

Appendix IV

Biological Data Sheets

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
FRENCH BROAD R	SR 1129	EB10	08/16/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Transylvania	1	06010105	350855	824759	6-(1)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	102	2200	26	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	0	0	50 (fallow)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Babcock Company LLC, Excelsior Packaging Plant / Rosman WWTP	NC0000108 / NC0021946	0.015 / 0.25

Water Quality Parameters

Temperature (°C)	25.2
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	21
pH (s.u.)	7.7

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	10
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	6
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	66

Substrate

gravel, cobble, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10333	105	46	4.3	3.0	Excellent
07/08/02	8848	96	54	3.6	3.0	Excellent
07/08/97	7317	92	51	3.5	2.8	Excellent
07/06/92	5873	108	51	3.8	2.6	Excellent

Taxonomic Analysis

A decrease in leptocerid caddisflies and ephemereid mayflies from 2002 levels is primarily responsible for the decrease in EPT richness in 2007. The increase in the biotic index from 3.6 to 4.3 in 2007 is, in part, due to the increases in tolerant midges, such as *Polypedilum illinoense* gr. and *Tribelos jucundum*, as well as abundant lumbricid oligochaetes. Despite this increase in the biotic index, many intolerant taxa were abundant such as *Serratella deficiens*, *S. serratoides*, *Acroneuria abnormis*, *Brachycentrus appalachia*, *Micrasema bennetti*, and *M. wataga*. This site is one of 5 locations within North Carolina where the rare mayfly *Barbaetis benfieldi* has historically been found. *Barbaetis benfieldi* was last collected in 1992.

Data Analysis

The sampling site lies on the edge of the Broad Basins ecoregion while the entire watershed upstream is contained within the Southern Crystalline Ridges and Mountains ecoregion. The headwaters of the French Broad River (North, West, East, and Middle Forks of the French Broad) all drain mostly undeveloped National Forest land. Regardless of being situated below Rosman and 2 minor dischargers, this site has maintained an Excellent rating. However, water quality does appear to be worsening slightly as indicated by the decrease in EPT and the substantial increase in the biotic index.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
FRENCH BROAD R	NC 146	EB89	08/15/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	352853	823328	6-(54.5)b	southern crystalline ridges and mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	658.4	2043	50	0.5

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	0	0	50 (I-26 corridor)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Asheville Steam Electric Power Plant	NC0000396	4.8
RFS Ecusta, Inc.	NC0000078	27.5
Brevard WWTP	NC0060534	2.5
Henderson WWTP	NC0025534	4.8

Water Quality Parameters

Temperature (°C)	26.1
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	42
pH (s.u.)	7.5

Water Clarity

turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	7
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	76

Site Photograph**Substrate**

Mixture of gravel, cobble, and boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10321	63	27	4.8	3.7	Good
09/10/02	8988	65	25	5.6	4.5	Good-Fair
07/08/97	7321	76	32	5.4	4.5	Good-Fair
07/08/92	5883	86	41	5.1	4.2	Good
07/26/90	5403	79	33	5.4	4.0	Good-Fair

Taxonomic Analysis

There were no stoneflies collected at this study location in 2007. Pollution intolerant, or "sensitive" taxa included the mayfly *Ephemera* sp., and the caddisfly *Brachycentrus numerosus*. Neither of these taxa have previously been collected at this site. Overall, the macroinvertebrate assemblage was dominated by facultative species.

Data Analysis

The bioclassification at NC 146 has improved slightly from Good-Fair in 2002 to Good in 2007. Although no stoneflies were collected at this location in either 2002 or 2007, their absence may be in part be attributable to adult emergence patterns rather than an effect of water quality. The infrequency of riffle habitats negatively affected the habitat score. However, due to the presence of abundant colonizable habitats at this location the bioclassification will likely remain Good unless water quality degrades.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
FRENCH BROAD R	SR 1348	EB90	08/16/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	353632	823441	6-(54.5)c	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	943	1960	50	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	50	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Asheville Steam Electric Power Plant	NC0000396	4.8
RFS Ecustra, Inc.	NC0000078	27.5
Brevard WWTP	NC0060534	2.5
Hendersonville WWTP	NC0025534	4.8

Water Quality Parameters

Temperature (°C)	26
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	62
pH (s.u.)	7.3

Water Clarity

slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	10
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	74

Site Photograph**Substrate**

Mix of bedrock, boulder, rubble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10324	77	30	5.34	4.15	Good-Fair
07/10/02	8867	73	30	4.76	3.98	Good
07/09/97	7323	72	32	5.03	4.02	Good-Fair
07/23/92	5934	73	32	5.24	4.30	Good-Fair
08/03/87	4190	70	23	5.26	4.02	Good-Fair

Taxonomic Analysis

No major changes in the benthic community were observed. Abundant taxa included *Baetis intercalaris*, *Heterocloeon anoka*, *H. curiosum*, *Maccaffertium ithaca*, *M. modestum*, *Stenacron pallidum*, *Tricorythodes*, *Brachycentrus numerosus*, *Cheumatopsyche*, *Hydropsyche venularis*, *Trienodes ignitus*, *Ancyronyx variegatus*, *Macronychus glabratus*, *Argia*, *Calopteryx*, *Macromia*, *Polypedilum flavum*, *Rheotanytarsus*, *Simulium* and *Crangonyx*.

Data Analysis

This site is located in the city of Asheville. EPT richness has been fairly stable (30 or 32) since 1992, but a slight decline in the NCBI occurred in 2002 resulting in a Good bioclassification. No major water quality problems are indicated by the benthic community.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
FRENCH BROAD R	SR 1634	EB92	08/14/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	354230	823719	6-(54.d)d	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	1049.3	1786	50	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	0	0	30 (Residential)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
French Broad River WRF	NC0024911	40
Asheville Steam Electric Power Plant	NC0000396	4.8
RFS Ecusta, Inc.	NC0000078	27.5
Brevard WWTP	NC0060534	2.5
Henderson WWTP	NC0025534	4.8

Water Quality Parameters

Temperature (°C)	27.1
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	84
pH (s.u.)	7.5

Water Clarity

Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	13
Pool Variety (10)	10
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	79

Substrate

Mixture of gravel, cobble, and boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10317	77	28	5.7	4.1	Good-Fair
07/10/02	8869	57	18	5.8	4.9	Fair
07/09/97	7325	55	18	5.6	4.7	Good-Fair
07/23/92	5935	53	19	6.1	4.8	Fair
07/24/90	5399	61	19	5.7	4.3	Fair

Taxonomic Analysis

Intolerant or "sensitive" taxa identified from the 2007 sample included the mayflies *Heptagenia marginalis*, *Stenacron pallidum*, and *Serratella deficiens*, and the caddisflies *Brachycentrus numerosus* and *Protoptila* sp. No stoneflies were collected at this site.

Data Analysis

The bioclassification of this study site has fluctuated between Fair and Good-Fair during the five sampling events between 1990 and 2007. The habitat score was negatively affected by an open stream canopy and by frequent gaps in the riparian zone. The operation of the French Broad River WRF was improved prior to 1997 sampling, and a trend of higher bioclassification at this location indicates a possible associated improvement in water quality. The recolonization of stoneflies would help this site in receiving a higher rating in the future.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
French Broad R	NC 213	EB194	07/31/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	354710	823939	6-(54.5)f	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	1,330	1,697	75	0.6

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	60	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	34.3
Dissolved Oxygen (mg/L)	5.7
Specific Conductance (µS/cm)	60.9
pH (s.u.)	6.7

Water Clarity

Slightly Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	4
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	62

Substrate

Sand, rubble, gravel, bedrock, and boulder.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/07	10270	79	32	4.98	3.73	Good-Fair
06/26/02	8840	81	26	5.80	4.50	Good-Fair
07/07/97	7336	52	25	4.70	3.70	Good-Fair
07/23/92	5929	66	24	5.30	4.50	Good-Fair
07/24/90	5398	49	18	5.50	4.70	Good-Fair

Taxonomic Analysis

Although the bioclassification has been extremely stable at this location through time, the 2007 sample did produce the highest EPT taxa richness and lowest EPTBI suggesting slightly improved water quality here this year. Indeed, several EPT taxa were collected here for the first time in 2007 and included the mayflies *Plauditus punctiventris*, *Maccaffertium pudicum*, and the caddisflies *Agapetus* sp., *Brachycentrus numerosus*, *Brachycentrus spiniae*, *Ceratopsyche bronta*, and *Polycentropus* sp.

Data Analysis

Including the 2007 sample, this segment of the French Broad River has been sampled on 10 occasions with all but two samples (Fair in 1985 and 1988) resulting in Good-Fair bioclassifications. This data suggests stable water quality conditions through time at this location although the 2007 sample set a record high for EPT taxa richness and a record low EPTBI. This improvement in EPT community metrics is likely the result of lowered pollution inputs due to drought as much of this catchment is most influenced by non-point inputs. Indeed, conductivity in 2007 (61µS/cm) was much lower than the level measured in 2002 (100 µS/cm)

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
W FK FRENCH BROAD R	US 64	EB45	08/28/07	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Transylvania	1	06010105	350815	825105	6-2-(7.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr, HQW	27	2300	12	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	50	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

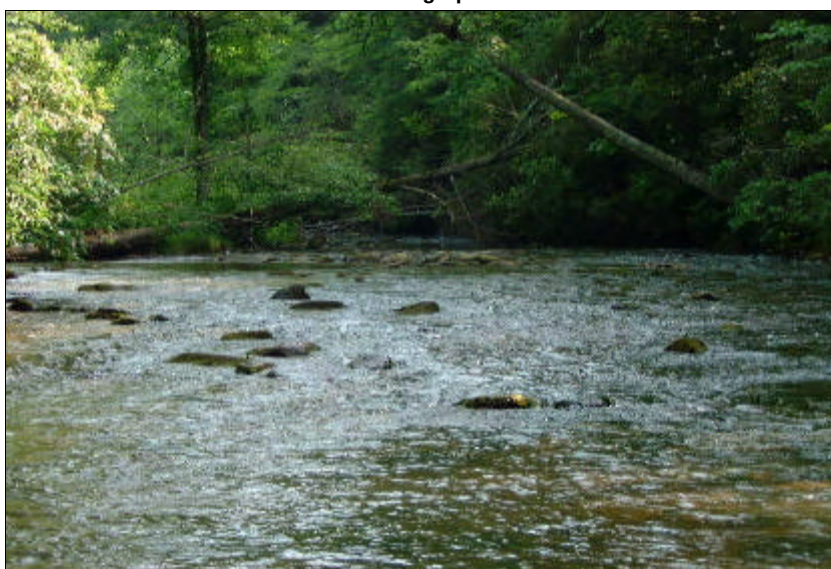
Water Quality Parameters

Temperature (°C)	20.5
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	19
pH (s.u.)	6.5

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	81

Substrate

cobble, sand, and boulder; silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/28/07	10338	96	39	3.6	2.3	Good
07/09/02	8851	91	51	3.0	2.3	Excellent
07/07/97	7314	94	50	3.0	2.1	Excellent
07/06/92	5871	87	47	3.5	2.4	Excellent

Taxonomic Analysis

A dramatic drop in EPT richness occurred since 2002 driven mostly by the occurrence of fewer mayfly taxa, of which five of the absent taxa belonged to the family Ephemerellidae. Also, 3 taxa species in the genus *Rhyacophila* (*R. atrata*, *R. formosa*, *R. fuscula*), an intolerant caddisfly group, were not collected in 2007. An increase in the biotic index is indicative of a slightly more tolerant benthic community with representatives like *Maccaffertium modestum*, abundant for the 1st time, and *Tribelos jucundum*, a tolerant midge, collected for the first time. EPT abundance values were also half those found in 2002 (157 vs. 329). Sensitive taxa of note included *Drunella allegheniensis*, *Paraleptophlebia* sp., *Paragnetina immarginata*, *Pteronarcys* sp., *Brachycentrus spinae*, *B. appalachia*, *Micrasema bennetti*, *M. rickeri* (63rd state record), *M. wataga*, and *Phylocentropus* sp.

Data Analysis

A mostly undeveloped watershed, this river drains a portion of Pisgah National Forest. Trout farms exist in the upper watershed and have been documented to have a localized effect on stream water quality (see BAU memos 20000925 and 20020125). This site was sampled approximately 7 seasonal weeks after the prior basinwide samples were collected. Many of the taxa that did not occur may have already emerged. Also, the biotic index is well within the Excellent range while only one more EPT taxon collected would have produced an bioclassification rating of Excellent for 2007. It is possible that seasonal emergence of insects, along with increased impacts of the trout farms on the stream in a drought year, may have both contributed to lowering the bioclassification rating to Good in 2007.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N FK FRENCH BROAD R	SR 1322	EB28	08/17/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Transylvania	1	06010105	350916	825024	6-3-(6.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	35	2250	10	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	20	20	60	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	21.3
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	20
pH (s.u.)	6.5

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	9
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	2
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	69

Substrate

cobble, boulder, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/17/07	10335	95	43	3.9	2.9	Excellent
07/09/02	8853	79	41	3.5	2.7	Excellent
07/07/97	7315	76	41	3.3	2.5	Excellent
07/06/92	5872	85	42	3.4	2.5	Excellent

Taxonomic Analysis

EPT richness in North Fork French Broad River has remained stable over the last 15 years. The biotic index, however, has risen since 1997 indicating that the benthos is slowly shifting towards a slightly more tolerant community (with increases in tolerant non-EPT taxa such as odonates and midges). Although intolerant taxa overwhelmingly dominated the community with *Epeorus vitreus*, *Paraleptophlebia* sp., *Acronuria abnormis*, *Leuctra* sp., *Paragnetina immarginata*, *Brachycentrus appalachia* and *Dolophilodes* sp. being abundant, increases in the overall EPT biotic index also increased. Previously uncollected taxa were *Centroptilum* sp. *Molanna tryphena*, and *Rhyacophila carolina*. the caddisfly *Setodes* sp. and the stonefly *Perlesta* sp., as well as 3 ephemereid mayflies, (*Danella lita*, *Drunella lita*, *Serratella serrata*) were not collected in 2007 as they were in years past.

Data Analysis

Draining National Forest land in Transylvania County, the North Fork French Broad River has little development and no dischargers to impact water quality. Cattle access to the river just downstream of the sampling site has severely eroded the banks of the river and is cause for concern. The stream has maintained an Excellent bioclassification rating for the fourth consecutive basinwide cycle with no water quality issues noted.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
M FK FRENCH BROAD R	SR 1131	EB21	08/16/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Transylvania	1	06010105	350716	824918	6-5	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	4.9	2240	4	0.1

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	0	75	0	25

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

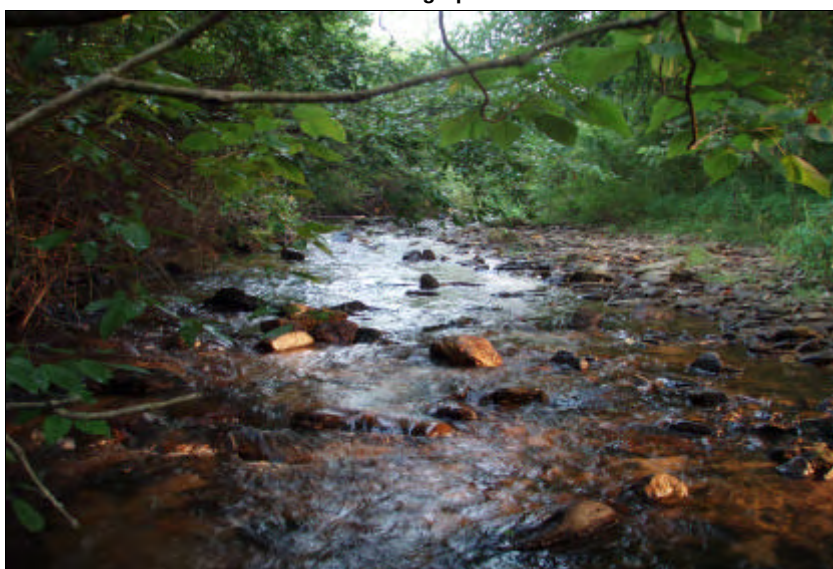
Water Quality Parameters

Temperature (°C)	22
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	26
pH (s.u.)	6.5

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	10
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	73

Substrate

primarily cobble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10334	---	43	---	2.3	Excellent
07/08/02	8849	---	51	---	2.2	Excellent

Taxonomic Analysis

Eight fewer EPT were collected (5 mayflies, 1 stonefly, 1 caddisfly) in 2007 than were collected in 2002. In both sampling years almost all abundant taxa were sensitive species, although one third fewer taxa were abundant in 2007 (10 and 15 respectively). For 2007, intolerant taxa that were abundant included the mayfly *Epeorus vitreus* and the caddisflies *Micrasema wataga*, *Dolophilodes* sp., and *Brachycentrus spinae*. All 5 occurring taxa of stoneflies collected were abundant. Some new taxa in 2007 were *Neophemera purpurea*, *Malirekus hastatus*, *Ceratopsyche sloossonae*, *Micrasema bennetti*, *Neophylax mitchelli* and *Nyctiophylax celta*. Two of three species of *Rhyacophila* (*R. acutiloba* and *R. carolina*) collected in 2002 were not found in 2007.

Data Analysis

A new basinwide site in 2002, the Middle Fork French Broad River drains a portion of the Pisgah National Forest. The sampling site lies within a heavily developed residential zone which leaves a large portion of the stream corridor without substantial riparian vegetation. Despite this, the stream has retained its Excellent rating from 2002 partially due to the lessened urban runoff during a low precipitation year. No water quality problems are noted at this site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
DAVIDSON R	US 276	EB164	08/16/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Transylvania	3	06010105	351628	824251	6-34-(15.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV, B; Tr	40	2195	15	0.1

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	0	0	(30) campground

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

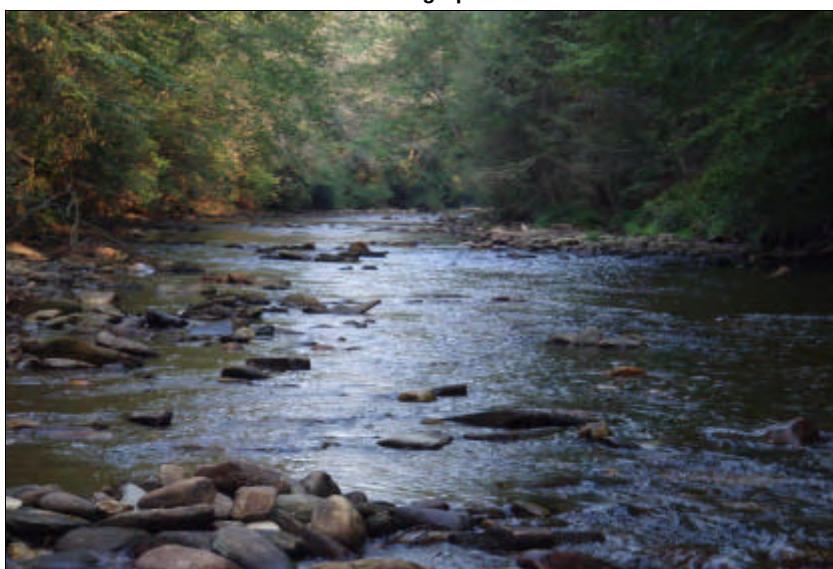
Water Quality Parameters

Temperature (°C)	19.6
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	22
pH (s.u.)	6.8

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	15
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	84

Substrate

cobble, boulder, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10330	---	37	---	2.6	Excellent
07/22/02	8883	---	37	---	3.2	Excellent
07/22/97	7333	---	52	---	2.7	Excellent
07/07/92	5875	---	45	---	1.8	Excellent

Taxonomic Analysis

EPT richness in Davidson River maintained its 2002 level, although it has historically been higher. The reduction of ephemereid mayflies from 1992 (8) to 2002 (3) and 2007 (1) is the primary reason for the difference in EPT richness values. Many intolerant taxa were abundant in 2007 and included 3 mayflies (*Epeorus vitreus*, *Heptagenia marginalis*, and *Maccaffertium pudicum*), 3 stoneflies (*Acroneuria abnormis*, *Paragnetina immarginata*, and *Tallaperla* sp.), as well as 5 caddisflies (*Brachycentrus spinae*, *Ceratopsyche sparna*, *Dolophilodes* sp., *Glossosoma* sp., and *Neophylax consimilis*). The previously collected taxa *Triaenodes ignitus*, *Polycentropus* sp. and *Perlesta* sp. were not collected in 2007. Also, an animal of special concern in North Carolina, the hellbender (*Cryptobranchus alleganiensis*), was found at this site.

Data Analysis

The entire watershed of Davidson River lies within Pisgah National Forest and is completely undeveloped. This stream is a popular recreational stream and has undergone substantial habitat rearrangement by fisherman, although effects on the macroinvertebrate community are minimal. Davidson River has consistently maintained an Excellent rating and no water quality issues were identified.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LITTLE R	SR 1560	EB18	08/16/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Transylvania	1	06010105	350918	823744	6-38-(1)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	16	2200	5	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	20	0	40 (fallow field)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

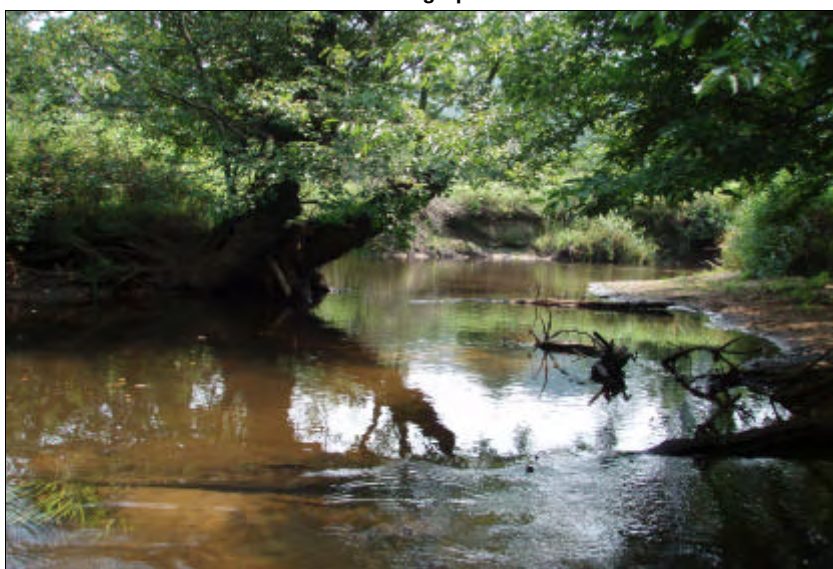
Water Quality Parameters

Temperature (°C)	21.2
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	21
pH (s.u.)	6.6

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Pool Variety (10)	7
Riffle Habitat (16)	4
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	53

Substrate

sand and woody debris

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10332	---	45	---	3.3	Excellent
07/09/02	8864	---	35	---	3.5	Good

Taxonomic Analysis

EPT richness increased by 10 taxa over the first basinwide sampling in 2002. This increase was due to more caddisflies being collected and, in turn, was responsible for lowering the EPT biotic index as the remainder of the 2007 benthic community was similar to that found in 2002. Caddisfly taxa not previously collected were *Dolophilodes* sp. (rare), *Glossosoma* sp. (abundant), *Hydroptila* sp. (rare), *Lype diversa* (common), *Micrasema wataga* (common), *Molanna tryphena* (rare), *Mystacides sepulchralis* (common), *Nyctiophylax moestus* (rare), *N. nephophilus* (common), *Rhyacophila appalachia* (rare), *R. fuscata* (common), and *Trienodes ignitus* (abundant). Stoneflies were also diverse with 9 taxa of which *Acrocnemura abnormis*, *Leuctra* sp. and *Tallaperla* sp. were abundant. Mayflies of note were *Baetisca* sp. (rare), *Drunella conestee* (common), *Hexagenia* sp. (common), and *Serratella deficiens* (abundant).

Data Analysis

Upstream of any dischargers, this site on the Little River receives water from a mostly forested watershed. Some residential development (including golf courses) and agriculture also exist within the watershed, potential non-point sources of pollution. This site received an Excellent bioclassification up from a previous Good rating. The previous Good rating, however, was only one taxon away from scoring an Excellent suggesting that the Little River at this site has only been slightly impacted. Of note is that both samplings occurred during drought years thereby lessening the impact of non-point source runoff on the benthos. Habitat in this stream was poor due to the homogeneous substrate and lack of riffles further supporting the fact that a diverse macroinvertebrate community benefits from excellent water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LITTLE R	SR 1533	EB16	08/16/07	GOOD-FAIR

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
TRANSYLVANIA	1	06010105	351518	823835	6-38-(20)	Broad Basins

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	44	2135	11	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	0	30	50	20 (fallow field)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Eagle's Nest Foundation - camp	NC0051021	0.008

Water Quality Parameters

Temperature (°C)	21.3
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	17
pH (s.u.)	6.4

Water Clarity

slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	3
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	52

Substrate

sand and woody debris

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10331	---	24	---	4.0	Good-Fair
07/11/02	8870	---	24	---	4.2	Good-Fair
07/08/97	7318	---	25	---	4.3	Good-Fair
07/07/92	5874	---	26	---	4.2	Good-Fair

Taxonomic Analysis

EPT richness in the Little River has remained fairly constant since 1992. Pollution sensitive taxa in 2007 were represented by only one species of mayfly (*Serratella deficiens*), one species of stonefly (*Paragnetina fumosa*) and one species of caddisfly (*Brachycentrus nigrosoma*). Other abundant taxa were tolerant (*Cheumatopsyche* sp. and *Maccaffertium modestum*). Overall, fewer mayflies were collected in 2007 (4) as compared to other years (5-7). The previously collected stonefly, *Pteronarcys* sp., was not found in 2007. New taxa collected at this site were the burrowing mayfly *Hexagenia* sp. and the caddisfly *Polycentropus* sp.

Data Analysis

This sampling site on the Little River lies in the Broad Basins ecoregion while the vast majority of the watershed lies within the Southern Crystalline Ridges and Mountains ecoregion. The Little River has consistently rated Good-Fair at SR 1533 since the monitoring of this waterbody began in 1992. A major discharger upstream (Sterling Diagnostic Imaging) became inactive since the last sampling in 2002, although the sampling site is downstream of a small discharger. Water quality has not improved at this site and is most likely affected by the high degree of urbanization and intense agriculture surrounding the stream. Additionally, the lack of good macroinvertebrate habitat impedes the streams ability to recover and contributes to the lack of benthic diversity.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CRAB CR	SR 1532	06/13/07	EF20	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
TRANSYLVANIA	1	06010105	35.23444444	-82.6175	6-38-23	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr,HQW	7	2090	6	0.3	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	15	0	85	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	15.4
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	27
pH (s.u.)	5.5

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	6
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	4
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	73

Site Photograph



Substrate

Cobble, gravel, sand, and silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/13/07	2007-75	21	56	Good
06/03/02	2002-62	20	50	Good

Most Abundant Species

Mottled Sculpin and Central Stoneroller

Exotic Species

Rosyside Dace, Rainbow Trout, Brown Trout, and Redbreast Sunfish.

Species Change Since Last Cycle

Gains -- Rosyside Dace, Tennessee Shiner, Rainbow Trout, and Greenside Darter. **Losses** -- Mirror Shiner, Bluegill, and Redline Darter.

Data Analysis

Watershed -- a small tributary to the Little River; drains eastern Transylvania County; no municipalities in the rural agricultural and forested watershed; site is ~ 1.4 miles above the creek's confluence with the river. **Habitat** -- eroding banks with narrow riparian zones; shallow riffles common, but embedded; snags and deadfalls; some quality deep snag pools where large trout and suckers were found; cattle with access to the stream on the left. **2007** -- low conductivity; low pH measurement was verified; percentage of tolerant fish (Creek Chub, White Sucker, and Redbreast Sunfish) was much greater than expected; a very diverse community for a stream of its size; large specimens of Golden Redhorse and wild Rainbow Trout and Brown Trout. **2002 & 2007** -- conductivity was low for an agricultural area; an abundant and very diverse community; 24 species known from the site including 9 species of cyprinids, 5 species of darters, and 3 intolerant species; slightly greater score in 2007 than in 2002; dominant species has been the Central Stoneroller and Saffron Shiner.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BOYLSTON CR	SR 1314	EB159	08/15/07	GOOD-FAIR

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Henderson	3	06010105	352231	823301	6-52-(6.5)	Broad Basins

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	16	2072	8	0.1

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	10	30	60	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.4
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	43
pH (s.u.)	7

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	8
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	4
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	2
Total Habitat Score (100)	69

Substrate

primarily sand and gravel, some cobble; silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10329	---	22	---	4.0	Good-Fair
07/22/02	8830	62	26	4.9	3.7	Good-Fair
07/21/97	7332	71	23	5.5	4.4	Good-Fair
07/07/92	5880	---	26	---	4.7	Good-Fair

Taxonomic Analysis

EPT richness in Boylston Creek fell by 4 taxa in 2007. However, an abbreviated EPT collection was employed because of time constraints. Abundant taxa collected were moderately intolerant (the mayfly *Isonychia* sp. and the caddisfly *Trifaenodes ignitus*) to tolerant (the mayfly *Maccaffertium modestum* and the hydropsychid caddisfly *Cheumatopsyche* sp.). Intolerant taxa were low in abundance and included the mayflies *Heptagenia marginalis*, *Serratella deficiens*, and *Stenacron pallidum*; the stonefly *Acroneuria abnormis* and the caddisflies *Brachycentrus nigrosoma* (1st site collection), *Glossosoma* sp., *Neophylax consimilis* and *Pycnopsyche lepida*.

Data Analysis

The highly developed Boylston Creek catchment primarily drains agricultural fields and urban areas. Despite the abbreviated EPT method, this creek maintains its Good-Fair rating. The highly urban environment is likely responsible for the lower water quality in this stream as no NPDES permitted dischargers exist on this stream. Agricultural irrigation is prevalent in this area possibly allowing many pollutants to enter the stream even during low precipitation years. The lack of good riparian vegetation and erosion also contribute to the Good-Fair rating.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
MILLS R	SR 1337	EB167	08/15/07	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Henderson	3	06010105	352355	823542	6-54-(1)b	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-II; Tr, HQW	67	2130	23	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	50	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

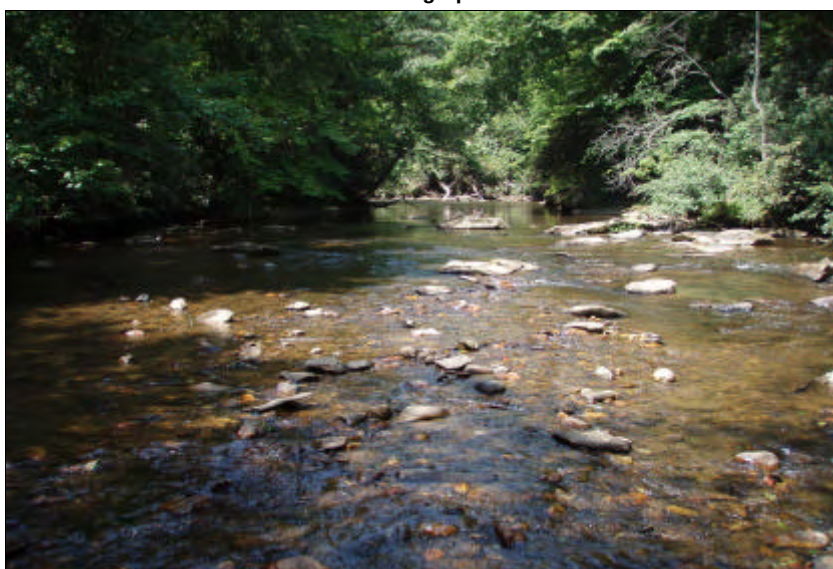
Water Quality Parameters

Temperature (°C)	21.5
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	18
pH (s.u.)	7.2

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	2
Right Riparian Score (5)	4
Total Habitat Score (100)	82

Substrate

boulder, cobble, and gravel; silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10294	89	34	4.4	2.8	Good
06/25/02	8833	74	39	4.4	3.1	Good
07/21/97	7330	115	53	3.5	2.4	Excellent
07/08/92	5881	88	51	3.2	2.3	Excellent

Taxonomic Analysis

Fewer EPT taxa were collected in 2007 than in any other year. The decrease in EPT richness was small since 2002 (5 EPT) but dramatic since 1997 (19 EPT). This decrease is due, in part, to the fewer number of mayflies and stoneflies collected in 2007. In fact, stoneflies have decreased in diversity and abundance since monitoring began, dropping from 9 taxa in 1992 to 3 in 2007 with no abundant species. Also, ephemeropterid mayflies were almost completely absent, represented only by a single *Serratella serratoides* specimen. None of the 5 species of *Drunella* previously collected occurred. Abundant intolerant taxa that were found included *Neophemera purpurea*, *Maccaffertium pudicum*, *Brachycentrus appalachia*, *Lepidostoma* sp. and *Neophylax oligius*. An increase of tolerant midge taxa occurred concurrently with the drop in EPT and were represented by the abundant *Polypedium aviceps*, *P. flavum*, *Tribelos jucundum*, and *Chironomus* sp.

Data Analysis

This site was sampled a little over a mile downstream of the confluence of the HQW waters of North Fork and South Fork Mills Rivers. Some intensive agriculture surrounds Mills River and may be contributing to the decrease of water quality seen over the past 10 years by contributing silt to the stream. A large fish kill attributed to pesticide runoff occurred in late July in the South Fork Mills River. The benthos was negatively affected (see BAU memo 20070925), particularly the stoneflies. Lingering effects of that toxic event are likely responsible for the decrease in EPT observed in 2007. Furthermore, indicative of worsening water quality is the increase in the biotic index which changed most dramatically between 1997 and 2002 when the bioclassification fell from Excellent to Good.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
MILLS R	SR 1353	EB168	08/15/07	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Henderson	3	06010105	352316	823246	6-54-(5)	Broad Basins

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III	73	2066	11	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	0	0	100	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Henderson WTP	NC0042277	0.18

Water Quality Parameters

Temperature (°C)	24.9
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	22
pH (s.u.)	8.2

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	11
Pool Variety (10)	6
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	67

Substrate

sand, gravel, and cobble; silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10328	72	33	4.5	3.1	Good
06/24/02	8831	58	28	5.5	4.0	Good-Fair
07/01/98	7773	19	2	6.7	6.0	Poor
07/21/97	7329	78	24	5.2	3.3	Good-Fair
07/08/92	5882	81	24	4.2	3.1	Good

Taxonomic Analysis

The addition of 5 caddisfly taxa was responsible for the increase in EPT richness to 33 from the 2002 level of 28. Five intolerant taxa were abundant in 2007 (4 caddisflies, *Brachycentrus appalachia*, *B. nigrosoma*, *Ceratopsyche sparna*, *Lepidostoma* sp. and one mayfly, *Neophemera purpurea*) compared to only one intolerant taxon in 2002 (*Brachycentrus nigrosoma*). Only one individual stonefly specimen (*Pteronarcys* sp.) was collected in 2007, the least amount since none were collected in 1998, a year Mills River at SR 1353 received a Poor bioclassification rating. New taxa collected in 2007 were *Drunella allegheniensis*, *Heptagenia marginalis*, and *Oecetis persimilis*.

Data Analysis

Approximately 4 miles downstream of the Mills River sampling site at SR 1337, this site passes through an intensive agricultural area with active pesticide mixing stations. Mills River At SR 1353 has historically had extremely variable water quality with bioclassification ratings ranging from Poor to Good. Silty pools, a result of agricultural activity, were evident as they were in the upstream site. Pesticide runoff (late July 2007, see BAU memo 20070925) far upstream impacted this portion of Mills river less than at SR 1337, most likely due to increased dilution by various minor dischargers and additional tributaries. It appears that water quality has improved since 2002 based on the EPT richness and lower biotic index, although, because of the variable nature of this site, it will require further monitoring.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N FK MILLS R	SR 1341	06/13/07	EF69	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HENDERSON	3	06010105	35.393889	-82.624444	6-54-2-9	Southern Crystalline Ridges & Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-II;Tr, HQW	23.1	2185	14	0.4	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	35	15 (rural residential)	50 (row crops)	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.4
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	16
pH (s.u.)	5.6

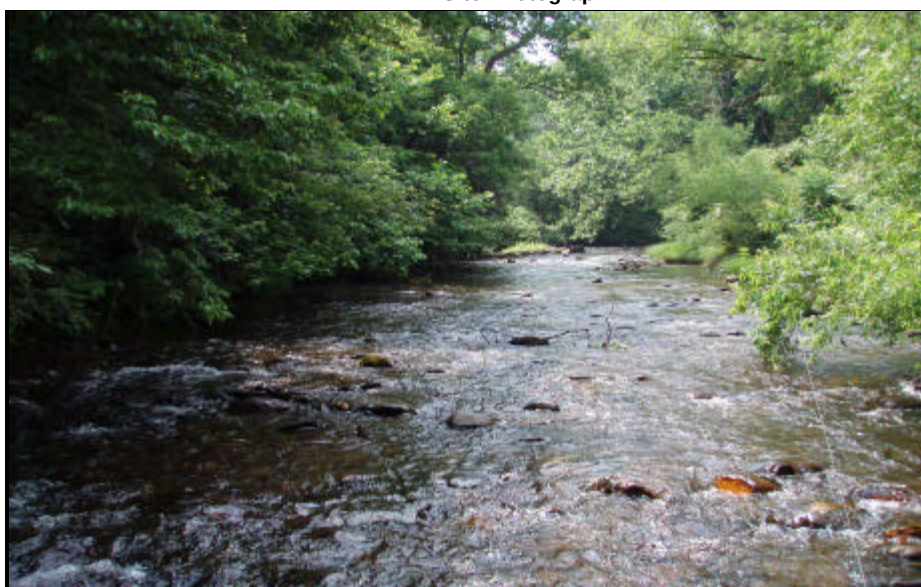
Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	15
Pool Variety (10)	4
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	5
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	81

Site Photograph



Substrate

Cobble and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/13/07	2007-77	21	60	Excellent

Most Abundant Species

Mottled Sculpin

Exotic Species

Rainbow Trout, Brown Trout, and Redbreast Sunfish

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a large tributary to the Mills River and ultimately the French Broad River, drains northwest Henderson County, including the U.S. Forest Service's Pisgah National Forest; NCWRC Wild Trout Waters and Delayed Harvest Trout Waters in the headwaters; no municipalities in the watershed. **Habitat** -- primarily extensive, swift riffles; infrequent shallow pools; right riparian zone with tomato farms and other row crops (corn), left riparian zone with a residence; open canopy, but banks were stable. **2007** -- very low conductivity; low pH was a verified reading; a diverse and an abundant community, including 8 species of cyprinids and 6 species of darters; site is a popular local fishing stream.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S FK MILLS R	SR 1340	06/13/07	EF68	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HENDERSON	3	06010105	35.375555	-82.614167	6-54-3-(17.5)	Southern Crystalline Ridges & Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-II;Tr, HQW	39.6	2180	11	0.5	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	35	15 (rural residential)	50 (pasture)	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Camp Highlander (~1,000 ft. upstream)	NC0033251	0.0074

Water Quality Parameters

Temperature (°C)	16.1
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	13
pH (s.u.)	6.3

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	15
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	87

Site Photograph



Substrate

Cobble and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/13/07	2007-76	19	56	Good

Most Abundant Species

Mottled Sculpin and Saffron Shiner

Exotic Species

Brown Trout and Redbreast Sunfish

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a large tributary to the Mills River and ultimately the French Broad River; drains northwest Henderson County, including the U.S. Forest Service's Pisgah National Forest; no municipalities in the watershed; NCWRC Wild Trout Waters in the headwaters. **Habitat** -- very rocky with very swift deep runs, riffles, and chutes; open canopy at the bridge; residences being built within the riparian zones; overall, water was deep and fast considering the area was supposed to be in a drought. **2007** -- very low conductivity; a diverse and abundant community, including 8 species of cyprinids and 5 species of darters; percentage of insectivores slightly skewed (88%) and prevented the community from being rated Excellent; Rainbow Trout represented only by young-of-year; site was sampled six weeks prior to a fish kill caused by pesticide runoff from adjacent agricultural lands (Biological Assessment Unit Memorandum BAU B-20070925).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
MUD CR	US 25	EB123	08/15/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HENDERSON	2	06010105	352315	823015	6-55d	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	110	2040	16	1

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	50	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Hendersonville WWTP	NC0025534	6.0
Mountain View WWTP	NC0074110	0.005

Water Quality Parameters

Temperature (°C)	22.1
Dissolved Oxygen (mg/L)	6.1
Specific Conductance (µS/cm)	97
pH (s.u.)	6.6

Water Clarity

slightly turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	7
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	65

Substrate

Almost all sand with small amounts of rubble and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10320	67	16	6.33	5.09	Fair
07/13/00	8178	57	10	7.06	5.71	Poor
09/09/97	7464	54	12	6.72	5.71	Fair

Taxonomic Analysis

A slight decrease in the number of Baetid taxa occurred between 1997 and 2000. In 2007, the taxawere collected again along with two new Baetid taxa that had not been previously collected, *Plauditus punctiventris* and *Pseudocloeon propinquum*. In addition to new Baetid taxa, four new caddisfly taxa were also collected, *Brachycentrus nigrosoma*, *Oecetis persimilis*, *Ceratopsyche sparna* and *Triaenodes ignitus*.

Data Analysis

Mud Creek is a tributary to the French Broad River and drains the city of Hendersonville and its metropolitan area. There are two major dischargers in the watershed above this monitoring site. This site was rated Fair in 1997, Poor in 2002, and Fair in 2007. Between year changes, however, were small and there was no evidence of any significant decline in water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CLEAR CR	SR 1513	EB73	08/13/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HENDERSON	2	06010105	352113	822640	6-55-11-(5)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	42	2080	8	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	25	0	75	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Greystone Subdivision	NC0068799	0.02
Pine Park Retirement Inn	NC0069370	0.03

Water Quality Parameters

Temperature (°C)	23.5
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	64
pH (s.u.)	6.6

Water Clarity

turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	10
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	72

Substrate

Mostly sand with some boulder, rubble, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/13/07	10314	---	23	---	4.89	Good-Fair
07/12/00	8169	56	14	5.96	5.30	Fair
07/08/97	7319	---	8	---	5.11	Poor
07/07/92	5878	---	9	---	5.29	Poor

Taxonomic Analysis

Taxa observed in 2007 sampling indicated an increase in mayfly and caddisfly taxa. Taxa that were common or abundant that had not been previously collected include the mayflies, *Baetis pluto*, *Heterocloeon anoka*, *Pseudocloeon propinquum* and *Serratella deficiens*; and the stonefly, *Leuctra*.

Data Analysis

Clear Creek's watershed contains numerous apple orchards and tomato farms. Improper pesticide use was thought to be associated with water quality conditions of the creek and was intensively sampled in 2000 and 2001 as part of the Mud Creek WARP study. Data from sites that bracketed orchards suggested that orchard runoff was responsible for the change in the invertebrate communities. Since 2000, EPT taxa richness has increased indicating a slight improvement in water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CANE CR	SR 1006	EB66	08/13/07	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HENDERSON	2	06010105	352523	822958	6-57-(9)a	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	80	2060	10	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	20	0	0	80 (driving range)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	25.6
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	63
pH (s.u.)	7.4

Water Clarity

turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	78

Substrate

Mostly rubble and gravel with small amounts of boulder and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/13/07	10315	---	7	---	4.90	Poor
08/28/03	9297	---	15	---	5.06	Fair
07/11/02	8871	---	11	---	4.28	Fair
07/08/97	7320	---	26	---	4.23	Good-Fair
07/07/92	5879	---	27	---	4.35	Good-Fair

Taxonomic Analysis

EPT taxa richness has declined since 1992. Mayfly taxa richness decreased from 17 taxa in 1992 to 14 taxa in 1997 to 6 taxa in 2002. In 2003, mayfly taxa richness had rebounded to 12 taxa but decreased again to 4 taxa in 2007. Stoneflies have disappeared from this site. No stoneflies were collected in 2003 or 2007 and only one taxon was collected in 2002; whereas, in previous years three (1997) or four (1992) taxa had been collected. Caddisfly taxa richness decreased from 6 taxa in 1992 to 3 taxa in 2007.

Data Analysis

Cane Creek, a tributary to the French Broad River, drains northern Henderson and southeast Buncombe counties. Although there are no dischargers directly upstream of this site, there are six NPDES facilities in the watershed. In addition, this site is located in a broad valley with agricultural and commercial land uses. Since 1992, the water quality has been declining. The site rated Good-Fair in 1997 and 1997, dropped to Fair in 2002 and 2003, and continued to drop in 2007 to Poor. This portion of the state experienced drought conditions in 2002 and in 2007 and could have contributed to the decline.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
AVERY CR	off SR 3498	06/12/07	EF66	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	35.456389	-82.568333	6-60	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
B	8.1	2080	5	0.3	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	85	5 (rural residential)	10	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	38
pH (s.u.)	5.9

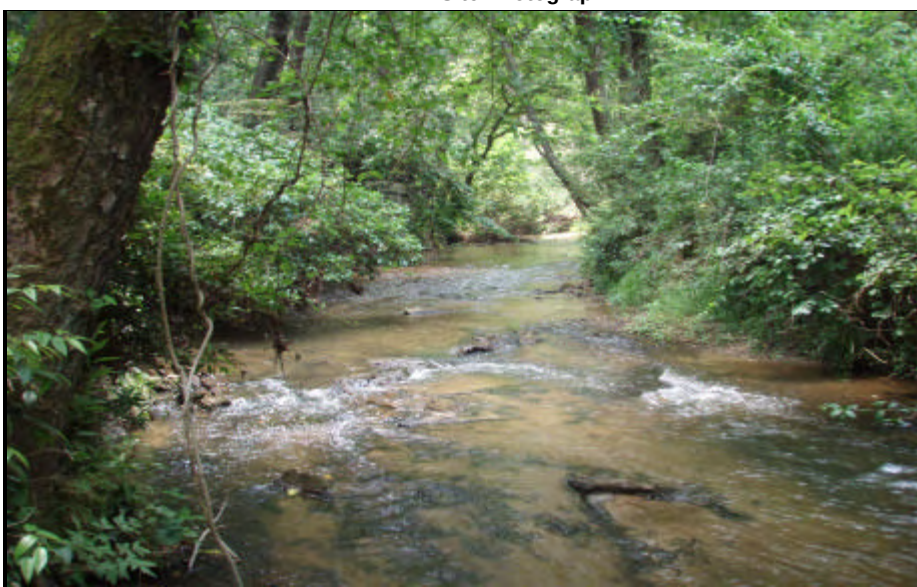
Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	83

Site Photograph



Substrate

Sand, gravel, and cobble.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/12/07	2007-73	23	40	Good-Fair

Most Abundant Species

Warpaint Shiner and River Chub

Exotic Species

Flat Bullhead, Redbreast Sunfish, Green Sunfish, and Swamp Darter

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a small tributary to the French Broad River, drains the extreme south central portion of Buncombe County; rural/suburbia; stream is impounded ~ 1.6 miles upstream by Dubose Dam; site is ~ 1.0 mile above the creek's confluence with the river. **Habitat** -- shallow and short runs and riffles; woody debris and undercut snags; some silt; stable banks and forested riparian zones. **2007** -- conductivity generally low; a very diverse community for a stream of its size, including 9 species of cyprinids and 7 species of darters, but no Rock Bass, Smallmouth Bass or trout were present; White Sucker represented by only young-of-year; fewer fish were collected than expected; the percentage of tolerant fish (Creek Chub, Flat Bullhead, Redbreast Sunfish, and Green Sunfish) was high; only one intolerant species was present.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BENT CR	off NC 191	06/12/07	EF67	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	35.5006616	-82.5994464	6-67-(7)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
B	10.7	2090	9	0.3	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	100	0	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	20.2
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	21
pH (s.u.)	6.5

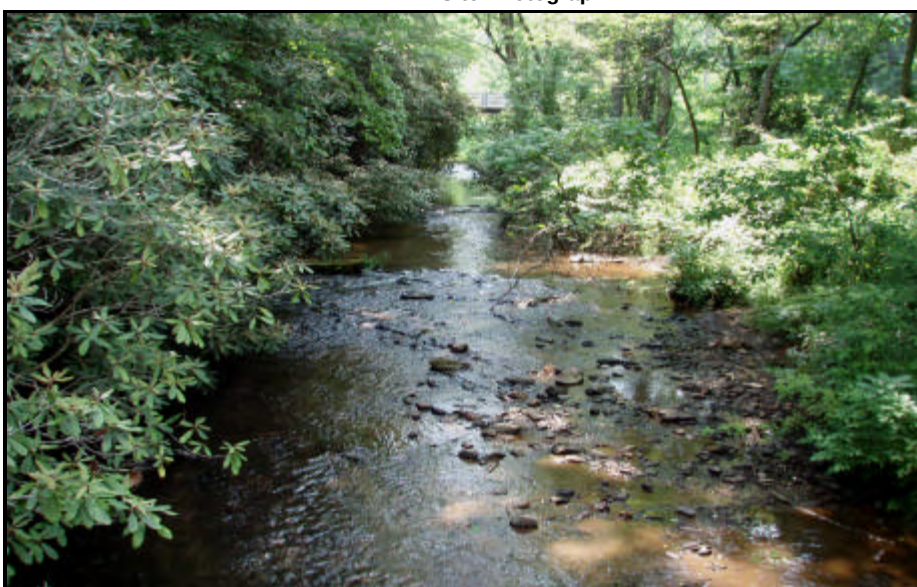
Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph



Substrate

Cobble, boulder, and gravel.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/12/07	2007-74	22	56	Good

Most Abundant Species

Mottled Sculpin

Exotic Species

Flat Bullhead and Redbreast Sunfish

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a small tributary to the French Broad River; drains southwestern Buncombe County, including the U.S. Forest Service's 9.4 square mile Bent Creek Experimental Forest; no municipalities in the watershed; NCWRC Hatchery Supported Trout Waters and Wild Trout Waters in the headwaters; site is within the UNC Arboretum property and is ~ 0.5 miles above the creek's confluence with the river. **Habitat** -- short, shallow riffles and runs; woody debris and snags; high quality instream and riparian habitats; one silty pool at the end of the reach. **2007** -- conductivity low; an abundant and diverse fish community for a stream of its size, including 5 species of darter and 4 species of suckers; however, the number of cyprinid species was slightly lower than expected and the percentage of tolerant fish (Creek Chub, White Sucker, Flat Bullhead, and Redbreast Sunfish) was slightly elevated.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HOMINY CR	SR 1123	EB327	08/17/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	353204	824212	6-76b	southern crystalline ridges and mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	29.9	2131	6	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	30	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.3
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	106
pH (s.u.)	7

Water Clarity

clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	11
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	3
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	80

Substrate

Mostly gravel and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/17/07	10326	81	31	5.0	4.0	Good-Fair
05/14/02	8735	71	36	4.3	3.9	Good
09/10/97	7468	71	32	5.1	4.1	Good-Fair
07/09/92	5901	28	28	3.3	3.3	Good

Taxonomic Analysis

Intolerant or "sensitive" taxa present at this study location included the mayflies *Neophemera purpurea* and *Serratella deficiens*; the stoneflies *Acroneuria abnormis*, *Paragnetina immarginata*, and *Pteronarcys biloba*; and the caddisflies *Brachycentrus spinax*, and *Nyctiophylax celta*.

Data Analysis

The study location previously at NC 151 was moved to SR 1123 in 2007. This location has received a bioclassification of either Good-Fair or Good in each of the four years of sampling. These similar ratings suggest relatively consistent water quality over the span of 15 years bracketed by sampling dates. This apparent stability is encouraging considering that much of the upstream land use is either agricultural operations or residential and that the sediment load at this location is often quite high after rain events as was documented in the 2003 report for this basin. These sediments are problematic because they ultimately settle from the water column and blanket streambed substrates.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HOMINY CR	NC 151	06/12/07	EF26	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	35.53555556	-82.69444444	6-76b	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	30.2	2095	7	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	60 (rual commercial)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	91
pH (s.u.)	6.7

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	75

Site Photograph



Substrate

Cobble, gravel, and sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/12/07	2007-71	15	46	Good-Fair
09/24/02	2002-84	16	40	Good-Fair
09/17/97	97-80	16	50	Good

Most Abundant Species

Saffron Shiner and Mottled Sculpin

Exotic Species

Redear Sunfish

Species Change Since Last Cycle

Gains -- Longnose Dace and Redear Sunfish. **Losses** -- Mountain Brook Lamprey, Brown Trout, and Redbreast Sunfish.

Data Analysis

Watershed -- a tributary to the French Broad River; drains southwestern Buncombe and a small part of eastern Haywood counties, 4 small dischargers upstream with a combined flow of 0.0714 MGD; site is ~ 500 ft. above its confluence with South Hominy Creek. **Habitat** -- riffles, chutes, and shallow plunge pools; silts in the pools; household debris in the channel; right riparian zone narrow with commercial land use. **2007** -- conductivity was elevated; an extremely abundant community, almost four times as many fish were collected in 2007 than in 2002 (n = 1,062 vs. 266), diversity metrics lower than expected; only 1 intolerant species present; between 2002 and 2007 the percentage of tolerant fish declined from 13% to 1% and the percentage of species with multiple age classes increased from 56% to 80%. **1997 - 2007** -- conductivity has ranged from 78 to 98 µS/cm; habitat scores have ranged from 69 to 75; 18 species are known from the site, but only 2 species of darters; dominant species have been the Saffron Shiner and the Mottled Sculpin; 2002 was a drought year and in the intervening years were the 2004 hurricane-induced flash floods; community has recovered from the 2004 floods.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HOMINY CR	SR 3412	EB105	08/16/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010202	353242	823806	6-76d	southern crystalline ridges and mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	91.1	2070	10	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	80	20	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	25.9
Dissolved Oxygen (mg/L)	8
Specific Conductance (µS/cm)	93
pH (s.u.)	7.3

Water Clarity

slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	6
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	60

Substrate

Mostly gravel and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10325	72	21	5.9	4.3	Fair
05/16/02	8744	65	21	5.6	5.0	Fair
09/09/97	7465	63	13	6.5	5.2	Fair
07/10/97	7328	13	13	4.1	4.1	Fair
07/09/92	5904	8	8	3.9	3.8	Poor

Taxonomic Analysis

The benthic macroinvertebrate community was dominated by species tolerant of water quality stressors. However, there were some sensitive taxa present including mayfly, stonefly, and caddisfly taxa (EPT taxa). Specifically, the mayfly *Stenacron pallidum*; the stoneflies *Pteronarcys proteus*, *P. dorsata*, and *Paragnetina immarginata*; and the caddisflies *Ceratopsyche morosa*. None of these taxa have previously been collected from this location. The number of EPT taxa have steadily increased during the 15 years of sampling SR 3412.

Data Analysis

This sampling location was given a bioclassification of Poor in 1992, and improved to Fair in 1997-2007. The low quality habitat at this site continues to be an issue; with limited colonizable substrates, a streambed composed primarily of silt, extensive bank erosion, and scarce riffle habitats. In addition, the specific conductance at this site is considered high for the ecoregion, suggesting that poor water quality is also affecting the benthic community. The combined effects physical and chemical stressors may dictate a slow improvement of this location after the closing of the BASF Corporation Plant in Enka (NC0000299) which was until recently discharging just above SR 3412.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S HOMINY CR	NC 151/SR 3449	06/12/07	EF50	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	35.53555556	-82.6925	6-76-5b	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	38.3	2095	14	0.4	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	85	15 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	33
pH (s.u.)	6.2

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	9
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	90

Site Photograph



Substrate

Cobble, gravel, sand, and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/12/07	2007-72	20	56	Good
11/30/04	2004-140	14	38	Fair
09/23/02	2002-81	19	50	Good
04/09/97	97-16	16	48	Good

Most Abundant Species

Mottled Sculpin and Saffron Shiner

Exotic Species

Rainbow Trout and Brown Trout

Species Change Since Last Cycle

Gains -- Tennessee Shiner, Black Redhorse, Golden Redhorse, and Rainbow Trout. **Losses** -- Redbreast Sunfish. Gains and losses compared 2007 to 2002; not 2004.

Data Analysis

Watershed -- tributary to Hominy Creek; drains southwest Buncombe County; no municipalities in the rural watershed; site is ~1,000 ft. above the creek's confluence. **Habitat** -- high quality instream habitats; swift riffles, runs, and chutes; *Podostemum* in the riffles; deep boulder pools; open canopy, but that is a function of stream width; areas healed over from the 2004 hurricane-induced flash floods **2007** -- conductivity low; all species gained were collected for the first time ever in 2007; number of intolerant species increased by one and the percentage of tolerant decreased from 6% to 1.5% between 2002 and 2007; the fish community has recovered from the 2004 flash floods. **1997 - 2007** -- conductivity has ranged from 25 to 35 µS/cm; habitat scores have ranged from 70 to 90; 24 species are known from the site, including 10 species of cyprinids, but only two species of darters; dominant species are the Mottled Sculpin, Saffron Shiner, and River Chub; NCIBI score has gradually improved from 48 to 50 to 56, the basinwide ratings have been consistently Good; sampled in 2004 as part of the post hurricane biological monitoring special study (BAU Memorandum F-20050404).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S HOMINY CR	NC 151	EB135	08/17/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	353204	824132	6-76-5	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	39	2115	14	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	0	30	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.6
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	40
pH (s.u.)	6.9

Water Clarity

slightly turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	72

Substrate

Mostly boulder and rubble with small amounts of gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/17/07	10327	96	37	4.77	3.00	Good
08/28/02	8991	---	26	---	2.73	Good-Fair
09/10/97	7467	38	8	6.35	5.32	Poor
07/09/92	5902	---	20	---	3.25	Good-Fair

Taxonomic Analysis

Caddisfly taxa richness has increased three fold since 1992. Three taxa were collected in 1992 and 1997; 12 taxa were collected in 2002; and 14 taxa were collected in 2007. Taxa collected in 2007 that had not been previously collected include *Brachycercus*, *Drunella allegheniensis*, *Heterocloeon anoka*, *Neureclipsis*, *Oecetis persimilis*, *Rhyacophila fuscata* and *Ceratopsyche morosa*.

Data Analysis

South Hominy Creek is a tributary to Hominy Creek and this site is located above the confluence with Hominy Creek. The water quality rating has fluctuated since 1992. In 1992, this site rated Good-Fair but dropped to Poor in 1997 due to an unknown toxic impact. It went back to Good-Fair in 2002 and rose to Good in 2007. With the exception of 2002, EPT taxa richness has increased suggesting that water quality is gradually improving.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SWANNANOA R	SR 2416	EB142	08/16/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	353629	822641	6-78c	southern crystalline ridges and mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	80.7	2115	16	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	20	20	60	0

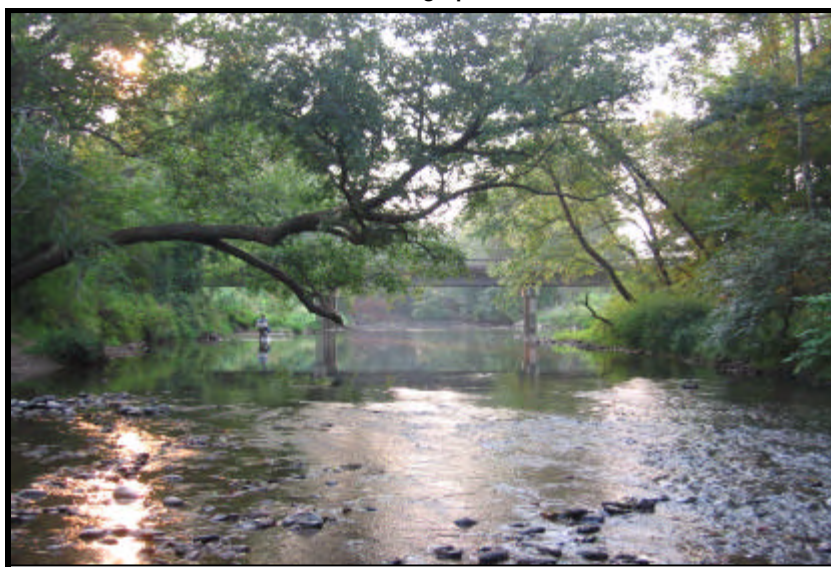
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.4
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	73
pH (s.u.)	6.5

Water Clarity

clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	7
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	74

Substrate

Mixture of gravel, cobble, and boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/16/07	10323	87	25	5.9	5.1	Good-Fair
08/28/03	9298	73	25	5.4	4.0	Good-Fair
08/27/02	8982	75	24	5.9	4.6	Fair
10/07/87	4433	60	22	5.2	4.3	Fair

Taxonomic Analysis

There were several "sensitive" or pollution intolerant taxa collected at this study location; including the mayflies *Isonychia* sp. and *Serratella deficiens*; the stonefly *Acroeuria abnormis*; and the caddisflies *Ceratopsyche sparna* and *C. morosa*. The number of EPT taxa has increased slightly during the 20 years of sampling, but midges continue to be the dominant group. The mayflies *Pseudocloeon propinquum*, *Plautitus dubius* group, *Acentrella turbida* and the caddisfly *Triaenodes ignitus* were added to this site's taxa list in 2007.

Data Analysis

The bioclassification of this study site improved from Fair in 1987 and 2002 to Good-Fair in both 2003 and 2007. Overall the habitat was relatively good, but the riparian zones had frequent breaks and riffle habitats were infrequent and small. There aren't any major dischargers upstream or minor dischargers within 1 mile of the study site. Because upstream land use is mostly agricultural and residential, non-point source pollution is likely the largest contributor to water quality degradation at SR 2416. However, the exceptional drought of 2007 should have minimized the impact of these stressors. Therefore, it is unclear why the bioclassification of this location is not greater than Good-Fair.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SWANNANOA R	US 25	EB145	08/15/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	353406	823242	6-78d	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	124	1980	14	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	0	100	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	26
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	83
pH (s.u.)	8.1

Water Clarity

clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	8
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	1
Right Riparian Score (5)	2
Total Habitat Score (100)	73

Substrate

Good mix of boulder, rubble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10322	82	30	5.63	4.18	Good-Fair
08/28/02	8990	73	26	5.80	4.71	Good-Fair
07/09/97	7322	62	28	5.44	4.26	Good-Fair
07/08/92	5884	72	27	5.74	4.44	Good-Fair
07/27/89	5017	60	15	6.29	4.48	Fair

Taxonomic Analysis

No major changes in the benthic community were observed. Abundant taxa included *Acentrella*, *Pseudocloeon propinquum*, *Maccaffertium mediopunctatum*, *Stenacron pallidum*, *Cheumatopsyche*, *Hydropsyche venularis*, *Micrasema wataga*, *Ceratopsyche sparna*, *Ancyronyx variegatus*, *Macronychus glabratus*, *Enallagma*, *Cricotopus vieriensis* group, *Polypedilum flavum*, *P. illinoense* group, *Phaenopsectra flavipes*, *Rheocricotopus robacki*, *Rheotanytarsus*, *Tanytarsus* sp U, *Simulium*, *Crangonyx*, *Corbicula fluminea*, *Helisoma anceps* and *Hydracarina*.

Data Analysis

The Swannanoa River, a tributary to the French Broad River, drains southeastern and eastern Buncombe County. This site, located in urban Asheville, has rated Good-Fair since 1992. Based on benthic data no major changes in water quality have been observed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NEWFOUND CR	SR 1622	EB129	08/14/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	353928	823847	6-84d	southern crystalline ridges and mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	25.4	1957	4	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	30	20	50	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	15.8
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	133
pH (s.u.)	7.8

Water Clarity

slightly turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	8
Pool Variety (10)	8
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	71

Substrate

Mostly gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10319	75	11	6.6	4.9	Fair
07/12/02	8873	70	23	6.2	5.0	Fair
05/18/99	7849	98	38	5.4	4.3	Good-Fair
07/09/97	7326	20	20	5.0	5.0	Good-Fair
07/27/89	5018	17	17	5.1	5.1	Fair

Taxonomic Analysis

Of the 11 EPT taxa (mayflies, stoneflies, and caddisflies) collected in 2007, all but the stonefly *Paragnetina immarginata* (which was rare) and *Ceratopsyche sparna* are considered tolerant of poor water quality. The overall number of EPT taxa has declined considerably during the 18 years of sampling and the current sample had less than half the EPT taxa that were collected in 2002.

Data Analysis

Newfound Creek SR 1622 has historically been heavily affected by nutrient loading and sedimentation from dairy farming. Despite past remediation efforts, the currently measured specific conductivity of 133 suggests that there are still pollution issues. In addition to water quality issues, the stream is negatively affected by marginal habitats. After improving to Good-Fair in 1997 and 1999, the bioclassification has dropped to Fair in both 2002 and 2007. Lastly, the habitat and water quality stressors described above may have been compounded by the exceptional drought occurring in 2007.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
NEWFOUND CR	SR 1641	06/11/07	EF37	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	35.66611111	-82.63416667	6-84e	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	34.2	1900	7	0.3	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	95	5 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.7
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	108
pH (s.u.)	7.4

Water Clarity

Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	79

Site Photograph



Substrate

Cobble, gravel, sand, and boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/11/07	2007-70	19	48	Good
06/17/02	2002-69	14	48	Good
04/09/97	97-17	10	28	Poor

Most Abundant Species

Central Stoneroller

Exotic Species

Flat Bullhead and Redbreast Sunfish

Species Change Since Last Cycle

Gains -- Tennessee Shiner, White Sucker, Black Redhorse, Fantail Darter, and Banded Darter. **Losses** -- none.

Data Analysis

Watershed -- tributary to the French Broad River; drains agricultural western Buncombe County; site is ~ 1.1 miles above the creek's confluence with the river. **Habitat** -- short, shallow riffles; gravel runs; vegetated banks; open canopy in places; shallow pools with *Elodea*; channel filled with sediment; became very turbid when walking downstream, but cleared up quickly. **2007** -- conductivity elevated; an abundant and diverse community, but only 2 intolerant species were present; percentage of omnivores+herbivores (Central Stoneroller, River Chub, and White Sucker) was slightly elevated and increased between 2002 and 2007; percentage of tolerant fish (Creek Chub, White Sucker, Flat Bullhead, and Redbreast Sunfish) was much greater than expected; large specimens of suckers present. **1997 - 2007** -- conductivity has ranged from 83 to 113 µS/cm; habitat scores have ranged from 61 to 79; 19 species are known from the site, including 4 species of darters; species diversity has steadily increased from 10 to 14 to 19 as has the diversity of darters from 0 to 2 to 4; dominant species has been the Central Stoneroller.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
REEMS CR	NC 251	EB131	08/14/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	354140	823647	6-87-(10)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	37	1790	5	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	100	0	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.7
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	104
pH (s.u.)	7.7

Water Clarity

slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	14
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	89

Site Photograph**Substrate**

Mostly boulder and rubble with some gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10318	---	23	---	3.74	Good-Fair
07/10/02	8865	---	27	---	3.69	Good-Fair
07/09/97	7324	---	30	---	3.33	Good
07/23/92	5936	---	20	---	3.37	Good-Fair

Taxonomic Analysis

Gains in the number of mayfly species since 1992 have been offset by a decline in the abundance of stoneflies. Overall EPT taxa richness was down slightly in 2007 from previous years and may be due to drought conditions this portion of the state was experiencing at the time of sampling. Abundant taxa included *Baetis flavistriga*, *B. intercalaris*, *Heptagenia marginalis*, *Maccaffertium ithaca*, *Acroneuria abnormis*, *Paragnetina immarginata*, *Leucotrichia pictipes* and *Ceratopsyche sparna*.

Data Analysis

Reems Creek drains the northwestern portion of Buncombe County including the town of Weaverville. There is no evidence of a long term change in water quality. This site has rated Good-Fair since 1992 with the anomalous exception of the Good rating it received in 1997.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SANDYMUSH CR	SR 1114	EB137	08/14/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MADISON	2	06010105	354405	824144	6-92-(9)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	47	1860	10	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	95	5 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	21
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	110
pH (s.u.)	7.5

Water Clarity

slightly turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	83

Substrate

Good mix of boulder, rubble, gravel, and sand with some silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10316	---	22	---	3.98	Good-Fair
07/10/02	8868	---	32	---	3.51	Good
07/10/97	7327	---	30	---	4.03	Good
07/22/92	5933	---	36	---	4.32	Excellent

Taxonomic Analysis

EPT taxa richness has decreased since 1992. Taxa not collected in 2007 that were previously common or abundant include the mayflies, *Pseudocloeon propinquum*, *Brachycercus*, *Epeorus rubidus*, *Heptagenia marginalis* and *Maccaffertium modestum*; the stoneflies *Leuctra* and *Perlesta*, and the caddisfly *Ceratopsyche bronta*.

Data Analysis

Sandymush Creek drains the extreme northwest corner of Buncombe County and a small portion of southwest Madison County before entering the French Broad River. Based on decreased EPT taxa richness, water quality appears to be declining. The site rated Excellent in 1992, dropped to Good in 1997 and 2002 and further dropped in 2007 to Good-Fair. This stream was one of many that experienced extreme flooding in September 2004 when the remnants of three hurricanes passed over western North Carolina.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TURKEY CR	SR 1629	06/11/07	EF59	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BUNCOMBE	2	06010105	35.70472222	-82.66888889	6-92-13	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	27.4	1885	8	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	95	0	5 (successional field)	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	20.5
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	97
pH (s.u.)	7.3

Water Clarity

Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	7
Riffle Habitat (16)	12
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	80

Site Photograph



Substrate

Cobble, boulder, and sand.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/11/07	2007-69	16	52	Good
06/17/02	2002-68	14	48	Good

Most Abundant Species

Bigeye Chub and Central Stoneroller

Exotic Species

Redbreast Sunfish

Species Change Since Last Cycle

Gains -- River Chub, Longnose Dace, and Black Redhorse. Losses -- Green Sunfish.

Data Analysis

Watershed -- tributary to Sandymush Creek; no municipalities in the rural, agricultural watershed; site is now part of the NCWRC's Sandymush Gamelands.

Habitat -- riffles with *Podostemum*, shallow pools with *Elodea*; side boulder pools; good riparian zones with stable banks, especially at the end of the reach; water easily silted, sediment from upstream sources; cattle no longer with access to the stream as in 2002. **2007** -- conductivity elevated; turbid even though drought conditions prevailed; an abundant and diverse community, but the diversity of darters and the number of intolerant species was lower than expected; percentage of tolerant fish (Creek Chub, White Sucker, and Redbreast Sunfish) slightly elevated, large specimens of suckers, Rock Bass, and Smallmouth Bass were present. **2002 & 2007** -- conductivity elevated; has been ~ 90 µS/cm; habitat scores have been 67 and 80; 17 species known from the site, but only two species of darters; dominant species has been the Bigeye Chub; slight increase in the NCIBI score due to the collection of two additional species of cyprinids (River Chub and Longnose Dace); turbidity may be a chronic watershed problem.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Ivy Cr	SR 2150	EB200	08/06/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	354728	823219	6-96-(0.5)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-II; HQW	60.6	1,972	13	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	50	10	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	32.4
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	40
pH (s.u.)	8.3

Water Clarity

Slightly Turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	7
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	75

Substrate

Rubble, boulder, gravel, sand, silt, and bedrock.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/06/07	10295	38	38	4.41	4.41	Excellent
07/09/02	8768	32	32	4.10	4.10	Good
07/07/97	7335	27	27	2.80	2.70	Good-Fair
07/22/92	5931	38	38	3.40	3.40	Excellent

Taxonomic Analysis

This site has exhibited large bioclassification oscillations ranging from Excellent to Good-Fair. The 2007 sample matched the previous high EPT species richness mark of 38 that was first set in 1992. EPT taxa collected for the first time in 2007 included the mayfly *Plauditus cestus*, *Acroneuria arenosa*, *Pteronarcys comstocki*, and *P. proteus*, and the caddisflies *Micrasema wataga*, *Neophylax oligius*, *Oecetis persimilis* (edge taxon), *Pycnopsyche* sp. (edge taxon), and *Triadenodes ignitus* (edge taxon). The presence of these edge taxa suggest that lower water levels due to the drought do not seem to be adversely affecting habitat at this location.

Data Analysis

The Ivy Creek watershed upstream of this location is a mix of forest, residential, and agricultural uses and as a result non-point pollution is likely the greatest potential stressor here. As would be expected in watersheds where non-point pollution is prevalent and where significant NPDES point sources are largely absent, reduced run-off due to drought conditions typically results in improved community metrics. The improvement seen in 2002 (mild drought) and 2007 (severe drought) from the 1997 sample support this conclusion. Indeed, in 1997 the average discharge of Ivy Creek near Marshall (approximately 8 miles downstream of this location) was 156.8 cubic feet per second (cfs) and was 184 cfs and 172.6 cfs in 1996 and 1995 respectively. While in 2002, 2001, and 2000 the annual discharge was 100.5 cfs, 97.3 cfs, and 112.2 cfs respectively. Annual discharge data for 2007 data are not yet available.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Ivy Cr	US 25-70 Bus	EB201	08/06/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	354629	823843	6-96-(11.7)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	160.7	1,750	20	0.6

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	90	10	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	30.9
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	87.3
pH (s.u.)	7.2

Water Clarity

Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	7
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	80

Site Photograph



Substrate

Boulder, rubble, sand, gravel, and silt.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/06/07	10296	85	32	4.76	3.30	Good
06/26/02	8839	80	30	4.90	3.70	Good-Fair
07/07/97	7337	59	28	4.72	3.54	Good-Fair
09/02/93	6406	33	33	3.31	3.31	Good
07/22/92	5930	87	36	4.67	3.63	Good

Taxonomic Analysis

Consecutive samples in 1997 and 2002 were the two lowest rated collections at this location. However, community metrics observed in 2007 are much more comparable to those seen from samples in 1993 and 1992 and represents marked improvements from 1997 and 2002. EPT taxa collected for the first time in 2007 include the mayflies *Heterocloeon curiosum*, the stonefly *Pteronarcys dorsata*, and the caddisflies *Ceratopsyche bifida* and *Brachycentrus numerosus*. These taxa combined to narrowly produce the lowest EPTBI ever measured here.

Data Analysis

The Ivy Creek watershed upstream of this road crossing is comprised of a mix of agriculture, forest, and suburban uses. As would be expected in a catchment where non-point pollution is the major stressor, reduced runoff due to the record 2007 drought has resulted in slightly improved community metrics relative to 2002 and 1997.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LITTLE IVY CR	SR 1547	06/18/07	EF71	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MADISON	4	06010105	35.8085416	-82.5187343	6-96-10a	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-II;HQW	42.1	2065	9	0.4	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	65	5 (rural residential)	30	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	24.6
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	151
pH (s.u.)	8.4

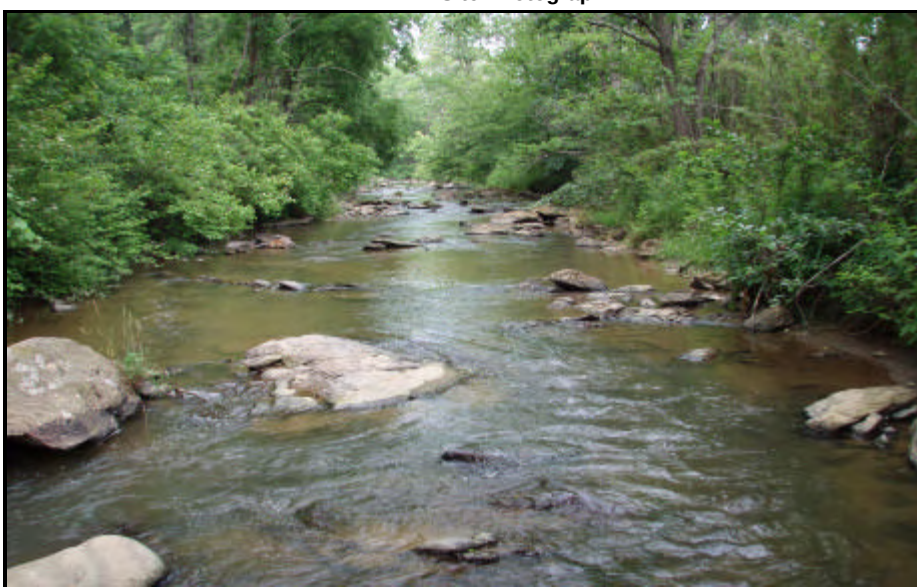
Water Clarity

Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	73

Site Photograph



Substrate

boulder, slick bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/18/07	2007-84	14	52	Good

Most Abundant Species

Whitetail Shiner

Exotic Species

Rainbow Trout

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a tributary to Ivy Creek and ultimately the French Broad River; located almost 3 miles above its confluence with Ivy Creek; drains the eastern corner of Madison County. Hatchery Supported Trout Waters. **Habitat** -- primarily riffle-runs, with slick bedrock and *Podostemum*; the elevated conductivity and periphyton covered substrates are consistent with the non-point agricultural influences within this catchment. **2007** -- an abundant (n = 608) and moderately diverse fish community was collected, but with no tolerant species, and only one darter species (Fantail Darter); the fish fauna were dominated by intermediately tolerant species including Whitetail Shiner (31%), Northern Hogsucker (23%), and Central Stoneroller (22%); several fish species were also represented by young-of-year specimens, a measure of good reproductive function; White Sucker and Swannanoa Darter were only represented by young-of-year, bringing the total species count to 16. Notwithstanding the predominant agricultural land use, this watershed is maintaining good water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L Ivy Cr	SR 1610	EB205	08/06/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	354732	823219	6-96-10b	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-II; HQW	46.5	1,974	7	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	30	30	0

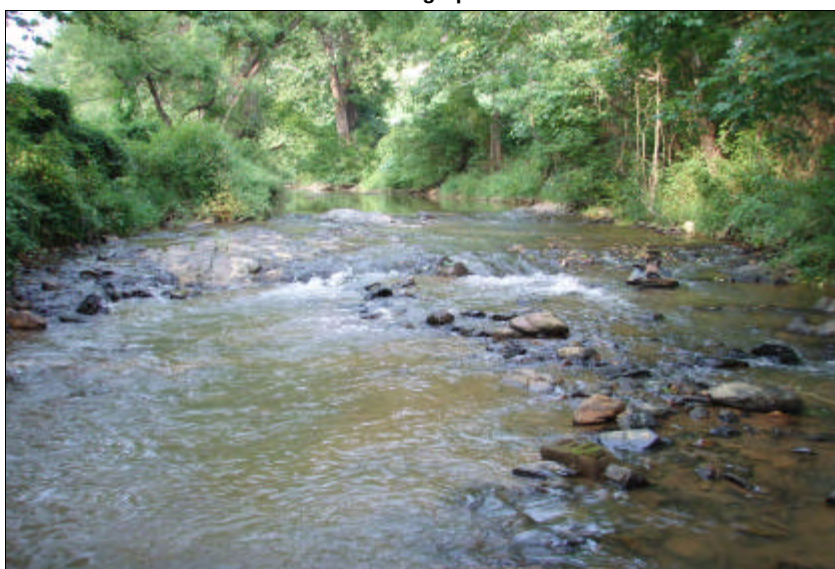
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	32.1
Dissolved Oxygen (mg/L)	7
Specific Conductance (µS/cm)	130
pH (s.u.)	8.3

Water Clarity

Slightly Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	10
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	74

Substrate

Bedrock, rubble, boulder, gravel, sand, and silt.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/06/07	10258	26	26	4.34	4.34	Good-Fair
05/29/02	8755	78	27	6.10	4.60	Good-Fair
07/07/97	7334	16	16	3.90	3.90	Fair
07/22/92	5932	35	35	3.90	3.90	Good

Taxonomic Analysis

EPT taxa richness in 1997 was the lowest measured at this site and was likely related to increased non-point pollution run-off as USGS annual average discharge data from nearby Ivy Creek (near Marshall) indicate that 1997, 1996, and 1995 were fairly wet. Conversely, the 2002 and 2007 samples were taken during droughts, and the reduced run-off was likely the reason for the rebound in the EPT taxa richness metric. EPT taxa collected in 2002 and/or 2007 but not found in 1997, included the mayflies *Leucrocuta* sp., *Acroneuria abnormis*, *Pteronarcys* sp., and the caddisflies *Neophylax mitchelli*, *Nyctiophylax celta*, *Oecetis persimilis*, and *Trienodes ignitus*.

Data Analysis

The watershed upstream of this segment is a mix of agriculture, residential, and forest use with no NPDES dischargers. As would be expected in a watershed characterized by non-point pollution inputs, the drought years of 2007 and 2002 decreased runoff and therefore pollution inputs. This was reflected in the invertebrate community as EPT richness during the drought years of 2002 and 2007 were improved over the EPT richness measured in the wetter year of 1997. Although there are no permitted NPDES dischargers in the catchment, the conductivity was quite high in both 2002 and 2007 (131 µS/cm and 130 µS/cm respectively) which may suggest straight piping. Indeed, the 130 µS/cm was the second highest conductivity measured in this subbasin in 2007. Moreover, the pH was extremely high in 2002 (8.9) and 2007 (8.3) which suggest that excessive nutrient inputs are fueling high photosynthetic rates.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BULL CR	SR 1574	06/19/07	EF13	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MADISON	4	06010105	35.80722222	-82.60916667	6-96-16	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	20.7	1900	7	0.3	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	80	20 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	18.7
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	103
pH (s.u.)	6.3

Water Clarity

Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	86

Site Photograph



Substrate

cobble, boulder, gravel, sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/19/07	2007-85	15	44	Good-Fair
06/19/02	2002-74	14	40	Good-Fair

Most Abundant Species

Central Stoneroller

Exotic Species

Redbreast Sunfish and Rainbow Trout

Species Change Since Last Cycle

Gains -- Rainbow Trout and Western Blacknose Dace. **Losses** -- White Sucker.

Data Analysis

Watershed -- a tributary to Ivy Creek located about one mile above its confluence; drains part of central Madison County, west of Mars Hill. **Habitat** -- boulder runs, short riffles, chutes, and a few shallow pools; conductivity was high and the stream became very turbid when disturbed during sampling. **2007** -- an extremely abundant fish community (n = 1870) with moderate species richness; the Central Stoneroller (an herbivore that thrives in nutrient-rich mountain watersheds) comprised 56% of the total collection. **2002 - 2007** -- consistent NCIBI metric scores and ratings in two consecutive samples; this rural watershed continues to be influenced by non-point nutrient and sediment loading from agricultural practices.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG PINE CR	off SR 1151	06/19/07	EF73	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MADISON	4	06010105	35.8384563	-82.7724754	6-108	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	15.8	1700	7	0.3	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	80	20 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	21.5
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	58
pH (s.u.)	6.7

Water Clarity

Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	83

Site Photograph



Substrate

cobble, boulder, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/19/07	2007-87	9	---	Not Rated

Most Abundant Species

River Chub

Exotic Species

Brown Trout

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a tributary to the French Broad River located about one and a half miles above its confluence; drains part of west-central Madison County. Although largely forested, much of the stream runs parallel with the road corridor and is vegetated with the exotic Japanese knotweed (*Polygonum cuspidatum*); many residential lawns and gardens also exist along the stream. **Habitat** -- high gradient mountain stream with chutes, riffles, runs, and a few good pools; several sunlit areas (road and stream-side residences) and a moderately elevated conductivity are contributing to the slick periphyton found on the rocky substrates. **2007** -- a highly abundant (n = 1749) yet low diversity fish community was collected; River Chubs and herbivorous Central Stonerollers (n = 592 or 34%, and n = 515 or 29%, respectively) comprised more than half of the fish collected. Several species were anticipated but absent including Mountain Brook Lamprey, Greenfin Darter, Swannanoa Darter, Mottled Sculpin, and Rainbow Trout. Based on NCIBI metric scores at this site, the rating would be Poor; since the fish community in this mountain watershed has been substantially altered by local

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Big Laurel Cr	SR 1503	EB184	09/18/06	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	355436	823238	6-112	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	5	2,677	4	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	40	10	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	18.7
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	45
pH (s.u.)	6.1

Water Clarity

Clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	83

Substrate

Rubble, gravel, sand, silt, and boulder.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
09/18/06	10088	---	44	---	2.72	Excellent
07/08/02	8843	---	45	---	2.30	Excellent
07/08/97	7341	---	33	---	2.30	Good

Taxonomic Analysis

EPT taxa richness has remained essentially unchanged between the 2002 and 2006 sampling events. Intolerant taxa common or abundant from both the 2002 and 2006 collections include the mayflies *Epeorus rubidus*, *Ephemera* sp., the stoneflies *Acroneuria abnormis*, *Paragnetina immarginata*, *Tallaperla* sp., and the caddisflies *Dolophilodes* sp., *Glossosoma* sp., and *Rhyacophila fuscata*. The slight increase in EPTBI measured from the 2006 sample was the result of a corresponding increase in abundances of several facultative taxa such as the mayflies *Baetis pluto*, *Plautius dubius*, *Maccaffertium modestum*, *Maccaffertium pudicum* and the caddisflies *Cheumatopsyche* sp., and *Ceratopsyche bronta*.

Data Analysis

Since the initial 1997 Good bioclassification, this site has improved to Excellent although the EPTBI did increase slightly in 2007 relative to the earlier samples. However, the 2007 sample also produced the highest EPT abundance (204) relative to the 2002 sample (196) and the 1997 sample (147). In general, the improvement seen in 2002 from the 1997 sample has been maintained through 2006 and indicates that water quality in this catchment remains stable. Indeed, conductivity values were nearly identical from 2002 (47µS/cm) and 2006 (45 µS/cm)

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Big Laurel Cr	NC 208	EB181	09/21/06	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	355522	824505	6-112	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	67.5	1,640	20	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	90	0	0	10-Residential

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	14.6
Dissolved Oxygen (mg/L)	9.49
Specific Conductance (µS/cm)	78
pH (s.u.)	7

Water Clarity

Clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	3
Riffle Habitat (16)	12
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	6
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	69

Substrate

Rubble, sand, gravel, boulder and silt.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
09/21/06	10074	---	47	---	3.37	Excellent
05/30/02	8767	90	46	4.60	3.50	Good
07/08/97	7340	---	36	---	2.70	Excellent
08/19/92	6004	---	38	---	3.00	Excellent

Taxonomic Analysis

Since 1997, overall EPT diversity has increased at this station. However, the 2002 Full-Scale sample produced the highest EPTBI recorded and was the result of first-time occurrence of several facultative mayfly taxa: *Plauditus dubius*, *Centrotium* sp., *Pseudocloeon frondale*, and *Hexagenia* sp. The occurrence of these taxa contributed to the lowered bioclassification observed in 2002. These aforementioned taxa were not collected in 2006 and as a result the EPTBI lowered.

Data Analysis

Although the 2002 sample received a Good bioclassification, it was on the borderline of receiving an Excellent bioclassification. While the EPTBI has increased since 1997, there has also been an increase in EPT abundance as it was 149 in 1992, 131 in 1997, 200 in 2002, and 262 in 2006. Overall, water quality at this location has remained generally stable since sampling commenced in 1992.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Puncheon Fk	SR 1503	EB217	08/01/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	355435	823239	6-112-5	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	7.3	2,998	5	0.5

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	20	30	10 (Commercial)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	23.3
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	41.4
pH (s.u.)	6.4

Water Clarity

Slightly Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	14
Pool Variety (10)	4
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	74

Substrate

Boulder, rubble, gravel, and sand.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/01/07	10265	40	40	2.48	2.48	Excellent
07/08/02	8770	40	40	2.80	2.80	Excellent
07/08/97	7342	31	31	2.20	2.20	Good

Taxonomic Analysis

This site has shown improved community metrics since the first sample in 1997. EPT taxa present in 2002 and 2007 but absent in 1997 included the mayflies *Acentrella* sp., *Serratella carolina*, the stonefly *Malirekus hastatus*, and the caddisflies *Lepidostoma* sp., *Polycentropus* sp., and *Pycnopsyche* sp. Moreover, there were several EPT taxa collected here for the first time and included the mayflies *Dipheter hageni*, *Ephemerella subvaria*, and the caddisflies *Diplectrona modesta*, *Leucotrichia pictipes*, *Lype diversa*, *Neophylax consimilis*, and *Neophylax mitchelli*.

Data Analysis

Since 1997, the EPT taxa richness and EPT abundance have been trending higher. In fact, the 2007 sample had the highest EPT abundance (252) yet measured here and has increased steadily from 174 in 1997 and 219 in 2002. In addition to these three samples, a 2006 sample was taken about 1.5 miles upstream off SR 1502 as part of a High Quality Waters/Outstanding Resource Waters reclassification study which was requested prior to the installation of a large subdivision and WWTP which will discharge to Puncheon Fork. This sample also resulted in an Excellent bioclassification. These data currently suggest favorable water quality at this location.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Shelton Laurel Cr	NC 208	EB219	09/19/06	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	355607	824435	6-112-26	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	54.8	1,712	10	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	80	0	0	20-Residential

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Madison Co., Boe/Laurel Elementary School	NC0034207001	0.005

Water Quality Parameters

Temperature (°C)	17.9
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	49
pH (s.u.)	5.9

Water Clarity

Clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	15
Pool Variety (10)	5
Riffle Habitat (16)	14
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	3
Total Habitat Score (100)	78

Substrate

Rubble, boulder, gravel, sand, bedrock, with a trace of silt.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
09/19/06	10101	---	44	---	3.40	Excellent
06/27/02	8841	---	32	---	3.60	Good
07/08/97	7339	---	31	---	3.10	Good
08/19/92	6003	---	32	---	2.90	Good
05/16/90	5267	---	44	---	2.50	Excellent

Taxonomic Analysis

The 2006 sample resulted in several EPT taxa collected at this location for the first time and included the mayfly *Maccaffertium pudicum*, the stoneflies *Eccopectura xanthenes*, *Paragnetina immarginata*, *Pteronarcys proteus*, and the caddisflies *Leucotrichia pictipes*, and *Paranyctiophylax moestus*. The addition of the long-lived and intolerant stoneflies *Paragnetina immarginata* and *Pteronarcys proteus* are particularly significant and suggest improved conditions at this location in 2006. In addition, the 2006 sample resulted in the most EPT specimens (203) ever collected here and represents a substantial increase from earlier samples: 142 in 1990, 144 in 1992, 163 in 1997, and 150 in 2002.

Data Analysis

Although the EPTBI had been steadily increasing from the initial 1990 Excellent sample, this trend was reversed in 2006 as the EPTBI decreased slightly from the 2002 sample. In addition, the combination of the highest EPT abundance yet measured at this location, the highest EPT diversity measured since 1990, and the first time presence of two long-lived and intolerant stoneflies suggest improved water quality along this reach of Shelton Laurel Creek. Although not conclusive, the limited conductivity data available here are supportive of this assertion as the conductivity was lower in 2006 (49 µS/cm) versus the 2002 measurement (56 µS/cm).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Spring Cr	SR 1172	EB222	11/01/06	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Madison	4	06010105	354800	825110	6-118-(1)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	30.8	2,437	6	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	0	30	20-road

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	10.6
Dissolved Oxygen (mg/L)	10.2
Specific Conductance (µS/cm)	63
pH (s.u.)	7.4

Water Clarity

Clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	2
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	2
Riffle Habitat (16)	16
Left Bank Stability (7)	2
Right Bank Stability (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	57

Substrate

Rubble, boulder, gravel, and sand.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
11/01/06	10119	---	41	---	3.06	Excellent
06/27/02	8842	---	37	---	3.30	Excellent
07/08/97	7338	---	31	---	3.00	Good
08/19/92	6002	---	26	---	2.70	Good-Fair

Taxonomic Analysis

This site at SR 1172 is well upstream of the historic basinsite at NC 209. Although it is further upstream, and the sample was collected outside of the normal summer window, there were several non-seasonal intolerant EPT taxa collected from Spring Creek for the first time and included the mayflies *Baetisca carolina* and *Rhithrogena uhari*, the stoneflies *Agnatina capitata* and *Tallaperla* sp, and the caddisflies *Diplectrona modesta*, and *Rhyacophila carolina*.

Data Analysis

Based on the 2002 sample collected further downstream at NC 209, the 2006 sample obtained at SR 1172 provides further evidence that water quality continues to improve throughout the Spring Creek watershed over levels measured in the early 1990's when biomonitoring initiated. Since 1992, EPT taxa richness and EPT abundance have generally been on the increase. Sampling at the historic basinsite at NC 209 will resume in 2012.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MEADOW FK	NC 209	06/19/07	EF72	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MADISON	4	06010105	35.8309149	-82.8620598	6-118-19	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	22.7	1900	7	0.4	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	98	2 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	18.8
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	41
pH (s.u.)	6.2

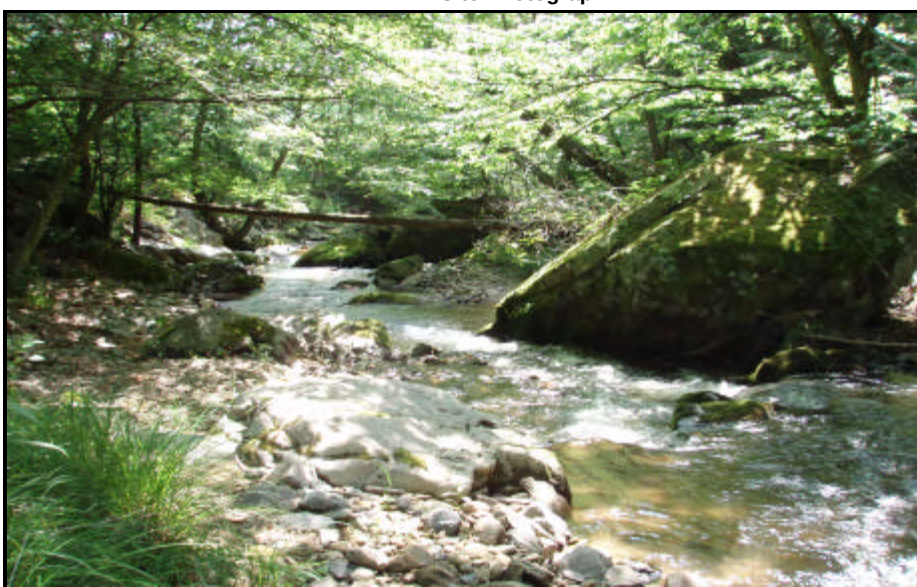
Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	15
Pool Variety (10)	9
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	99

Site Photograph



Substrate

cobble, boulder, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/19/07	2007-86	11	48	Good

Most Abundant Species

Longnose Dace

Exotic Species

Rainbow Trout and Brown Trout

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected here. **Watershed** -- a forested tributary to Spring Creek and ultimately the French Broad River; this site location is just above the Spring Creek confluence; drains the westernmost tip of Madison County, including some Pisgah National Forest lands; Hatchery Supported Trout Waters. **Habitat** -- very high quality instream habitats including high gradient riffles and runs, and fast plunge pools; the stream is braided in several sections of the 600' sample reach and has extensive forested riparian zones; this site earned the highest habitat score among all sites sampled in the basin in 2007. **2007** -- an abundant (n = 421) assemblage of cool and cold water fish species was collected; the fish community had low to moderate species richness (typical for high gradient mountain streams) and included 2 reproducing species of trout; there appears to be no water quality issues in this high gradient mountain watershed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Pigeon R	I-40 at Brown's Bridge	EB250	08/08/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Cocke Co., Tenn.	5	6010106	354707	830647	5-(7)f	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	535	2,048	40	0.6

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	100	0	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	22.6
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	220
pH (s.u.)	6.4

Water Clarity

Slightly Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	10
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	5
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	1
Total Habitat Score (100)	70

Site Photograph



Substrate

Boulder, rubble, gravel, and sand with a trace of bedrock.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/07	10302	84	34	4.90	3.70	Good
07/23/02	8885	76	38	5.00	3.92	Good
07/24/97	7365	81	40	4.77	3.13	Good
08/03/94	6632	58	27	4.37	3.61	Good
07/25/90	5400	57	22	4.67	3.78	Good-Fair

Taxonomic Analysis

Including the 2007 sample, this location has been sampled on 12 occasions with five samples resulting in Good bioclassifications, six Good-Fair ratings, and one Fair bioclassification in 1985. This site showed an improvement in bioclassification starting with the 1994 sample and this trend has continued (particularly as it pertains to the EPT community). Indeed, since the improvement noted in 1994, numerous EPT taxa have been present each year since 1994 and include the mayflies *Baetis intercalaris*, *Maccaffertium ithaca*, *M. modestum*, the stoneflies *Acroneuria abnormis*, *Leuctra* sp., *Paragnetina immarginata*, and the caddisflies *Cheumatopsyche* sp., *Hydropsyche venularis*, *Lepidostoma* sp., *Polycentropus* sp., *Ceratopsyche*

Data Analysis

With the exception of the 1985 sample, this site has always been either Good-Fair or Good and has been consistently been Good since 1994. Although there are large diurnal swings in discharge in this segment of the Pigeon River below Lake Waterville, it does not appear that this is an overwhelmingly negative influence on the invertebrate community as a whole. However, there may be some issues with low dissolved oxygen levels as the low dissolved oxygen indicating gastropod *Physella* sp has been common in the last three collections (previously *Physella* sp had only been collected once and was rare between 1989, 1990, and 1994).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
W Fk Pigeon R	SR 1216	EB273	08/08/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	352346	825617	0	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III; Tr	28	2,998	15	0.5

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	90	0	0	10 (SR 1216)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	22.3
Dissolved Oxygen (mg/L)	10.9
Specific Conductance (µS/cm)	6
pH (s.u.)	6.3

Water Clarity

Clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	15
Pool Variety (10)	5
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	82

Substrate

Rubble, boulder, gravel, sand.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/07	10306	---	46	---	1.93	Excellent
11/29/04	9528	69	42	2.50	2.00	Good
07/25/02	8896	---	37	---	2.40	Excellent
07/22/97	7358	---	50	---	1.50	Excellent
01/12/93	6044	81	47	2.50	1.70	Excellent

Taxonomic Analysis

The upstream portion of the West Fork Pigeon River watershed is completely protected with only very minimal impacts from SR 1216 present. As would be expected from an undisturbed catchment such as this, all but one sample taken here has been Excellent. Several of the same pollution intolerant EPT taxa have been present at this station from every summer sample and include the mayflies *Acentrella* sp., *Drunella cornutella*, and *Rhithrogena exilis*, the stoneflies *Acroneuria abnormis*, *Leuctra* sp. and *Pteronarcys proteus*, and the caddisflies *Ceratopsyche alhedra*, *Dolophilodes* sp., *Glossosoma* sp., *Lepidostoma* sp., *Pycnopsyche* sp., and *Ceratopsyche sparna*.

Data Analysis

With the exception of the post Hurricane Ivan, Francis, and Jeanne sampling conducted in 2004, every sample taken at this location using NCDWQ collection methodology (six samples since 1990) has resulted in an Excellent bioclassification. With the exception of the 2004 post Hurricane sampling, and the 2002 sample (which was conducted during a torrential downpour) EPT community metrics have been remarkably consistent at this location over time and reflects the highly protected nature of the West Fork Pigeon River catchment.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Richland Cr	Business, US 23	EB262	08/07/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	352752	830040	5-16-(11.5)b	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	11	2,759	5	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	10	90	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	27.9
Dissolved Oxygen (mg/L)	6.6
Specific Conductance (µS/cm)	24.5
pH (s.u.)	6.8

Water Clarity

Clear

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	3
Instream Habitat (20)	14
Bottom Substrate (15)	14
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	2
Right Riparian Score (5)	1
Total Habitat Score (100)	73

Substrate

Rubble, gravel, sand, and boulder.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/07/07	10297	---	27	---	2.85	Good-Fair
07/29/02	8894	---	31	---	2.90	Good
07/25/97	7370	---	23	---	2.70	Good-Fair
08/18/92	5997	---	17	---	3.50	Fair

Taxonomic Analysis

Although the 2007 sample declined in bioclassification from the 2002 (Good) sample, the 2007 collection was just one EPT short of receiving a Good rating and the EPTBI was essentially identical between years. These data suggest that there has been no significant change in water quality at this location since 2002. In terms of EPT species richness, the 2007 and 2002 sample were both superior to the 1997 and 1992 samples. Intolerant EPT taxa collected either in 2002 and or 2007 but absent from the 1992 and 1997 samples include the mayflies *Drunella cornutella*, *Epeorus dispar*, *Habrophlebiodes* sp., *Stenacron pallidum*, the stoneflies *Isoperla holochlora*, *Malirekus hastatus*, *Pteronarcys* sp., and *Suwallia* sp., and the caddisflies *Brachycentrus spinae*, *Dolophilodes* sp.,

Data Analysis

The large increase in EPT species richness noted in 2002 and 2007 (relative to the 1992 and 1997 samples) is likely related to the decreased nonpoint runoff which is prevalent in this watershed as both of these samples were taken during droughts. The large increase in EPT taxa richness from the 1992 and 1997 samples noted in 2002 and 2007 was mostly concentrated in stonefly diversity. In 1992 and 1997 only one taxon of stonefly was collected. In 2002 four stonefly taxa were collected and in 2007 three taxa were present. In general, stoneflies are widely considered the most intolerant of all the aquatic insect orders and combined with the other improved metrics these data continue to suggest improved conditions in this segment of Richland Creek.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
RICHLAND CR	Boyd Ave	06/15/07	EF44	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HAYWOOD	5	06010106	35.48916667	-82.99916667	5-16-(11.5)a	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
B;Tr	42.9	2665	12	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	25	75 (residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	16.6
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	50
pH (s.u.)	6.9

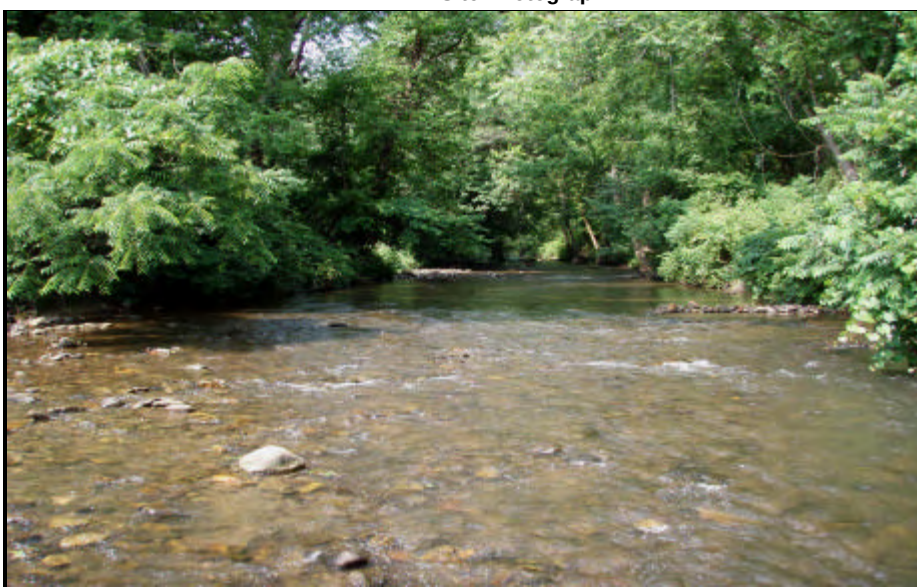
Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	83

Site Photograph



Substrate

Cobble and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/15/07	2007-82	7	---	Not Rated
07/17/01	2001-78	11	28	Poor

Most Abundant Species

Longnose Dace

Exotic Species

Rainbow Trout, Brown Trout, and Green Sunfish

Species Change Since Last Cycle

Gains -- Western Blacknose Dace. **Losses** -- Whitetail Shiner, White Sucker, Brown Bullhead, Redbreast Sunfish, and Black Crappie.

Data Analysis

Watershed -- a tributary to the Pigeon River; drains southwestern Haywood County, including the upper portion of the City of Waynesville and the US 23/74 corridor. **Habitat** -- fast, shallow riffles and runs; undercuts and snags; very clean substrate; open canopy near the bridge, then shaded; residences within the riparian zones. **2007** -- conductivity slightly elevated; more than twice as many fish were collected in 2007 than in 2001 (n = 410 vs. 200); only seven species were present, no darters, lampreys, or sculpins were present; excellent wild Rainbow Trout and Brown Trout populations; Rainbow Trout (n = 90) were 125-250 mm TL and Brown Trout (n = 11) were 150-270 mm TL; fish community is Not Rated because the community has characteristics of a trout stream which it did not have in 2001. **2001 & 2007** -- 12 species are known from the site, but no darters, sculpins, or lampreys; percentage of tolerant fish decreased from 13.5% in 2001 to 0.5% in 2007; dominant species have been the Northern Hogsucker and Longnose Dace; although Not Rated; community has greatly improved since 2001; sampled in 2001 as part of the Richland Creek Use Attainability Reclassification study (BAU Memorandum F-2001020906).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Richland Cr	SR 1184	EB260	08/07/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	353031	825819	0	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	47.7	2,586	10	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	50	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	N/A
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	N/A
pH (s.u.)	7.2

Water Clarity

Slightly Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	14
Pool Variety (10)	3
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	77

Substrate

Rubble, gravel, sand, and boulder.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/07/07	10299	---	29	---	3.41	Good
07/24/02	8891	---	19	---	4.30	Good-Fair
07/24/97	7373	---	24	---	3.20	Good-Fair
08/18/92	5998	---	26	---	3.30	Good-Fair
08/10/88	4692	42	11	6.20	5.30	Fair

Taxonomic Analysis

In addition to the six samples noted above, this location has also been sampled twice earlier (1985 and 1983) with both of these samples producing Poor bioclassifications. This segment of Richland Creek has been improving in bioclassification since 1983 and the 2007 sample set record high EPT species richness and abundance values. Notably intolerant EPT collected for the first time at this location included the mayflies *Serratella carolina*, *S. deficiens*, the stonefly *Malirekus hastatus*, and the caddisflies *Diplectrona modesta*, *Dolophilodes* sp., *Lepidostoma* sp., *Leucotrichia pictipes*, *Oecetis* sp., and *Trifaenodes ignitus*.

Data Analysis

The continued trend of improving EPT community metrics and bioclassification at this location since 1983 is primarily the result of the removal of the two upstream dischargers (Lee and Dayco) in 1998. Moreover, recent work (2006 and 2007) undertaken by Regional Office staff have resulted in the identification and subsequent repair of numerous sewer leaks and overflows upstream of this location (on Richland Creek proper as well as on several tributaries including Hyatt Creek and Shelton Branch). The record high EPT richness and EPT abundance measured in 2007 is likely related to a subsequent reduction in these inputs as well as a reduction in overall nonpoint runoff from Waynesville.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
RICHLAND CR	SR 1184	06/15/07	EF47	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HAYWOOD	5	06010106	35.50833333	-82.97194444	5-16-(11.5)c	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
B;Tr	48	2590	9	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	5 (residential)	0	25 (industrial)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	16.5
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	56
pH (s.u.)	6.2

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	4
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	85

Site Photograph



Substrate

Cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/15/07	2007-81	12	36	Fair
07/17/01	2001-77	9	28	Poor

Most Abundant Species

Central Stoneroller

Exotic Species

Rainbow Trout, Brown Trout, Redbreast Sunfish, and Green Sunfish

Species Change Since Last Cycle

Gains -- Longnose Dace, Western Blacknose Dace, Smallmouth Bass, and Largemouth Bass. **Losses** -- Bluegill.

Data Analysis

Watershed -- a tributary to the Pigeon River; drains southwestern Haywood County, including the Waynesville metropolitan area; Hatchery Supported Trout Waters; site is ~ 1.3 miles above Lake Junaluska. **Habitat** -- riffles, chutes, and runs; deep pool in middle of the reach; residence along the right bank. **2007** -- conductivity slightly elevated; more than 15 times as many fish were collected in 2007 than in 2001 (n = 603 vs. 41); increases especially noted in the number of Central Stoneroller, Longnose Dace, and Northern Hogsucker; only 12 species were collected; percentage of tolerant fish (Redbreast Sunfish and Green Sunfish) was high, but decreased from 46% in 2001 to 11% in 2007; percentage of omnivores+herbivores was also high; wild Rainbow Trout and Brown Trout present, some stocked trout collected, including one Brook Trout 323 mm TL. **2001 & 2007** -- 13 species known from the site, but no darters, sculpins, or lampreys; although community was rated Fair in 2007, there was a dramatic improvement since 2001 in the abundance and diversity metrics; dominant species is the Central Stoneroller; sampled in 2001 as part of the Richland Creek Use Attainability Reclassification study (BAU Memorandum F-2001020906).

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
RICHLAND CR	Walnut Trail Rd	06/14/07	EF48	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HAYWOOD	5	06010106	35.53777778	-82.95638889	5-16-(16)a	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	64.7	2510	13	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	55	15 (rural residential)	25	5 (NC 209)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	22.7
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	60
pH (s.u.)	5.8

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	79

Site Photograph



Substrate

Cobble, boulder, and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/14/07	2007-80	10	40	Good-Fair
09/24/02	2002-83	12	32	Poor
10/22/97	97-91	12	38	Fair

Most Abundant Species

Central Stoneroller

Exotic Species

Redbreast Sunfish

Species Change Since Last Cycle

Gains -- Tuckasegee Darter. **Losses** -- Brown Bullhead and Green Sunfish.

Data Analysis

Watershed -- a tributary to the Pigeon River; drains southwestern Haywood County, including the City of Waynesville metropolitan area; site is ~ 1.5 miles above the creek's confluence and ~ 1 mile below Lake Junaluska. **Habitat** -- riffles, chutes, and runs with a variety of pool sizes; exposed gravel bars. **2007** -- water clear and warmer than expected, conductivity slightly elevated, dissolved oxygen saturation at 74%; twice as many fish were collected in 2007 than in 2002 (n = 224 vs. 116), but the diversity metrics and abundance were still lower than expected for a stream of this size; only 10 species present, including just 2 species of cyprinids; percentage of tolerant fish (Redbreast Sunfish) decreased from 44% to 4% between 2002 and 2007; percentage of species with multiple age classes increased from 64% to 80%; first time a species of darter has been collected; large specimens of Northern Hogsucker and Rock Bass. **1997 - 2007** -- total habitat scores have ranged from 73 to 79; conductivity has ranged from 60 to 81 µS/cm; 15 species are known from the site, including 6 species of sunfish and 4 species of cyprinids, but no sculpins or lampreys; dominant species have been the Central Stoneroller and Northern Hogsucker.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Richland Cr	SR 1519	EB261	08/07/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	353252	825645	0	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	67.7	2,493	9	0.6

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	30	20	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	N/A
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	N/A
pH (s.u.)	6.6

Water Clarity

Slightly Turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	76

Substrate

Rubble, sand, gravel, boulder and bedrock.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/07/07	10300	---	16	---	4.46	Fair
07/25/02	8893	45	20	5.40	4.40	Good-Fair
07/25/97	7372	---	15	---	4.40	Fair
08/18/92	5999	---	14	---	4.40	Fair

Taxonomic Analysis

With the exception of the 2002 collection, this site has always maintained a Fair bioclassification. The 2007 sample lacked, for the first time ever, the flow dependent Heptageniid mayflies *Maccaffertium ithaca*, and *M. modestum* as well as the edge-dependent caddisflies *Trienodes ignitus* and *Nectopsyche exquisita*. The lack of these taxa are likely related to the 2007 drought and corresponding decreased discharge from Lake Junaluska which would both reduce flow as well as available edge habitat.

Data Analysis

This site is approximately 2.3 miles below Lake Junaluska. It is possible that the severe 2007 drought has resulted in reduced discharge from the lake. This hypothesis is supported by the absence (for the first time) of all Heptageniid mayflies and by a lack of several edge-dependent taxa. While the next closest upstream site (approximately 3.2 miles) on Richland Creek (SR 1184) improved drastically in 2007 due to reduced non-point pollution input, these effects were likely attenuated by the effects of the lake. Indeed, relative to the SR 1184 site, this location has always had much lower EPT diversity and is likely related to physical and chemical effects of Lake Junaluska.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Johnathans Cr	SR 1306	EB239	08/07/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	353107	830607	0	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III; Tr, CA	13.8	2,974	6	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	30	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

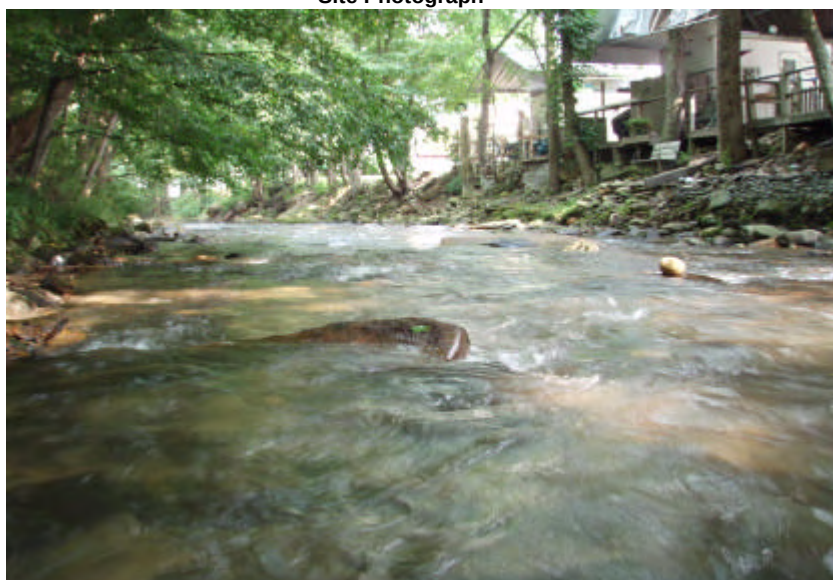
Water Quality Parameters

Temperature (°C)	N/A
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	N/A
pH (s.u.)	N/A

Water Clarity	Slightly Turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	0
Right Riparian Score (5)	3
Total Habitat Score (100)	73

Site Photograph

Substrate	Boulder, rubble, gravel, and sand.
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/07/07	10301	---	38	---	1.73	Excellent
07/24/02	8890	---	37	---	1.50	Excellent
07/24/97	7368	---	46	---	1.60	Excellent
08/18/92	5996	---	41	---	2.00	Excellent

Taxonomic Analysis

Although some of the watershed upstream of this location includes residential and commercial impacts, the majority of this catchment is still forested. As such, the EPT community here has largely been stable through time. However, the 2002 and 2007 samples both lacked several caddisfly taxa that had been collected here in 1992 and 1997. These taxa were *Goera* sp., *Neophylax mitchelli*, *Rhyacophila nigrita*, and *Ceratopsyche slossonae*. It is unclear why these highly pollution intolerant taxa were absent in 2002 and 2007 but present in 1992 and 1997.

Data Analysis

With the exception of the four aforementioned intolerant caddisfly taxa absent in 2007 and 2002 but collected in 1997 and 1992, the EPTBI (and EPT taxa richness) has been largely stable at this location. However, the EPT abundance has continued a slightly downward trend with 193, 272, 150, and 191 EPT specimens being tallied from the 1992, 1997, 2002, and 2007 samples respectively. Conductivity was very low (24 µS/cm) from the 2002 sample generally indicating favorable water chemistry here but meters were malfunctioning in 2007 so no measurements were made.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Johnathans Cr	SR 1322	EB240	08/08/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	353433	830107	0	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	50.9	2,564	11	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	30	50	20	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Maggie Valley WWTP	NC0056561001	1.0

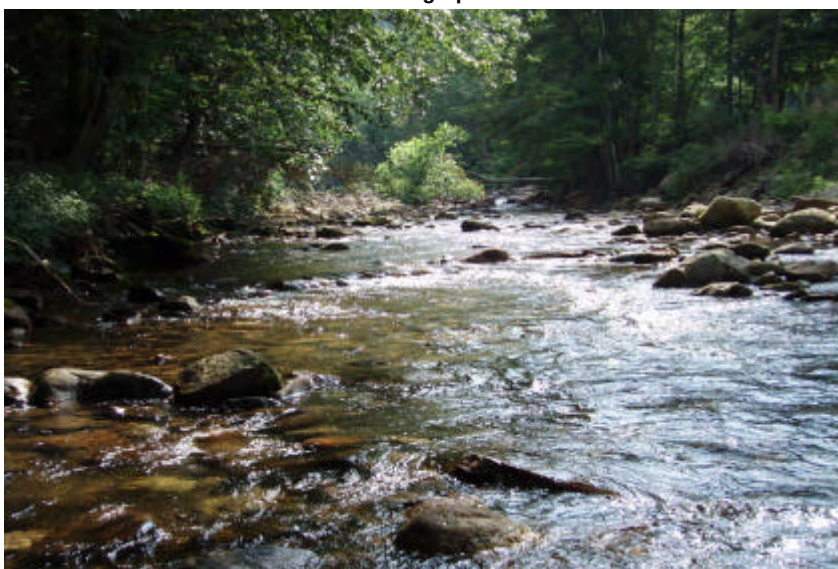
Water Quality Parameters

Temperature (°C)	21.2
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	N/A
pH (s.u.)	6

Water Clarity

Clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	3
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	72

Substrate

Boulder, rubble, gravel, and sand.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/07	10305	---	35	---	2.95	Good
07/25/02	8892	---	40	---	3.60	Excellent
07/24/97	7364	---	41	---	2.60	Excellent
08/18/92	5995	---	33	---	3.30	Good

Taxonomic Analysis

There were several EPT taxa that were present from the 1997 and 2002 samples that were absent for the first time in 2007 and included the mayflies *Baetis flavistriga*, *Heptagenia marginalis*, *Isonychia* sp., the stonefly, *Perlesta* sp., and the caddisfly *Pycnopsyche* sp. The decrease in EPT taxa for 2007 may be the result of less dilution of the upstream discharger due to the severe 2007 drought. Although 2002 was also a drought year that event was much less severe than the 2007 drought and may have provided more dilution and thereby explaining the 2002 Excellent rating.

Data Analysis

This site is downstream from Maggie Valley and landuse is a mix of urban, forest and agriculture. This site is also approximately two miles downstream from the Maggie Valley WWTP (NC0056561001; 1.0 MGD). Streams that are downstream of large point dischargers often experience an increase in the instream waste concentration (IWC) during times of drought due to lessened dilution. This was likely the case in 2007 and the drop in EPT taxa measured in 2007 supports this conclusion. Unfortunately, water chemistry meters were not in operation at the time of sampling so a conductivity measurement was not possible. The one previous conductivity measurement made in 2002 (34 µS/cm) was still quite low despite the upstream discharger.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Johnathans Cr	SR 1349	EB241	08/08/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	353717	830018	0	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	65.4	2,410	17	0.5

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	90	10	0	0

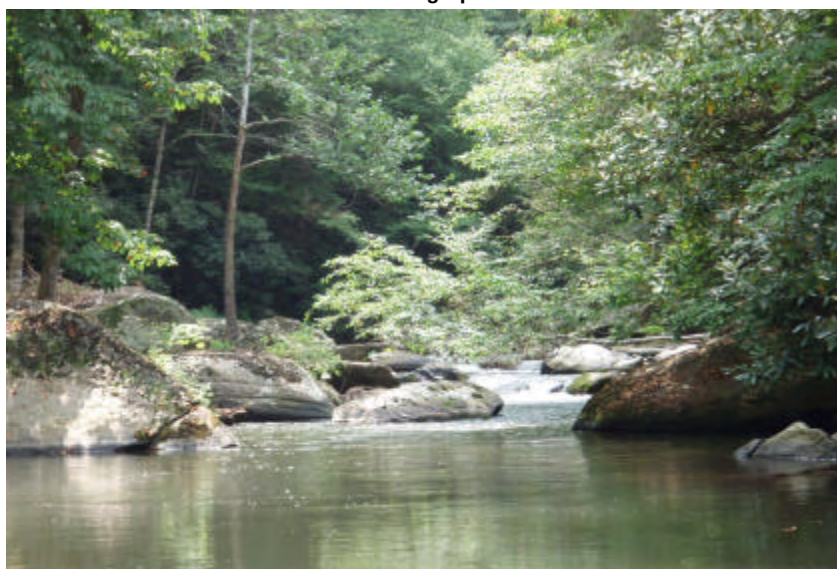
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	21.9
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	N/A
pH (s.u.)	7.3

Water Clarity

Slightly Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	13
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	3
Total Habitat Score (100)	74

Substrate

Rubble, gravel, sand, boulder, and silt.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/07	10304	---	33	---	2.95	Good
09/09/02	8986	---	34	---	3.80	Good
07/24/97	7367	---	39	---	3.10	Excellent
08/18/92	5994	---	23	---	3.70	Good-Fair

Taxonomic Analysis

EPT richness at this location continues a slight downward trend since the only Excellent sample was recorded here in 1997. EPT present in 1997 but absent in the drought years of 2002 and 2007 included the mayflies *Baetis tricaudatus*, *Caenis* sp., *Dannella simplex*, *Drunella conestee*, *Ephemerella catawba*, *Rhithrogena* sp., *Mccaffertium modestum*, *Serratella serratoides*, the stonefly *Perlesta* sp., and the caddisfly *Micrasema wataga*.

Data Analysis

Declines in EPT taxa richness in 2002 and 2007 are likely attributed to the concentration of effluent from the upstream Maggie Valley WWTP discharge. The record high EPT richness noted in 1997 coincided with a year that had more rainfall than either the last two samples and this improvement in the EPT community was likely the result of dilution effects. Water chemistry meters were malfunctioning at the time of sampling so no conductivity measurements were available.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CRABTREE CR	NC 209	06/14/07	EF21	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HAYWOOD	5	06010106	35.59805556	-82.93388889	5-22	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	19.1	2520	8	0.3	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	25	0	65 (pasture)	10 (old school)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.1
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	65
pH (s.u.)	7.6

Water Clarity

Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	5
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	68

Site Photograph



Substrate

Sand, cobble, boulder, and bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/14/07	2007-79	13	44	Good-Fair
09/24/02	2002-82	11	40	Good-Fair
06/03/97	97-52	8	28	Poor

Most Abundant Species

Central Stoneroller

Exotic Species

Brown Trout and Redbreast Sunfish

Species Change Since Last Cycle

Gains -- River Chub, Fathead Minnow, and Western Blacknose Dace. Losses -- Largemouth Bass.

Data Analysis

Watershed -- a tributary to the Pigeon River; drains northeastern Haywood County; no municipalities in the rural watershed. **Habitat** -- riffles, chutes, runs, and plunge pools; a fairly open canopy with breaks in the riparian zones; eroded areas, especially at the end of the reach on the left bank; cattle continued to have access to the stream; water very easily silted. **2007** -- conductivity elevated; a very abundant community with a lot of biomass of most species; diversity lower than expected, no species of darters present; dominance by the Central Stoneroller and the very high percentage of omnivores+herbivores were indicative of nutrient enrichment; River Chub collected for the very first time. **1997 - 2007** -- conductivity has ranged from 57 to 75 µS/cm; total habitat scores have ranged from 64 to 68; 14 species are known from the site, but no species of darters, sculpins, or lampreys ever collected at the site; species diversity and NCIBI scores and ratings have steadily increased over time, but nutrients and bank erosion are still chronic problems at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Fines Cr	SR 1355	EB231	08/08/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	354007	825938	0	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	25.6	2,295	7	0.6

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	80	10	10	

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	21.8
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	52.8
pH (s.u.)	7.3

Water Clarity

Slightly Turbid

Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	87

Substrate

Boulder, rubble, gravel, sand, silt, and bedrock.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/07	10303	---	29	---	3.13	Good
07/24/02	8889	---	25	---	3.50	Good-Fair
07/23/97	7362	---	27	---	2.60	Good-Fair
08/17/92	5991	---	19	---	3.70	Good-Fair

Taxonomic Analysis

The 2007 sample produced both the highest EPT species richness and the highest EPT abundance (132) ever measured at this location. Intolerant EPT taxa collected for the first time here included the mayflies *Acentrella* sp., *Baetisca* sp., the stoneflies *Malirekus hastatus*, *Perlesta* sp., and the caddisfly *Lepidostoma* sp.

Data Analysis

The Fines Creek watershed is a mixture of residential, agricultural, and forest uses. As would be expected in a catchment where non-point pollution is the primary pollutant source, reduced pollution runoff due to the 2007 drought is likely the reason for the improvement in metrics and bioclassification seen this year.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FINES CR	off SR 1355	06/14/07	EF76	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
HAYWOOD	5	06010106	35.6669444	-82.991111	5-32	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	25.7	2293	12	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	100	0	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	16.0
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	71
pH (s.u.)	6.8

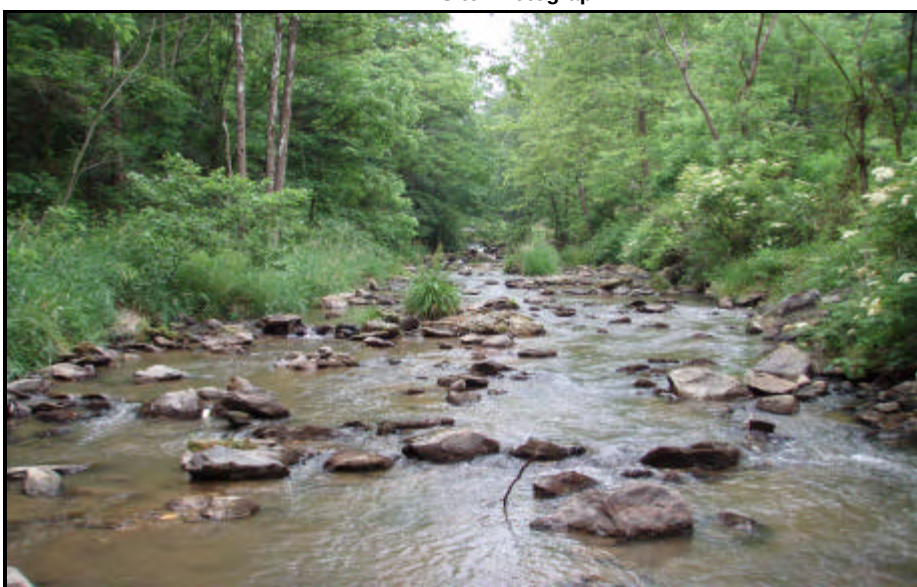
Water Clarity

Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	89

Site Photograph



Substrate

cobble, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/14/07	2007-78	16	40	Good-Fair
09/24/02	2002-85	13	38	Fair
10/22/97	97-93	11	34	Fair

Most Abundant Species

Central Stoneroller

Exotic Species

Redbreast Sunfish, Swamp Darter, Rainbow Trout, and Brown Trout

Species Change Since Last Cycle

Gains -- Swamp Darter, Smallmouth Bass, Largemouth Bass, Black Redhorse, and Western Blacknose Dace.
Losses -- Whitetail Shiner and Green Sunfish.

Data Analysis

Watershed -- the last tributary to join the Pigeon River above Walters Lake; located about 200 meters above its confluence; drains part of northeast Haywood County; much of the lower valleys in this watershed are used for dairy production, and most tributaries are paralleled by roads; a use attainability study was conducted in 2006, which qualified this watershed for supplemental Tr reclassification (BAU Memo 20060906). **Habitat** -- high gradient mountain stream habitats with plunge pools, abundant riffles, and some large woody debris from storm events. **2007** -- a fairly diverse and abundant (n = 754) fish community was collected, half of which consisted of the herbivorous Central Stonerollers (n = 376); the slight improvement in rating is largely due to additional species and the increase in abundance since the 2002 sample; one introduced Swamp Darter was collected. **1997 - 2007** -- nonpoint agricultural runoff continues to impact the water quality in this catchment. However, species richness and abundance of the fish community has steadily increased over 3 samples.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Cataloochee Cr	SR 1395	EB227	08/08/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Haywood	5	06010106	354002	830422	0	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr, ORW	49.1	2,499	18	0.3

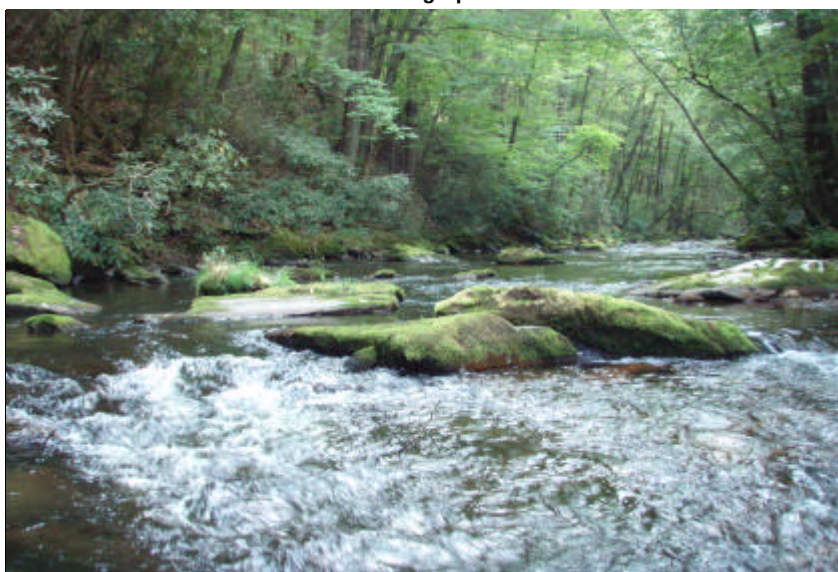
Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	100	0	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/A

Water Quality Parameters

Temperature (°C)	N/A
Dissolved Oxygen (mg/L)	N/A
Specific Conductance (µS/cm)	N/A
pH (s.u.)	N/A

Water Clarity	Clear
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Site Photograph**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	20
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	92

Substrate	Boulder, rubble, gravel, sand, silt, and bedrock.
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/07	10310	120	59	3.33	2.10	Excellent
07/24/02	8888	---	42	---	1.50	Excellent
07/23/97	7363	102	50	2.70	1.60	Excellent
08/17/92	5992	84	42	2.90	1.80	Excellent
07/11/91	5660	80	48	2.70	2.00	Excellent

Taxonomic Analysis

Including the 2007 sample, this segment of Cataloochee Creek has been sampled on 14 occasions with all collections resulting in Excellent bioclassifications. The 2007 sample resulted in the highest EPT species richness ever measured here with several taxa collected for the first time including the mayfly *Ephemera blanda*, the stoneflies *Helopiscus* sp., and *Suwallia* sp., and the caddisflies *Goera calcarata*, and *Oligostomis pardalis*. This entire catchment is contained within Great Smokies National Park. This is reflected in the invertebrate community as many of the same highly intolerant taxa have been collected here during each summer sample and include the mayflies *Drunella conestee*, *D. cornutella*, the stoneflies *Isoperla holochlora*, *Malirekus hastatus*, and *Tallaperla* sp., and the caddisflies *Dolophilodes* sp., *Glossosoma* sp., and *Lepidostoma*.

Data Analysis

Although water chemistry meters were not functioning in 2007, previous water chemistry measurements reflect the highly protected nature of this catchment as measurements in 2002 and 1997 were 16µS/cm and 10 µS/cm respectively which are among the lowest conductivities measured in North Carolina. Predictably, this site has among the highest EPT species richness ever recorded by Division of Water Quality Biologists and ranks 6th overall from more than 6,500 samples. In addition, this location also ranks 2nd overall in terms of total EPT abundance with 356 EPT specimens collected.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NOLICHUCKY R	NC 197 (SR1321)	EB289	08/14/07	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Mitchell	6	06010108	360429	822041	7	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	593	1960	30	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	60	20	0	20

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

Water Quality Parameters

Temperature (°C)	---
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	106
pH (s.u.)	8.5

Water Clarity

slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	7
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	82

Substrate

cobble, boulder, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10247	88	37	4.5	3.5	Good
07/09/02	8846	89	43	4.4	3.6	Good
07/09/97	7345	71	37	4.0	3.6	Good
07/21/92	5926	87	41	4.2	3.4	Good

Taxonomic Analysis

EPT richness in the Nolichucky River fell to 37 as 3 fewer mayfly taxa, 2 caddisfly taxa, and one stonefly taxon were collected than in 2002, which had the highest richness ever recorded for a basinwide sample at this site. The EPT community was dominated by moderately intolerant taxa like *Isonychia* sp., *Tricorythodes* sp., *Neureclipsis* sp. and *Oecetis persimilis*. Abundant intolerant taxa that occurred included *Acronuria abnormis*, *Paragnetina ichusa*, and *Ceratopsyche morosa*. Previously collected taxa that were not found in 2007 included the intolerant species, *Mystacides sepulchralis*, *Goera* sp., *Glossosoma* sp., *Anthopotamus distinctus*, *Leucrocota* sp. and *Perlesta* sp.

Data Analysis

This river integrates water from the Cane River and the North Toe River (Excellent and Good, respectively) and has no NPDES dischargers. This site has consistently rated Good for the last 15 years. The biotic index has increased since 1997, suggesting slightly more tolerant benthic community which is supported by an increase in midges and oligochaetes. A relatively high specific conductance indicates dischargers upstream (mostly in the North Toe River) but seems to have little impact on the biota. The water quality, overall, remains good and appears to be relatively stable.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N TOE R	SR 1121	06/22/07	EF36	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
AVERY	6	06010108	36.06583333	-82.00027778	7-2-(0.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-V;Tr	29.5	3262	14	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	30 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	14.0
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	64
pH (s.u.)	7.0

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	15
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	4
Light Penetration (10)	4
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	82

Site Photograph



Substrate

cobble, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/22/07	2007-93	15	44	Good-Fair
06/23/97	97-61	18	46	Good-Fair

Most Abundant Species

Mottled Sculpin

Exotic Species

Green Sunfish, Rainbow Trout, and Brown Trout

Species Change Since Last Cycle

Gains -- Green Sunfish. **Losses** -- Mountain Brook Lamprey, Redbreast Sunfish, Western Blacknose Dace, and Brook Trout.

Data Analysis

Watershed -- the headwaters of the North Toe River located in west-central Avery County; the North Toe River eventually joins the Cane River to form the Nolichucky River in Yancey County before flowing into Tennessee; land use in this upper part of the watershed is a mix of forest, agriculture and urban (Newland and part of Sugar Mountain); Hatchery Supported Trout Waters. **Habitat** -- primarily riffles and runs with some boulder pools; the macrophyte *Podostemum* was thriving among the riffle habitats. **2007** -- an extremely abundant ($n = 1242$), and moderately diverse fish community was collected including several large wild specimens of Brown and Rainbow Trout; Mottled Sculpin represented 35% ($n = 435$) of the sample population. **1997 - 2007** -- relatively stable NCIBI metrics between sample years; although the rating did not change, the small drop in NCIBI score comes from 3 fewer species in the 2007 sample, including the intolerant Brook Trout. This watershed continues to receive non-point nutrient loading from agricultural practices.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N TOE R	US 19E	EB288	08/13/07	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Avery	6	06010108	355852	820058	7-2-(21.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV; Tr, CA	74	2800	25	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	40	40	0	20 (campground)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

Water Quality Parameters

Temperature (°C)	22.6
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	58
pH (s.u.)	7.7

Water Clarity

slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	14
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	4
Left Riparian Score (5)	2
Right Riparian Score (5)	4
Total Habitat Score (100)	74

Substrate

cobble, boulder, and gravel; silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/13/07	10243	95	42	4.1	3.4	Good
07/10/02	8805	89	39	4.9	3.8	Good
07/10/97	7351	72	42	4.0	3.4	Excellent
07/21/92	5923	99	41	4.3	3.2	Good

Taxonomic Analysis

The North Toe River at US 19E has maintained a fairly stable EPT community since 1992. Additionally, the biotic index has dropped after a somewhat significant rise was observed in 2002. This drop can be attributed to a more intolerant EPT community and fewer oligochaete worms collected in 2007. The intolerant EPT community had 3 abundant stonefly taxa (*Acroneuria abnormis*, *Leuctra* sp., and *Paragnetina immarginata*), 2 abundant caddisfly taxa (*Brachycentrus spinae* and *Neophylax oligius*) and one abundant mayfly species (*Epeorus vitreus*). Other taxa included the intolerant but not abundant *Micrasema bennetti*, *M. wataga*, *Pteronarcys* sp., *Tallaperla* sp., *Baetisca* sp., *Brachycercus* sp., and *Serratella serrata*.

Data Analysis

This segment of the North Toe River is well developed along its length with small communities and active agricultural fields. Some small tributaries are undeveloped and drain portions of Pisgah National Forest in Avery County. This site was very silty, a symptom of agriculture and residential development. However, this stream rated Good but was borderline with Excellent. A slightly lower biotic index or 2 more EPT taxa would have given this site an Excellent bioclassification rating. As in 2002, there was a high abundance of diatomeaceous growth on the rocks which may indicate nutrient enrichment. No serious habitat problems were noted.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N TOE R	SR 1162	EB286	06/21/06	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Mitchell	6	06010108	355545	820655	7-2-(27.7)b	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	145	2473	30	0.6

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	75	25	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Uninem Corp - Quartz operation / Uninem Corp - Schoolhouse Quarz facility	NC0000175 / NC000061	3.6 / 2.16
Feldspar Corp. - Spruce Pine Facility / Spruce Pine WWTP	NC0000353 / NC0021423	3.5 / 2.0
K-T Feldspar Corp. - Spruce Pine Facility	NC0000400	3.5

Water Quality Parameters

Temperature (°C)	24.3
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	98
pH (s.u.)	6.9

Water Clarity

slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	83

Site Photograph**Substrate**

boulder, cobble, gravel and sand; silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/21/06	9965	116	49	4.9	3.7	Good
07/10/02	8806	60	22	5.9	4.2	Fair
07/09/97	7348	70	34	4.7	3.7	Good
07/20/92	5922	78	23	5.2	3.1	Good-Fair

Taxonomic Analysis

EPT richness more than doubled since 2002 to achieve the highest number ever recorded at this site. Stoneflies, completely absent in 2002, have recovered with 7 taxa present of which 2 were abundant (*Acro-neuria abnormis* and *Perlesta* sp.). The most caddisfly taxa ever collected were collected in 2006, almost 3 times the number of caddisfly taxa collected in 1997 (the last Good rating). However, abundant midge taxa and many oligochaete taxa kept the biotic index relatively high at 4.9. The number of abundant EPT taxa increased overall, but was evenly split between intolerant and tolerant groups. Never before collected taxa included *Rhyacophila formosa*, *Micrasema wataga*, *Brachycentrus nigrosoma*, *Anthopotamus distinctus* and *Eurylophella aestiva* (23rd state record).

Data Analysis

Data from 2006 was used in lieu of sampling in 2007. Downstream of 5 major NPDES dischargers (four mining facilities and the town of Spruce Pine WWTP), the North Toe River has historically varied in bioclassification ratings. The Fair rating in 2002 occurred after a 1500 gallon petroleum spill which was remediated by the EPA. Since that event, the biota has recovered and surpassed prior levels to receive a Good bioclassification rating for 2007. Petroleum odors were noted during the 2006 sampling.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N TOE R	SR 1314	EB287	08/27/07	GOOD

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Yancey	6	06010108	360018	821146	7-2-(58.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	322	2278	35	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	80	20	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none (below N Toe R @ SR1162 dischargers)	---	---

Water Quality Parameters

Temperature (°C)	27.3
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	101
pH (s.u.)	8.1

Water Clarity

slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	11
Pool Variety (10)	10
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	3
Total Habitat Score (100)	75

Substrate

bedrock, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/27/07	10336	73	35	5.3	4.6	Good
07/09/02	8802	75	36	4.9	3.8	Good
07/09/97	7347	74	40	4.7	4.2	Good
07/21/92	5924	94	42	4.8	4.1	Good

Taxonomic Analysis

EPT richness continues to decline, although at a slow rate. The biota is dominated by semi-intolerant taxa such as *Neureclipsis* sp., *Tricorythodes* sp. and *Isonychia* sp. and by tolerant taxa such as *Baetis intercalaris*, *B. flavistriga*, *Caenis* sp. and *Cheumatopsyche* sp. Only one sensitive taxon, *Ceratopsyche morosa*, was abundant in 2007. Even though a few previously collected taxa were not found (*Eurylophella funeralis*, *Ephoron leukon*, *Serratella deficiens*, *S. serratoides*, *Nyctiophylax celta*, *Setodes* sp. and *Triaenodes ignitus*), some taxa were collected for the first time including the stonefly *Pteronarcys comstocki* (4th state record), *Oecetis nocturna*, *O. morsei*, and *Anthopotamus distinctus*. The stonefly *Perlesta* sp. was also missing, probably because of emergence.

Data Analysis

Over 14 miles downstream of the last major NPDES discharger and 7 miles downstream from the confluence with the South Toe River, this site passes through agricultural and industrial (mining) areas. This site has maintained a Good rating since 1992. However, it appears that the macroinvertebrate community is becoming more tolerant as evidenced by an increasing biotic index. One caveat, however is that EPT richness in 2007 may be affected by seasonal emergence of some insects from the stream as this site was sampled late in August. The appalachian elktoe (*Alasmidonta raveneliana*), a federally endangered mussel, was found near this site in 2002.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG CRABTREE CR	SR 1002	06/18/07	EF7	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MITCHELL	6	06010108	35.8875	-82.14638889	7-2-48	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C; Tr	12.3	2590	9	0.3	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	100	0	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	18.5
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	32
pH (s.u.)	6.1

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	92

Site Photograph



Substrate

cobble, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/18/07	2007-83	20	58	Excellent
12/01/04	2004-141	17	58	Excellent
05/04/99	99-30	18	58	Excellent
09/30/98	98-77	17	58	Excellent
06/24/97	97-62	18	58	Excellent

Most Abundant Species

Mottled Sculpin

Exotic Species

Redbreast Sunfish

Species Change Since Last Cycle

Gains -- Rosyside Dace, Greenside Darter, Black Redhorse, Gilt Darter, and Creek Chub. **Losses** -- White Sucker and Whitetail Shiner.

Data Analysis

Watershed -- a tributary to the North Toe River located about 5.5 miles upstream of its confluence; drains the southernmost tip of Mitchell County and small part of southeastern Yancey County. **Habitat** -- high quality instream habitats including runs with fast chutes, cobble riffles, and boulder pools; low flow; good forested riparian zone widths. **2007** -- an abundant community of fish (n = 474) with good species richness (including 4 intolerant species) and good reproductive function; all species collected were represented by multiple age classes; a 7.5 inch Eastern Hellbender (a NC species of Special Concern and indicative of low siltation) was also collected and released. **1997 - 2007** -- a total of 22 species are known from this watershed including 10 species of minnows, 3 species of suckers, and 4 species of darters. This regional reference site has maintained the same NCIBI score and Excellent rating over a 10 year period and would qualify for HQW or ORW status if petitioned.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BIG CRABTREE CR	US 19 E	EB274	08/15/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Mitchell	6	06010108	355409	820851	7-2-48	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	17	2600	7	0.1

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	50	50	0	0

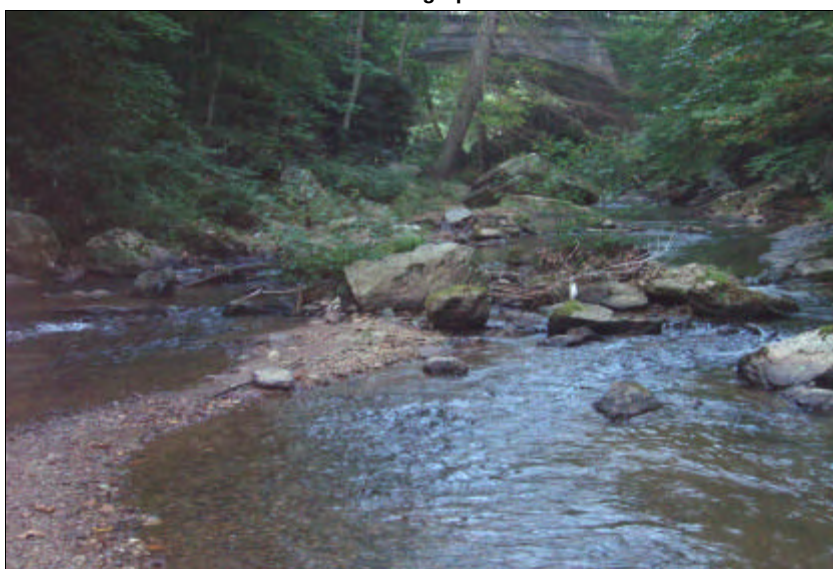
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

Water Quality Parameters

Temperature (°C)	18.3
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	42
pH (s.u.)	6.7

Water Clarity	clear
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Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	86

Substrate	cobble with boulder and gravel, some sand
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/15/07	10293	---	37	---	2.9	Excellent
07/11/02	8809	---	37	---	3.0	Excellent
07/10/97	7350	---	40	---	2.2	Excellent

Taxonomic Analysis

EPT diversity in Big Crabtree Creek has remained stable relative to other sampling years. However, abundant intolerants in 2007 decreased by a factor of 2 from previous years. Six taxa in 2002 were abundant while only 3 were abundant in 2007 (the mayfly *Epeorus vitreus* and the stoneflies *Leuctra* sp. and *Tallaperla* sp.). Only one baetid mayfly (*Baetis intercalaris*) was collected in 2007 in contrast to 4 in 2002 and 5 in 1997. Also, 2 species of the caddisfly *Rhyacophila* (*R. amicus* and *R. fuscula*), present in previous years, were not collected. Collected taxa of note include the mayflies *Paraleptophlebia* sp. and *Serratella serratoidea*; the stoneflies *Pteronarcys* sp. and *Paragnetina immarginata*; and the caddisflies *Brachycentrus spinae*, *Dolophilodes* sp., and *Mystacides sepulchralis*.

Data Analysis

The catchment of Big Crabtree Creek is primarily forested with sparse pockets of residential development throughout and agricultural fields near US 19E. With no dischargers and low potential non-point source runoff (particularly during drought conditions), Big Crabtree Creek has few stressors on the macroinvertebrate community. This conclusion is supported by an Excellent rating for the last 3 basinwide cycles.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S TOE R	SR 1167	EB294	08/13/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Yancey	6	06010108	354952	821104	7-2-52-(1)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr, ORW	43	2800	12	0.25

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	30	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

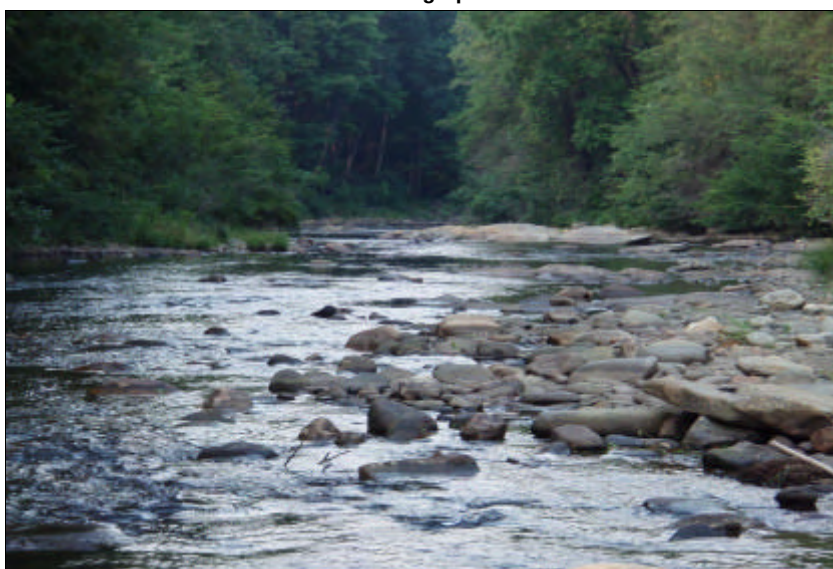
Water Quality Parameters

Temperature (°C)	25.2
Dissolved Oxygen (mg/L)	6.7
Specific Conductance (µS/cm)	21
pH (s.u.)	6.6

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	82

Substrate

cobble, boulder, and bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/13/07	10244	110	51	3.8	3.0	Excellent
07/11/02	8810	100	50	3.5	2.6	Excellent
07/10/97	7349	82	40	3.2	2.5	Excellent
07/20/92	5921	102	48	3.6	2.6	Excellent

Taxonomic Analysis

Very little change occurred in EPT richness from 2002 to 2007. Abundant taxa were mostly intolerant taxa such as *Neophemera purpurea*, *Paragnetina immarginata*, *Leuctra* sp., *Brachycentrus spinae*, *B. appalachia*, *Dolophilodes* sp., and *Mystacides sepulchralis*. The increase in the biotic index can be partially attributed to a higher diversity of midges as well as an overall more tolerant EPT community. *Agnetina flavescens*, a perlid stonefly, was collected for only the 27th time in the entire state. Also, a hellbender (*Cryptobranchus alleganiensis*), a species of special concern in NC, was noted (and photographed).

Data Analysis

Classified as Outstanding Resource Waters (ORW), the South Toe River drains a portion of Pisgah National Forest in Southeastern Yancy County. With no NPDES dischargers, the agricultural and residential development that exists along the river corridor in the lower watershed has little to no impact on the stream in low flow years such as 2002 and 2007. At SR 1167, South Toe River has consistently rated Excellent. Even though the biotic index has increased during the last 2 cycles, suggesting a more tolerant community, it is still well within the excellent range. Of particular note, rootmats were out of the water reducing habitat for some groups of benthic insects although the instream habitat was very good.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CANE CR	SR 1211	06/21/07	EF14	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MITCHELL	6	06010108	36.01166667	-82.1475	7-2-59	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	16.3	2512	8	0.3	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	55	10 (rural residential)	30	5 (city park)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	14.7
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	68
pH (s.u.)	6.9

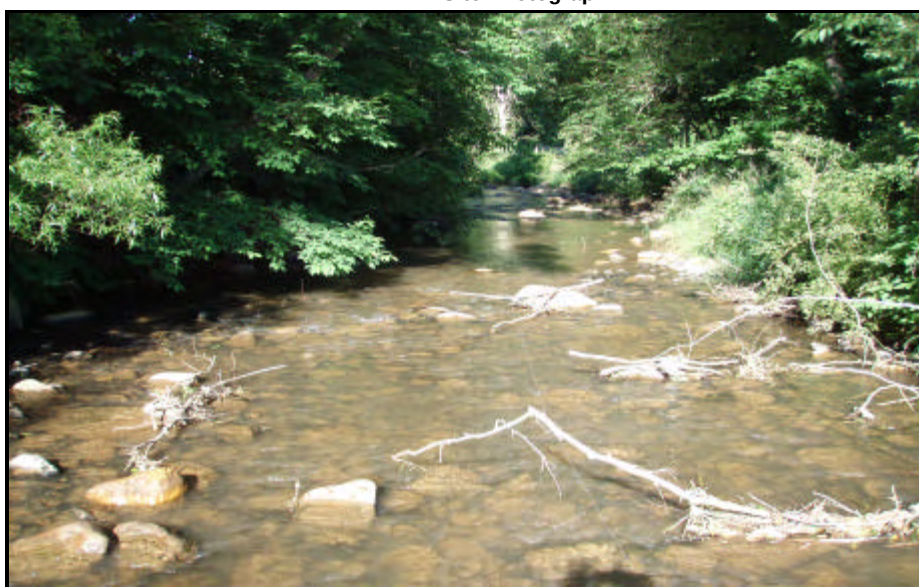
Water Clarity

Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	70

Site Photograph



Substrate

cobble, boulder, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/07	2007-90	13	36	Fair
06/24/97	97-63	12	34	Fair

Most Abundant Species

Bluehead Chub

Exotic Species

Redbreast Sunfish, Bluehead Chub, and Brown Trout

Species Change Since Last Cycle

Gains -- Rock Bass. Losses -- none

Data Analysis

Watershed -- a tributary to the North Toe River located about 4 miles above its confluence; drains central Mitchell County, just east of Bakersville; land use in this rural catchment is primarily agricultural; Hatchery Supported Trout Waters. **Habitat** -- cobble riffles, chutes, and one long shallow silty pool; thin but intact riparian zone widths on both sides of the sample reach; cattle have been fenced out of the stream. **2007** -- a moderately diverse, yet extremely abundant fish community (n = 1516) was collected; the non-indigenous Bluehead Chub (n = 636, 42%) and Central Stoneroller (n = 435, 29%) represented the majority; no darters were collected; only one intolerant species (Rock Bass) was collected. **1997 - 2007** -- there are 13 known species from this site including 8 species of minnows, 2 species of sunfish, 2 species of suckers, and 1 trout species. The NCIBI metrics have remained stable between sample cycles. However, this watershed continues to experience non-point runoff from rural agricultural practices, which is consistent with the high percentage of omnivores + herbivores collected in both samples.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG ROCK CR	NC 226	06/20/07	EF10	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MITCHELL	6	06010108	36.05027778	-82.21861111	7-2-64	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	33.3	2375	12	0.4	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	70	0	30	10

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	20.2
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	65
pH (s.u.)	6.9

Water Clarity

Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	7
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	87

Site Photograph



Substrate

cobble, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/20/07	2007-89	15	50	Good
09/30/98	98-78	14	50	Good

Most Abundant Species

Mottled Sculpin

Exotic Species

Brown Trout

Species Change Since Last Cycle

Gains -- Bluegill and Smallmouth Bass. Losses -- Whitetail Shiner and Rainbow Trout.

Data Analysis

Watershed -- a tributary to the North Toe River located just over 5 miles above its confluence; drains a large portion of northern Mitchell County including some Pisgah National Forest lands within the outskirts of the catchment; Hatchery Supported Trout Waters. **Habitat** -- cobble and bedrock shelf riffles, boulder runs, and 1 long fast chute; thin riparian corridors that are flanked by pasture fields; slightly elevated conductivity. **2007** - a fairly diverse and abundant (n = 708) fish community was collected at this regional reference site; one very old Eastern Hellbender (NC Species of Special Concern and indicative of low siltation) measuring 21.5" long was also collected and released. **1998 - 2007** -- very stable NCIBI metric scores over the 9 year span between samples; this watershed is supporting a total of 17 known species including 8 species of minnows, 2 species of suckers, and 2 species of darters. Notwithstanding some non-point nutrient loading from agriculture, there appears to be no obvious water quality issues here.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BIG ROCK CR	NC 197	EB275	08/14/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Mitchell	6	06010108	360128	821511	7-2-64	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	63	2135	9	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	20	20	60	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

Water Quality Parameters

Temperature (°C)	25.5
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	66
pH (s.u.)	8.6

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	3
Left Riparian Score (5)	2
Right Riparian Score (5)	1
Total Habitat Score (100)	73

Substrate

sand with equal amounts of boulder, cobble and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10292	---	38	---	3.3	Excellent
07/09/02	8801	---	36	---	3.0	Excellent
07/09/97	7346	---	34	---	2.4	Good
07/21/92	5925	---	43	---	2.7	Excellent

Taxonomic Analysis

After a historically low EPT richness in 1997 (34), Big Rock Creek regained 2 EPT each basinwide cycle. Only 4 intolerant taxa were abundant; two stoneflies, *Acronetia abnormis* and *Paragnetina immarginata*, as well as 2 caddisflies, *Brachycentrus spinae* and *Ceratopsyche morosa*. Other intolerant taxa were the mayflies *Epeorus vitreus*, *Heterocloeon anoka*, *Neophemera purpurea* and *Anthopotamus distinctus* (1st collection at this site); and the caddisflies *Micrasema wataga* and *Setodes* sp. The caddisfly *Brachycentrus appalachia*, collected in previous years, was not found in 2007.

Data Analysis

Big Rock Creek drains a portion of Pisgah National Forest and the Pisgah Gamelands. However, the river corridor in the lower watershed is well developed both residentially and agriculturally. Although this stream only rated Good in 1997, two more taxa would have resulted in an Excellent rating. This stream appears to have no water quality issues as evidenced by a stable and diverse macroinvertebrate community.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
PIGEONROOST CR	SR 1349/NC 197	06/20/07	EF39	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MITCHELL	6	06010108	36.04583333	-82.29916667	7-2-69	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	14.1	2130	9	0.4	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	93	5 (rural residential)	0	2 (fire station)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.4
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	39
pH (s.u.)	6.8

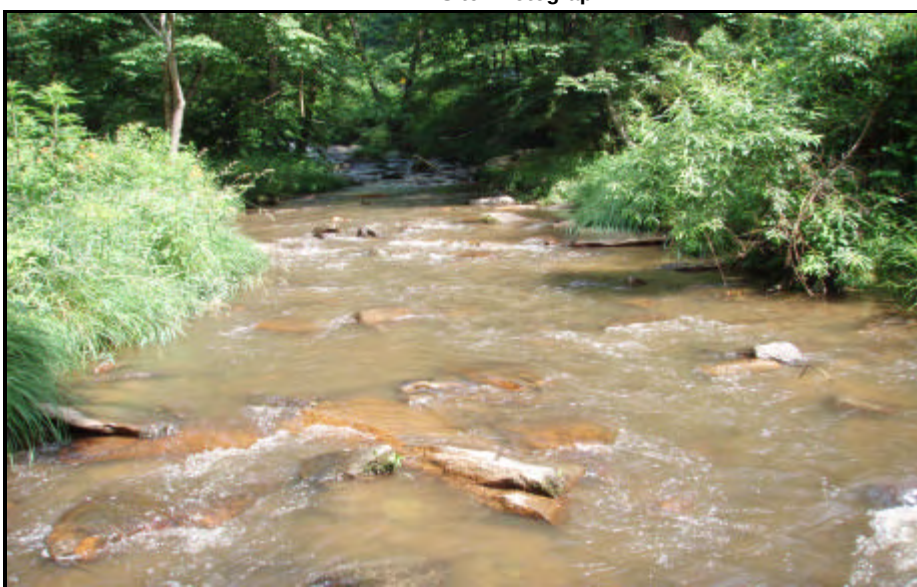
Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	92

Site Photograph



Substrate

cobble, boulder, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/20/07	2007-88	22	56	Good
06/21/02	2002-79	23	58	Excellent
10/20/97	97-87	21	60	Excellent

Most Abundant Species

Mottled Sculpin

Exotic Species

Redbreast Sunfish and Brown Trout

Species Change Since Last Cycle

Gains -- Redbreast Sunfish, Fatlips Minnow, and Creek Chub. **Losses** -- Rock Bass, Smallmouth Bass, Rainbow Trout, and Brook Trout.

Data Analysis

Watershed -- one of the last tributaries to the North Toe River before the North Toe joins the Cane River to form the Nolichucky River; drains part of the northwest corner of Mitchell County including portions of the Pisgah National Forest. **Habitat** -- high gradient forested mountain stream with abundant riffles, fast chutes, and boulder shelves. **2007** -- a very abundant fish population (n = 1553) with good species richness, including three intolerant species (Telescope Shiner, Greenfin Darter, and Gilt Darter); with the addition of just one more bass or trout species (see Losses), this site would have received its third consecutive rating of Excellent. **1997 - 2007** -- this site is supporting an incredibly abundant fishery of 27 known species including 13 species of minnows, 5 species of Darters, 3 species of trout, 2 species of bass, and 1 species of sucker. With stable NCIBI metrics, two Excellent ratings, and one Good rating, this watershed might qualify for reclassification to HQW or ORW if returns to Excellent.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CANE R	US 19W	EB302	08/14/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Yancey	7	06010108	360000	822126	7-3-(13.7)a	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	145	2100	25	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	20	80	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

Water Quality Parameters

Temperature (°C)	24.7
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	68
pH (s.u.)	8.7

Water Clarity

slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	74

Substrate

cobble, boulder, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10246	99	45	4.4	3.5	Excellent
07/09/02	8845	91	46	4.4	3.6	Excellent
07/09/97	7344	84	46	4.4	3.5	Excellent
07/21/92	5927	93	48	4.4	3.5	Excellent

Taxonomic Analysis

The EPT richness, as well as the biotic index, have remained stable over the last four basinwide cycles. Of note is that more intolerant taxa were abundant (10) than moderately intolerant (6) and tolerant taxa (2) combined. Three intolerant caddisfly taxa, *Goera* sp., *Mystacides sepulchralis*, and *Nyctiophylax celta* were not previously collected. Other taxa included the mayflies *Ephoron leukon*, *Anthopotamus distinctus*, *Serratella deficiens*; the stonefly *Acroneuria abnormis*; and the caddisflies *Micrasema wataga* and *Neureclipsis* sp. *Heterocloeon petersi*, *Perlesta* sp., *Psychomyia flavida*, and *Triaenodes perna*, all found in 2002, were not collected in 2007.

Data Analysis

Originating in Pisgah National Forest, the Cane River passes through many small communities and rural developments. Additionally, the river is closely followed by US 19 for much of its length eliminating riparian and adding potential road runoff. Despite this, the Cane River has consistently rated Excellent since 1992 indicating no water quality or serious habitat deficiencies, based upon the macroinvertebrate community. The addition of high quality waters from many of the Cane River tributaries is likely partially responsible for maintaining the excellent water of the Cane River.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BALD MTN CR	SR 1408	EB299	08/14/07	EXCELLENT

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Yancey	7	06010108	355902	822432	7-3-32	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi ²)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	15	2380	7	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	30	70	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none	---	---

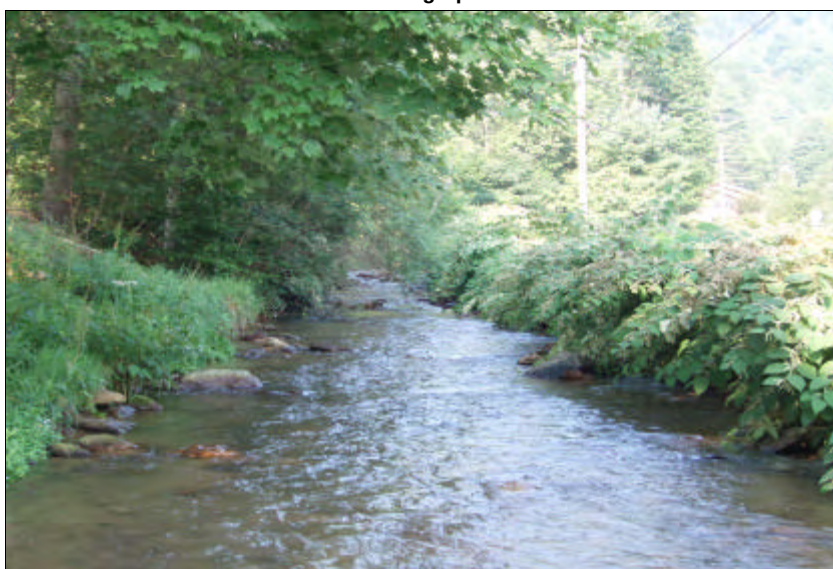
Water Quality Parameters

Temperature (°C)	17.1
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	44
pH (s.u.)	6.7

Water Clarity

clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	0
Total Habitat Score (100)	77

Substrate

Mostly cobble with gravel. Some boulder and sand.

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/14/07	10245	---	41	---	2.4	Excellent
07/09/02	8844	---	40	---	2.8	Excellent
07/08/97	7343	---	32	---	2.5	Good
07/21/92	5928	---	26	---	3.4	Good-Fair

Taxonomic Analysis

EPT richness was similar to 2002 levels but has increased substantially over the years prior to 2002. Abundant intolerant taxa dominate the fauna of Bald Mountain Creek. These taxa include the mayflies *Drunella conestee*, *Epeorus vitreus*, *Rithrogena* sp., and *Serratella carolina*; the stoneflies *Leuctra* sp., *Paragnetina immarginata*, and *Pteronarcys* sp.; and the caddisflies *Glossosoma* sp. and *Neophylax oligius*. Interestingly, previously abundant taxa such as the ubiquitous tolerant caddisfly *Cheumatopsyche* sp. and the moderately intolerant stonefly *Perlesta* sp. were not collected in 2007.

Data Analysis

SR 1408 closely follows Bald Mountain Creek completely eliminating the riparian on one side of the stream. Additionally, the river corridor is moderately developed both residentially and agriculturally, although, overall, the watershed drains mostly forested land. Despite this, Bald Mountain Creek water quality has steadily improved to Excellent from its lowest rating of Good-Fair garnered in 1992. However, the potential non-point source impacts from agriculture and residential development is high. As 2007 (as well as 2002) was a severe drought year, little non-point source runoff entered the stream to impact the benthic fauna.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG CR	SR 1444	06/21/07	EF75	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
YANCEY	7	06010108	36.0154299	-82.3515462	7-3-40-(2.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	8.1	2230	5	0.4	No

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	90	10 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	18.8
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	40
pH (s.u.)	6.8

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	15
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	86

Site Photograph



Substrate

cobble, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/07	2007-92	19	56	Good

Most Abundant Species

Mottled Sculpin

Exotic Species

Rainbow Trout and Brown Trout

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a tributary to the Cane River (and ultimately the Nolichucky River) located just above its confluence; drains part of the northern tip of Yancey County. The upper 1/2 of this highlands watershed lies within Pisgah National Forest lands. **Habitat** -- typical instream habitats for a high gradient mountain stream; 100% riffle-runs with chutes; open canopy and full sunlight for part of the sample reach, which flows through a residential property. **2007** -- a diverse and abundant (n = 767) population of fish were collected including 6 intolerant species, 9 minnow species, 3 darter species, and all 3 trout species; with one more darter species collected, this site would have rated Excellent. There are no apparent water quality issues in this watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HOLLOW POPLAR CR	NC 197	06/21/07	EF74	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MITCHELL	6	06010108	36.0875132	-82.3369141	7-10	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	6	2290	4	0.3	Yes

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	75	25 (rural residential)	0	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	---	---

Water Quality Parameters

Temperature (°C)	17.1
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	41
pH (s.u.)	6.9

Water Clarity

Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	15
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	86

Site Photograph



Substrate

cobble, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/07	2007-91	2	---	Not Rated

Most Abundant Species

Rainbow Trout

Exotic Species

Rainbow Trout

Species Change Since Last Cycle

N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a tributary to the Nolichucky River located about one mile above its confluence; drains a small headwater catchment in the western corner of Mitchell County bordering Tennessee; the highest elevations of this watershed lie within Pisgah National Forest lands. **Habitat** -- a highlands trout stream with 100% riffle-run habitats; an open canopy exists in sections of the stream along the road (see picture). **2007** -- only two species were collected (Rainbow Trout and Western Blacknose Dace), which is typical for the upper reaches of a high gradient Blue Ridge trout stream; this system probably used to support a reproducing population of Brook Trout, which were replaced with Rainbow Trout. Several dozen young-of-year wild Rainbow Trout were collected and or observed. No apparent water quality issues exist in this rural mountain watershed.