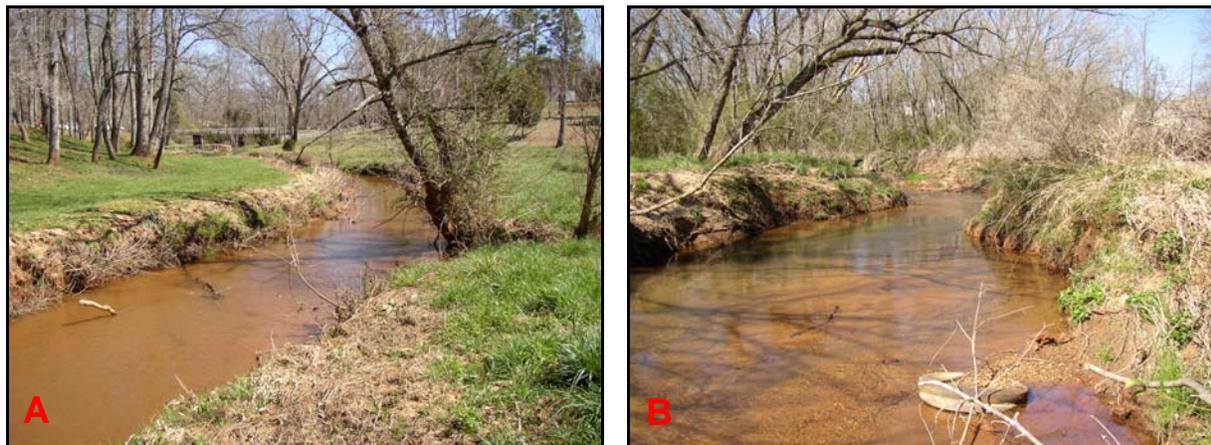


**Figure 4. Hollands Creek above SR 1547 showing residential lawn on the right bank just upstream of the bridge (A), bedrock, and rocky runs (B).**

**Site No. 4, Hollands Creek at SR 1548**

Site No. 4 is located on Hollands Creek at SR 1548, just upstream of the stream’s confluence with Catheys Creek. Fish were sampled upstream from the SR 1548 bridge. The riparian zone at this site was essentially non-existent, consisting primarily of lawns, very little stream cover and very erodible banks (Figure 5). Instream habitats were also extremely poor, and were limited to runs with some side snags created by the few trees present in the sample reach, a few stick riffles, and one plunge pool created by some old concrete slabs used for channel stabilization. The channel was also filled with sand

and silt. Although the water clarity was good, the stream was easily silted during fish sampling. The overall habitat score for this site was 26 (Table 1).



**Figure 5. Hollands Creek above SR 1548 showing lack of riparian zone and siltation from fish sampling (A), and erodible banks (B).**

**Physical and Water Quality Characteristics**

The drainage areas of the four sites were variable, ranging from 5.4 to 44 square miles (Table 2). Water temperatures were slightly elevated at Site Nos. 1 and 3 because they were sampled late in the day. Site No. 2 had a slightly elevated conductivity (86  $\mu\text{mhos/cm}$ ) because of its location downstream of the Town of Spindale’s WWTP. This was a substantial improvement from the conductivities measured at this site in 1994 and 2000 (352 and 240  $\mu\text{mhos/cm}$ , respectively) under similar low flow conditions during these years (43 and 42 cfs, respectively). It was likely that the closing of several textile mills in this watershed over the last several years has reduced the concentration and volume of the WWTP effluent. The other three sites had unremarkable conductivities, probably because they only receive non-point sources of pollution.

**Table 2. Physical and water quality characteristics at four sites in the Catheys Creek watershed, March 23, 2004.**

	Site No.			
	1	2	3	4
<b>Waterbody</b>	1	2	3	4
<b>Location</b>	US 221	SR 1549	SR 1547	SR 1548
<b>County</b>	Rutherford	Rutherford	Rutherford	Rutherford
<b>Date</b>	03/23/2004	03/23/2004	03/23/2004	03/23/2004
<b>Physical and water quality characteristics</b>				
Drainage area (mi <sup>2</sup> )	13.3	44.0	5.4	9.9
Temperature (°C)	12.8	6.2	9.6	6.0
Conductivity ( $\mu\text{mhos/cm}$ )	52	86	53	68
Dissolved oxygen (mg/L)	10.5	12.0	11.1	12.4
Dissolved oxygen saturation (%)	99	97	97	100
pH (s.u.)	6.7	6.8	6.6	6.4
Average width (m)	8.0	11.0	6.0	6.0
Average depth (m)	0.3	0.4	0.3	0.2
Water clarity	Clear	Clear	Clear	Clear
Substrate	Sand, gravel	Sand	Bedrock, cobble	Sand, clay

Dissolved oxygen saturation levels were high at all four sites and ranged from 97 to 100 percent. This is typical for streams during early spring when solar radiation is intense, there is little canopy, and diatom blooms are prevalent. Despite these high dissolved oxygen concentrations, the pH values were typical for well-buffered Piedmont streams. Water clarity was also good at all four sites. Substrates were typical

for this watershed and consisted primarily of sand, except for Site No. 3 where the substrate reflected an anomaly in the local geology, rather than a change in land use.

There are no flow gauges on either of these two streams. The USGS gauge on the First Broad River near Casar was used as an estimator of flows in Catheys and Hollands Creeks. On March 23, 2004, the daily median flow for the First Broad River (37 cfs) was about 60 cfs less than (or about one-third) the historical flows. Thus, it was assumed that the flow in these two streams was substantially lower than normal.

### Fish Community

On March 23, 2004, 17 species were collected from these four sites (Table 3). This included 13 species at Site No. 1, 12 species at Site No. 2, 11 species at Site No. 3, and 9 species at Site No. 4. The bluehead chub and the piedmont shiner were the dominant species at all four sites. The 1994 and 2000 studies at Catheys Creek also showed the bluehead chub as the numerically dominant species.

**Table 3. Tolerance ratings, adult trophic guild assignments, and the abundances of the individual fish species at four sites in the Catheys Creek watershed, March 23, 2004.**

Species	Common Name	Tolerance Rating	Adult Trophic Status	Site No.			
				1	2	3	4
<i>Clinostomus funduloides</i>	Rosyside dace	Intermediate	Omnivore	14	4	47	2
<i>Cyprinella chloristia</i>	Greenfin shiner	Intermediate	Insectivore		4		
<i>C. pyrrhomelas</i>	Fieryblack shiner	Intolerant	Insectivore	32	10	1	
<i>C. zanema</i>	Santee chub	Intolerant	Insectivore	9	1		3
<i>Hybopsis hypsinotus</i>	Highback chub	Intolerant	Insectivore	71		20	6
<i>Nocomis leptcephalus</i>	Bluehead chub	Intermediate	Omnivore	158	51	217	93
<i>Notropis hudsonius</i>	Spottail shiner	Intermediate	Omnivore		1		
<i>N. szepticus</i>	Sandbar shiner	Intermediate	Insectivore		13	1	
<i>N. sp. cf. chlorocephalus</i>	Piedmont shiner	Intermediate	Insectivore	186	29	116	91
<i>Catostomus commersoni</i>	White sucker	Tolerant	Omnivore	1		3	1
<i>Scartomyzon rupiscartes</i>	Striped jumprock	Intermediate	Insectivore	31		64	
<i>Ameiurus platycephalus</i>	Flat bullhead	Tolerant	Insectivore	5	1		
<i>Noturus insignis</i>	Margined madtom	Intermediate	Insectivore	24	1	2	
<i>Lepomis auritus</i>	Redbreast sunfish	Tolerant	Insectivore	34	10	5	6
<i>L. macrochirus</i>	Bluegill	Intermediate	Insectivore	2	2		
<i>Etheostoma flabellare</i>	Fantail darter	Intermediate	Insectivore	22		65	3
<i>E. olmstedii</i>	Tessellated darter	Intermediate	Insectivore				1

The NCIBI ratings ranged from Fair at the lower sites on Hollands and Catheys Creeks to Good at the upper site on Catheys Creek (Table 4). Overall, species diversity was lower at the two sites where the habitat was the poorest (Site Nos. 2 and 4) than at Sites Nos. 1 and 3 where the habitat was of moderate or high quality. As a whole, the communities had a good diversity of intolerant species and a low percentage of tolerant fish. Omnivores+herbivores were abundant at Site Nos. 2 – 4.

**Table 4. Electroshocking data, NCIBI scores and ratings of four sites in the Catheys Creek watershed, March 23, 2004.**

	Site No.			
	1	2	3	4
<b>Waterbody</b>	<b>Catheys Cr</b>	<b>Catheys Cr</b>	<b>Hollands Cr</b>	<b>Hollands Cr</b>
<b>Location</b>	<b>US 221</b>	<b>SR 1549</b>	<b>SR 1547</b>	<b>SR 1548</b>
<b>County</b>	<b>Rutherford</b>	<b>Rutherford</b>	<b>Rutherford</b>	<b>Rutherford</b>
<b>Date</b>	3/23/2004	3/23/2004	3/23/2004	3/23/2004
<b>Shocking duration (seconds)</b>	6,722	4,164	6,666	3,291
<b>No. fish/100 seconds shocking time</b>	8.8	3.0	8.1	6.3
<b>Metric value</b>				
<b>(Metric score within parentheses)</b>				
No. of Species	13 (5)	12 (3)	11 (5)	9 (3)
No. of Fish	589 (5)	127 (3)	541 (5)	206 (5)
No. of Species of Darters	1 (3)	0 (1)	1 (3)	2 (5)
No. of species of Sunfish, Bass, and Trout	2 (3)	2 (3)	1 (1)	1 (1)
No. of Species of Suckers	2 (5)	0 (1)	2 (5)	1 (3)
No. of Intolerant Species	3 (5)	2 (5)	2 (5)	2 (5)
% Tolerants	7 (5)	9 (5)	1 (5)	3 (5)
% Omnivores + Herbivores	27 (5)	41 (3)	41 (3)	46 (3)
% Insectivores	73 (5)	59 (3)	59 (3)	54 (3)
% Piscivores	0 (1)	0 (1)	0 (1)	0 (1)
% Diseased Fish	0 (5)	0 (5)	0 (5)	0 (5)
% Species with Multiple Age Groups	85 (5)	50 (3)	73 (5)	33 (1)
<b>Total NCIBI Score</b>	<b>52</b>	<b>36</b>	<b>46</b>	<b>40</b>
<b>NCIBI Class</b>	<b>Good</b>	<b>Fair</b>	<b>Good-Fair</b>	<b>Fair</b>

The upper site on Catheys Creek (Site No. 1) was rated Good. This site was the least impacted of any of the sites. A lower than expected diversity of darters, sunfish and bass, and an absence of piscivores prevented this site from rating Excellent. By comparison, the lower site was rated Fair due to an absence of darters, suckers, and piscivores, and an abundance of omnivores.

As mentioned previously, the two sites on Hollands Creek were very dissimilar in terms of instream and riparian habitats even though the sites were only 2¼ miles apart. The fish communities were also dissimilar in terms of species, metrics, and ratings. The community was more diverse and abundant at Site No. 3 than at Site No. 4. Instream habitats such as rocky runs and riffles and undercuts at Site No. 3 provided favorable habitats for rosieside dace, striped jumprock, and fantail darter which were absent or rare at Site No. 4.

The lower Catheys Creek site at SR 1549 (Site No. 2) has been sampled and rated with the NCIBI three times in the last 11 years (1994, 2000, and 2004) (Tables 5 and 6). The community is very unstable and many of the species found at this site were rare and represented by only one or two individuals per species. Generally, the site was lacking in darters and piscivores (the only species of bass collected were in 1994 when one individual each of largemouth bass and smallmouth bass were collected). The dominant species has always been the bluehead chub. Also, the ratings among these three samples (Good-Fair, Poor, and Fair, respectively) were rather variable for samples taken under similar flow conditions. The abrupt decline between 1994 and 2000 indicated an event or series of events that further degraded this stream some time after the 1994 sample. Because fish can recolonize a stream the size of Catheys Creek fairly quickly due to the proximity of tributaries and the Second Broad River, this event probably occurred in 1999 and resulted in an extremely low number of fish collected (65) and the low percentage of species with multiple ages (23 percent) in 2000. By comparison, the 1994 and 2004 samples revealed 119 and 127 fish with each sample represented by 50 percent of the species with multiple ages.

**Table 5. Tolerance ratings, adult trophic guild assignments, and the abundances of the individual fish species at Catheys Creek, SR 1549, Rutherford County, 1994 – 2004.**

Species	Common Name	Tolerance Rating	Adult Trophic Status	Date		
				6/20/1994	5/10/2000	3/23/2004
<i>Clinostomus funduloides</i>	Rosyside dace	Intermediate	Omnivore	1	1	4
<i>Cyprinella chloristia</i>	Greenfin shiner	Intermediate	Insectivore	3		4
<i>C. pyrrhomelas</i>	Fieryblack shiner	Intolerant	Insectivore	8	3	10
<i>C. zanema</i>	Santee chub	Intolerant	Insectivore	2	4	1
<i>Hybopsis hypsinotus</i>	Highback chub	Intolerant	Insectivore	1	1	
<i>Nocomis leptocephalus</i>	Bluehead chub	Intermediate	Omnivore	53	41	51
<i>Notropis hudsonius</i>	Spottail shiner	Intermediate	Omnivore			1
<i>N. szepticus</i>	Sandbar shiner	Intermediate	Insectivore			13
<i>N. sp. cf. chlorocephalus</i>	Piedmont shiner	Intermediate	Insectivore	9	4	29
<i>Semotilus atromaculatus</i>	Creek chub	Tolerant	Insectivore	1		
<i>Moxostoma collapsum</i>	Notchlip redhorse	Intermediate	Insectivore	5	1	
<i>Scartomyzon rupiscartes</i>	Striped jumprock	Intermediate	Insectivore	5	3	
<i>Ameiurus platycephalus</i>	Flat bullhead	Tolerant	Insectivore	1	1	1
<i>Noturus insignis</i>	Margined madtom	Intermediate	Insectivore	4	2	1
<i>Lepomis auritus</i>	Redbreast sunfish	Tolerant	Insectivore	11	2	10
<i>L. macrochirus</i>	Bluegill	Intermediate	Insectivore	13	1	2
<i>Micropterus dolomieu</i>	Smallmouth bass	Intolerant	Piscivore	1		
<i>M. salmoides</i>	Largemouth bass	Intermediate	Piscivore	1		
<i>Etheostoma flabellare</i>	Fantail darter	Intermediate	Insectivore		1	

**Table 6. Electroshocking data, NCIBI scores , and ratings at Catheys Creek, SR 1549, Rutherford County, 1994 – 2004.**

Date	06/20/1994	05/10/2000	03/23/2004
Shocking duration (seconds)	8,523	3,053	4,164
No. fish/100 seconds shocking time	1.4	2.1	3.0
<b>Metric value (Metric score within parentheses)</b>			
Number of species	16 (3)	13 (3)	12 (3)
Number of fish	119 (3)	65 (1)	127 (3)
Number of species of darters	0 (1)	1 (1)	0 (1)
Number of species of Sunfish, Bass, and Trout	4 (5)	2 (3)	2 (3)
Number of species of suckers	2 (5)	2 (5)	0 (1)
Number of intolerant species	4 (5)	3 (5)	2 (5)
Percentage of tolerant fish	11 (5)	5 (5)	9 (5)
Percentage of omnivores+herbivores	45 (3)	63 (1)	41 (3)
Percentage of insectivores	54 (3)	37 (1)	59 (3)
Percentage of piscivores	1.68 (5)	0 (1)	0 (1)
Percentage of diseased fish	0 (5)	0 (5)	0 (5)
Percentage of species w/multiple age groups	50 (3)	23 (1)	50 (3)
<b>NCIBI Score</b>	46	32	36
<b>NCIBI Rating</b>	Good-Fair	Poor	Fair

### SUMMARY

The instream and riparian habitats, physical and chemical characteristics, and fish communities at four sites on two streams in the Catheys Creek watershed were evaluated in March 2004. With the exception of Hollands Creek at SR 1548 (Site No. 4), the habitat scores were very similar (within four points) to the scores recorded during the 2003 WRP benthic macroinvertebrate study (NCDENR 2003b). Site No. 4 scored ten points higher during the 2003 study but the habitat was still extremely degraded.

The three NCIBI ratings of Good-Fair, Poor and Fair at Catheys Creek at SR 1549 (Site No. 2) indicated an unknown event or series of events that occurred in this stream around 1999. Although the conductivity at this site has improved from 352  $\mu$ mhos/cm in 1994 to 86  $\mu$ mhos/cm in 2004, the unstable fish

communities may be associated with effluent toxicity fluctuations from the Town of Spindale's WWTP. Sedimentation from the urban areas of Rutherfordton and Spindale have contributed to the poor instream habitats at the downstream sites on Catheys and Hollands Creeks (Site Nos. 2 and 4) by filling in pools and covering functional substrates. These poor habitats are emulated in the low species diversity of these streams and their Fair NCIBI ratings. Restoration efforts are needed to improve the habitat qualities at both of these sites. The two upstream sites on Catheys and Hollands Creeks were rated Good and Good-Fair, respectively. The riparian and instream habitats are adequate and support reproducing fish communities.

## REFERENCES

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